



Concepts and principles for the management of electronic records, or records management theory is archival diplomatics

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Abstract

Purpose – The greatest challenges which digital systems present are the creation and maintenance of reliable records and the preservation of their authenticity over time. It is vital for every organisation that its records should be able to stand for the facts which they concern, i.e. that their content is trustworthy. To meet these challenges the international community of records professionals must develop appropriate strategies, procedures and standards. This paper seeks to explore the concepts and principles derived from archival diplomatics that should guide the management of electronic records and therefore these developments, as well as drawing conclusions about the nature of the research work required.

Design/methodology/approach – The paper looks at the problems presented by electronic records, considers a definition of electronic records, and discusses the authenticity and reliability of electronic records.

Findings – Research work needs to be carried out to formulate the principles that will guide the development of international, national and organisational policies, strategies and standards, the specific criteria for each type of policy, strategy and standard, and the procedural methods for their implementation. The most important thing is to ensure that the policies, strategies and standards are consistent with one another, and this is only possible when they are based on the same concepts and inspired by the same principles.

Originality/value – Concepts, laws and models from various fields must be studied to foster useful transfers from one field to another, to encourage the development of theory in emerging areas of endeavour and investigation, to eliminate the duplication of theoretical efforts in different fields, and to promote consistency of scientific knowledge. However, in order to develop the body of knowledge of records management, concepts, laws and models of archival diplomatics must be brought to bear.

Keywords Records management, Information management, Archives management

Paper type Conceptual paper



Introduction

In his article “Records management: confronting our professional issues”, J. Michael Pemberton writes: “the theoretical roots of records management, archives, and librarianship lie in information science, cognitive science, systems sciences, and at

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conceptual intersections with fields cognate with our own"[1]. I strongly disagree with this statement and firmly believe that the theoretical roots of records management lie in diplomatics as it has developed over the centuries for archival purposes[2].

In order to support my assertion, I will discuss the concepts and principles for the management of electronic records that have been developed by using archival diplomatics theory and methodology[3]. They are among the findings of two research projects directed by myself at the University of British Columbia (UBC) – the UBC/Department of Defense project on the Preservation of the Integrity of Electronic Records, carried out between 1994 and 1997, and the International Research on Permanent Authentic Records in Electronic Systems (InterPARES), begun in January 1999[4].

The primary contribution of diplomatics to an understanding of electronic records is its analysis of the attributes of a record based on concepts and principles that have evolved over centuries of detailed study of the documentary process. By decontextualising and universalising those attributes, the original diplomatists were able to recognise and evaluate records created over several centuries and juridical systems. In the same way, diplomatic concepts and principles have proven useful in identifying electronic records generated within many different hardware and software environments and for developing standards. The contribution of archival science is its analysis of aggregates of records in terms of their documentary and functional relationships and the ways in which they are controlled and communicated. The following discussion of the concepts and principles that should guide the management of electronic records focuses on those that are derived directly from archival diplomatics.

Overview of the problems presented by electronic records[5]

The last decade has generated more records than any previous decade of human activity. The fact that the majority of them are less reliable, retrievable or accessible than ever before is one of the ironies of the modern information age. Idiosyncratic software systems generate, manage and store digital data using proprietary technologies and media that are not developed to segregate records from other types of information, to prevent manipulation or tampering, or to establish and maintain an intellectual order, and that are subject to the dynamism of the computer industry. This digital information cannot be considered trustworthy and is easily lost in a self-perpetuating and expensive cycle of obsolescence and incompatibility.

Moreover, organisations and individuals create records in a variety of media and formats. It is quite common for records relevant to a single matter to exist partly in a paper file, partly in an e-mail box, and partly in a spreadsheet application or in a relational database. It is essential to establish explicit intellectual links among these records as they are created, and maintain them while they are actively used. It is equally important to preserve such links among inactive records, in particular those that are destined to permanent preservation, so that, several decades from now, researchers will be able to see the entire dossier relating to the matter they are exploring. *Ad hoc* attempts have been made by individual organisations to either create all records in a single medium or reduce them to one medium of choice. For example, offices have established routines for printing out e-mail and inserting it in a paper file,

scanning paper documents into electronic systems, or converting electronic and paper records to microfilm. These attempts have been unsuccessful for a number of reasons.

First, both the imposition of one medium of communication on the operations of an organisation and the constant conversion of records made or received in a variety of media to one medium of choice, if done for purposes of later accessibility and preservation, rather than for the ordinary requirements of the business at hand, hamper the workflow of the office. Therefore their implementation tends to be sporadic and inconsistent. Second, many record forms do not lend themselves to such conversions. For example, hypertext records cannot be printed out to paper, and scanned maps or photographs are not always reliable surrogates of the paper originals. Third, court decisions have rejected the practice of converting electronic records to other media on the grounds that the converted records lack elements critical to their use as evidence[6]. For example, the printout of an electronic spreadsheet will not contain the formulae on which calculations are based.

The effects of the adoption of information and communication technologies without forecasting and planning for the consequences of hybrid records systems, digital environments facilitating manipulation of data, media and digital obsolescence, and the proprietary and idiosyncratic nature of applications have already been witnessed in governments and other organisations. In Canada, in the spring of 1996, the inadequacy of procedural mechanisms for ensuring the authenticity of electronic records became a focal point of hearings held by the Canadian Commission of Inquiry into the Deployment of Canadian Forces to Somalia. As part of its investigation, the Commission requested access to National Defence Operation Centre (NDOC) logs, which were maintained in an automated database and which contained a record of all message traffic coming into National Defence headquarters from Canadian Forces' theatres of operation. During its review of the logs, the Commission discovered several anomalies, including entries containing no information, missing serial numbers, and entries with duplicate serial numbers. The Commission was concerned that there may have been deliberate tampering with these logs. Although subsequent investigations were unable to show evidence of tampering, they could not exclude the possibility of it, because of the absence of standard operating procedures with regard to the log, the complete ineffectiveness of the security system in place, a lack of system audits, and the tendency to bypass the awkward system. Therefore, the Commissioners concluded that NDOC logs were not a reliable record of transactions at the operations centre either for present investigators or for future researchers[7].

This example makes quite clear that, although physical preservation is an issue with electronic records, it is not the major issue. The greatest challenges with which digital systems present us are the creation and maintenance of reliable records and the preservation of their authenticity over time. It is vital for every organisation that its records be able to stand for the facts they are about, that is, that their content is trustworthy. It is equally important that, in time, those records can be proved to be what they purport to be, immune from any sort of tampering and corruption, that is, that they are trustworthy as records. According to diplomatics, the former type of trustworthiness is defined reliability; the latter is defined authenticity. Records' reliability depends on the degree of completeness of their form and on the degree of control exercised over their procedure of creation. Records' authenticity depends on

their mode, form and state of transmission as drafts, originals or copies, and on the manner of their preservation and custody. It is necessary that the international community of records professionals develop strategies, procedures and standards capable of meeting the challenge presented by the creation and maintenance of reliable records and the preservation of authentic records.

Defining electronic records

In order to establish the terms of reference and parameters for the development of strategies, procedures and standards ensuring the reliability and authenticity of electronic records, it is essential to be able to define, identify and segregate electronic records from other forms of digital information.

An electronic record can be defined in a decontextualised way by identifying and defining its necessary and sufficient components in such a manner that they can be recognised and captured by a digital information system. A diplomatic analysis of various types of electronic records shows that the necessary and sufficient components of an electronic record are the same as those of its traditional counterpart, although they may manifest themselves in different ways. They are:

- *medium*, i.e. the physical carrier of the message;
- *content*, i.e. the message that the record is intended to convey;
- *physical and intellectual form*, i.e. the rules of representation that allow for the communication of the message;
- *action*, i.e. the exercise of will that gives origin to the record;
- *persons*, i.e. the entities acting by means of the record;
- *archival bond*, i.e. the relationship linking each record to the previous and subsequent one; and
- *context*, i.e. the juridical, administrative, procedural and documentary framework in which the record is created[8].

The fundamental difference from traditional records is that the components of electronic records may reside in different parts of the medium or even of the system and may not physically exist if not purposely generated. This means that a complete record is one whose components have been inextricably and irreversibly linked to each other and have been made explicit by transforming them in an element of form, for example, by expressing the archival bond in a classification code.

Another difference is in the multiple manifestation of individual elements of form. For example, in an electronic record, one may have several dates: the date given to the document by its author, which demonstrates the relationship between the author and the content; the date and time of transmission to either an external or an internal addressee, which represent the moment in which a record begins to have consequences; the date and time of transmission to the dossier or class to which the record belongs, which reveals the development of the matter; and the date and time of each retrieval, which show every act of consultation. Each and every one of these dates may be necessary to prove either the reliability of the record or its authenticity over time.

A similar situation exists with regard to the signature, which assigns responsibility for the record and its content. A handwritten or typewritten subscription can be attached to a record by its author or writer, but, in an electronic record, it does not have the function of a signature. Instead, the name appearing in the header of an electronic mail message (the superscription, if one wishes to adopt diplomatic terminology) or in the profile of other types of record is able to fulfil the signature function. A mix of accountability and authenticating functions is then exercised by the digital signature, which is not even a sub- or superscription, but a digital data file that uses a computationally unique string of numbers and enables the detection of unauthorised modifications to the contents of a record. When one compares the digital signature with the traditional means of authentication analysed by diplomatics, one realises that the digital signature is conceptually a seal. It serves the immediate need of proving provenance to the addressee of the document, but, once “broken” for purpose of verification, has no more use. It can, however, constitute a problem if the record to which it is attached needs to be kept beyond the life of the system in which it is received. This means that the control exercised by an organisation on its procedures of records creation must get down to the prescription of the formal elements to be introduced in the record and kept intact, also in light of the retention period of the record.

Ensuring records reliability

In light of what has been discussed above, in addition to the traditional body of rules governing the making, receiving, routing, annotating and setting aside of records, further requirements must be introduced for the specific control of electronic records, aimed to ensure their reliability. For example:

- compiling records according to pre-defined standard formats and templates;
- authenticating records using pre-established methods, depending on record type and function;
- embedding in the electronic records system access privileges, by assigning to each person who has access to the electronic system, on the basis of clearly identified competencies, the authority to compile, classify, annotate, read, retrieve, transfer, or destroy only specific groups of records;
- embedding in the electronic records system “workflow rules” according to which the system will present only the person competent for each action with the related records and will solicit the making of the appropriate record at the proper time in the automatic development of the procedure;
- limiting access to the technology or to parts of it by means of magnetic cards, passwords, finger prints, etc.; and
- designing within the electronic system an audit trail, so that any access to the system and its consequences (e.g. a modification to the record, a deletion, an addition) can be documented as they occur.

Although the implementation of these requirements also supports the ability of the organisation and of its legitimate successor(s) to verify or prove the authenticity of its electronic records, it is not sufficient to fulfil this purpose. Audit trails, encryption and

the unique identification of the original version of a records may prevent, impede or detect manipulation and tampering while the records stay in the live system in which they were made or received and set aside. However, these means are not useful when the records are removed from the system either to be stored on a non-online medium or to be transferred to a new digital system.

Ensuring records authenticity

A key difference between electronic and non-electronic records is that the latter are kept authentic by maintaining them in the same form and state of transmission in which they were made or received and set aside, while the former are kept authentic by continuous refreshing and periodic migration. The most detailed and clear definition of migration to date is the following:

Migration is a set of organised tasks designed to achieve the periodic transfer of digital materials from one hardware/software configuration to another, or from one generation of computer technology to a subsequent generation. The purpose of migration is to retain the ability to display, retrieve, manipulate and use digital information in the face of constantly changing technology. Migration includes refreshing as a means of digital preservation but differs from it in the sense that it is not always possible to make an exact copy or replica of a database or other information object as hardware and software change and still maintain the compatibility of the object with the new generation of technology[9].

In other words, because refreshing generates a complete reproduction of both the content and the formal elements of the records, the resulting records may be considered faithful copies of the original records. Migration, on the contrary, generates a reproduction of the content of the record, with changes in configuration and format, often having a ripple effect on other components of the record. Thus, migration always involves some measure of loss.

According to diplomatics, there are components of the record that can be lost without compromising its substance and the ability to verify its authenticity over time, and others the loss of which would be equivalent to the loss of the record. These components vary from one type of record to another. For example, colour is a meaningful part of the message in a map or a chart, columns in a table, highlight in a hypertext, etc. In some types of records, these components are visible to the user, because they appear in their intellectual form[10]. In others, they are invisible to the user, as they exist either as metadata or as the elements of physical form[11] that condition, for example, the records' performance.

Thus, it is essential, first, to identify for each type of electronic record produced by an organisation the components that ensure its authenticity over time; second, to assess whether those that are not visible to the user can be made visible and stabilised by linking them inextricably to the intellectual form of the record; third, to determine whether, in the cases in which this operation were not doable, it would be possible and advisable to move the records in question to a non-digital form (e.g. microfilm); and fourth, to adopt self-authenticating and well-documented procedures for migration and an uninterrupted line of physical custody.

According to archival diplomatics, the latter is undoubtedly the most secure method to allow the verification of authenticity over the long term. When the records are needed by the creator in the usual and ordinary course of business, the procedural

controls on records creation and maintenance established to ensure their trustworthiness, and the continuing reliance of the creator on the products of the refreshing and migration processes are by themselves sufficient to authenticate them. However, when the records are no longer needed by the records creator to conduct its business, but must be retained for any of a variety of reasons, the migration process will have to be carried out by a party who has no stake in the records' content or existence. Moreover, its results will have to be verified and certified by such neutral party, be it an archival institution, a notary or any other body formally entrusted with an authenticating function. Finally, the resulting authentic copies of the obsolescent records will have to be declared so on the basis of a proper documentation of the process. Historically, archival description has always had the function of authenticating the records by making explicit and perpetuating their provenance and interrelationships. Today, its role is enhanced by the need for an ongoing description of the transformations to which electronic records need to be subjected time after time after time. It appears that, over the very long term, the only reliable form of authentication that will remain valid across cultures and regimes is one completely external to the records it validates.

However, this conclusion is only based on intuition and needs to be demonstrated. One part of the literature written on the subject has emphasised for a long time the need to understand the nature of the technological context of electronic records in each cultural, administrative, economic, and legal environment even before beginning to identify what is essential for ensuring the authenticity of electronic records over the long term[12]. Another part has underlined the universality of the record and how authenticity over time needs to be based on requirements and procedures independent of specific contexts, given the fact that future contexts cannot be known or predicted[13]. Finally, two other conflicting positions opt for a conceptual universal solution that entirely relies on technological advancements: one is known as Universal Preservation Format, or UPF, and the other as "emulator".

The Universal Preservation Format is:

... a data file mechanism that utilises a container or wrapper structure. Its framework incorporates metadata that identifies its contents within a registry of standard data types and serves as the source code for mapping or translating binary composition into accessible or useable forms. The UPF is designed to be independent of the computer applications that created them, independent of the operating system from which these applications originated, and independent of the physical media upon which it is stored. The UPF is characterised as "self-described" because it includes within its metadata all the technical specifications required to build and rebuild appropriate media browsers to access its contained material throughout time. Objects within the UPF are branded with a unique identifier that travels with that object throughout time. Any modification made to the content of the object must be reflected in its identifier[14, p. 24].

This preservation format is universal in two senses, philosophical and technological. In a philosophical sense, its conception derives from the belief that problems of long term preservation of authentic electronic records cannot be solved or even properly addressed without taking a universal approach based on an international and interdisciplinary collaboration. In a technological sense, its assumption is that it is possible to design a universal storage system that "will serve ultimately as safe

heavens for electronic media created in the past, present and future: for current digital materials, for migrated analogue materials, and for hybrid materials that may be developed in the future"[14, p. 5].

The position of those who support the emulator solution is represented by the work of Jeff Rothenberg. He believes that, because of the increasing complexity of modern data files and of their dependence on specific applications, access to electronic records can only occur either through the original application or through an emulator[15]. This solution has merit for some old proprietary systems, for which emulators called freeware already exist, and where it is necessary to preserve the original programming together with the records. However, it is problematic as a general proposition, because the continuing integrity of the emulator then becomes an issue, and one may have to run an emulation within another emulation in order to get to the data one needs. Emulation assumes that software has an inherent value, but such value cannot possibly balance the costs and difficulty of upgrading continuously emulation software[16].

The creation of trustworthy records

Irrespective of the long-term solution for the preservation of authentic electronic records, it is quite clear that there will not be much worth preserving for the future if serious measures are not taken by records creators to guarantee the trustworthiness of electronic records (in both meanings – trustworthiness of content and trustworthiness of the record as a record) since the moment of creation.

The first such measure consists of embedding procedural rules of records creation in an agency-wide, centralised records system, and of integrating business and documentary procedures. The centralised records system must include a recordkeeping system and a separate record-preservation system, in order to ensure an optimum amount of control over record creation, handling and preservation. The integration of business procedures with documentary procedures strengthens this control by identifying all the business procedures within each organisation's function; breaking them down into phases; determining for each phase the component actions, the records that must be used in relation to each action, the records that must be made, received, and handled during each action and by whom; the way in which the records have to be classified, audited, and disposed of; their level of confidentiality and the specific methods for ensuring their reliability and authenticity.

The second measure for guaranteeing the trustworthiness of electronic records consists of instituting procedures for strengthening their interrelationships and the links that they have with the non-electronic records created by the same organisation. According to archival theory, the tightening of this archival bond may occur by assigning a classification to each record that makes explicit and permanent its relationship with the action in which it participates and with all previous and subsequent records resulting from the same activity. Also registration, by providing evidence of the recorded interactions between the creating body and the external world, freezes and perpetuates the network of relationships that best serves to attest to the integrity of a record. The creation of a record profile for each record of the organisation, electronic and non-electronic, accomplishes a very similar purpose, by incorporating in an electronic form inextricably linked to the record for as long as the record exists all

the metadata that uniquely identify the record and reveal what it is all about. In a way, the record profile could be seen as similar to the wrapper of the Universal Preservation Format. However, it differs from it because of the permanent link that each profile has with the profiles of all records belonging in the same dossier.

The third and final measure for ensuring the trustworthiness of electronic records is the integration of the management of the electronic and non-electronic records belonging in a hybrid records system. As mentioned earlier, this integration may be implemented by creating an electronic record profile for every record, electronic and non-electronic, made or received and set aside in the central records system and by establishing a repository for those records profiles[17]. Other ways consist of scanning and classifying all non-electronic records within the electronic recordkeeping system (of course, storing the originals elsewhere), printing all electronic records, or transferring to microfilm all the organisational records, whatever their original medium and physical form (again, storing the originals elsewhere). While the idea behind the latter solutions is sound in that it aims to keep centralised control of all records within one system, be it electronic or not, it has already been shown that these are not viable solutions from a practical point of view, although conceptually they might be[18].

The appraisal of electronic records

At this point, it might seem that the concerns of records creators for the trustworthiness of their records have been addressed in the most thorough way. And it would be so if the issue of appraisal did not raise its ugly head. The simple fact is that, with electronic records, appraisal appears at the centre and front of the records creation and maintenance processes. There is little consensus at this time on what is the appropriate framework for appraisal decisions[19]. The questions that loom largest are:

- When should electronic records be appraised?
- How many times should electronic records be appraised?
- What should be appraised: records, functions or both?
- Who should be responsible for appraisal?
- At what level of record or function aggregation should appraisal take place?

The problem is compounded by the fact that each question may have several different but equally legitimate answers, depending on the given qualifiers. In addition, one may wonder whether the criteria for appraisal should be questioned and its most sacred axioms, such as that prohibiting selection of parts of a file or of a record, revisited.

The issue presents itself because the records generated today in electronic systems are quite different from their traditional counterparts. For example, the university students' registration records are generated to enrol students in faculties and courses, and are kept to maintain and provide evidence of such enrolment, to be used for a variety of purposes. This documentary evidence must therefore contain all the data necessary to uniquely identify the student, to link him/her to a specific programme of study, to establish the dates of registration, exams and programme completion, and to keep track of any variation to the above. These data are usually entries in a record

called register, encompassing one academic year, and composed of multiple volumes or of rolls of microfilm. The whole of the registers of a university makes up one uniform and ongoing series of records constituted on the basis of form and function. Independently of any consideration related to the legal and research value of the records in question, given the centrality of the registration function to any university, the entire series is usually permanently preserved.

Should such sweeping appraisal be extended to the electronic records that are created in electronic students registration systems? Does new technology mean new appraisal? Perhaps, or perhaps better questions to ask are:

- Has the new technology influenced the registration function to the point of changing the nature of the records contained in an electronic registration system?
- Does the new technology allow for appraisals that were not possible with traditional records?
- Does permanent preservation of these electronic systems require the accomplishment of tasks very different from those accomplished for traditional systems? If so, where does responsibility for their preservation reside?

As regards the function of registration, it appears very clearly that it has lost its purity. The capability of information technology to manipulate data has induced many administrators to associate with the primary function of a system a host of secondary, often marginal, functions that are not central to the university mission but can provide support to it. For example, in order to develop a long term plan for the university, it is important to be able to establish the detailed demographics of the present student population, the amount of financial support it receives in the form of scholarships and fellowships, and from whom, and other facts that can be determined by collecting a few extra data from each registering student. Thus, an electronic student registration system contains many more data than any traditional system. These data are not there to fulfil the registration function and would be useless without the functionality of the technology that allows connecting them in many different ways. Given this situation, is functional appraisal still possible? If so, would it imply the separation of the data required to enact and prove registration from all other marginal data, an operation unthinkable before the advent of relational databases? Is each student's registration one record or one entry in a larger record? If the latter, how large is the record? As large as the electronic registration system? If so, does it include the operating system, the software system, the network software, and the application software? Let's not forget that traditional registers did include their own functionality as part of the record, as they comprised indexes of all kinds. Are we confronted with a similar situation? Very likely, given the complexity of the system and the multiple tasks that it accomplishes, from issuing transcripts of courses and marks to assigning classroom space on the basis of the number of registrants to each given course. Is the implication of all this that the whole thing must be preserved, even if many of the data contained in each registration will not be needed after one year? Probably yes, because of another small detail. The registrar's office also maintains a paper records system. Requests for

transcripts and for any other type of documentation generated by the electronic system are mostly in paper files and so are some original registrations (their transcription is in the system, but the legal record is not). Presently, these electronic systems do not keep track of the records they issue either routinely or upon written request, neither do they maintain links to the related paper files. Thus, the fair assumption is that nothing can be safely disposed of.

At this point, we are confronted with the issue of preservation. How can preservation of such a complex system be ensured, given the rapid obsolescence of technology? The only option, keeping into account the administrative needs of the university, is migration to a new system. Several universities have done so. Being very much aware of the potential for serious losses, they have kept two systems alive and working in parallel for quite a long time. But, no matter how long is the time allowed for spotting errors and gaps, an absolute guarantee is not possible. Thus, how can authenticity be certified? How can the registrar's office fulfil its duty of accountability to the administration, the government(s) and the students? Moreover, the number of records in the system is constantly growing and slowing the system down. The next body of records to be migrated will be much larger than the previous one and the process much more difficult and expensive. In the meanwhile, what is happening to the archival bond between the electronic records and the related paper records?

There are no answers to all these questions as yet. The primary reason is that general answers will not do. The complexity of electronic records systems and the multiplicity of the ways in which they relate to the other systems created or used by the same organisation, both electronic and non-electronic, have taken us much beyond simplistic statements, such as "We need to build appraisal within the electronic system" or "We need to adopt an interventionist approach". Besides being meaningless on practical grounds, such statements go against the most basic understanding of what records are all about and of the assumptions on which their reliability and authenticity rest. If we move to actual methodologies, we can easily see that macro level, functional approaches are not very useful because too much would be retained, and micro level, content-analysis approaches are too time-consuming, expensive, and inevitably idiosyncratic.

How to find valid answers

The first thing that we need to do is to acquire a much deeper knowledge of the types of digital systems that are used to create records today and that may be used to create and keep records tomorrow. For example, geographical information systems (GIS), as we know them, do not contain records. If GIS layers are printed out and attached to a report, or are electronically linked to an e-mail message, they would be records. Otherwise, we are confronted with a store of data that can be assembled in a variety of ways very useful to support decision-making without generating any record. While one could argue that a GIS altogether is one record, because, as a whole indivisible system, it includes all the necessary and sufficient components of a record, this determination might be intellectually satisfying but not very useful. For example, what would it imply for the ongoing preservation of its authenticity? That no alteration can take place? That all historical data and functionality must be maintained? If it is one record, we must keep intact all its parts. Perhaps, or perhaps not. So, let's say that GISs are not

and do not contain records. However, in the future, they could be made to create records and keep records. In fact, they could contain the entire records system of an organisation. Thus, we do need to understand how they work. We also need to determine how they should work to be sure that, if they will contain records, they will respond to all the requirements that ensure the reliability and authenticity of those records.

While the knowledge that needs to be acquired and the articulation of future requirements are necessarily based on technical understanding, it is not the records managers' or archivists' responsibility to acquire such understanding. Scholarly interdisciplinary research does not need to be carried out by professionals in the field, although they do need to test it and provide feedback. It is the academics' responsibility to work across disciplines and methodologies and to make sure that the theory of each field supports and enriches that of the others without compromising its basic concepts; in our specific case, without compromising the concepts and principles of archival diplomatics.

An example of this basic research is constituted by the work presently carried out by a task force of the InterPARES project entrusted with the development of an electronic records typology[20]. Computer engineers are working together with archival diplomatists and legal experts to analyse all the technological components of each type of system and their specific function, and to study the impact that a change in each of those components would determine in the physical and intellectual form of records made, received and/or maintained and used in the system. The consequences of physical and architectural changes, parametric changes, source changes, and format changes are looked at for the specific purpose of establishing what elements of form conditioned by the digital system are an integral part of the meaning of the record and need therefore to be protected from manipulation and across migrations. While electronic engineers have much to learn from records experts about the nature of records, it is quite clear that the latter have as much to learn from the former. For example, for a long time archivists have considered e-mail to be a record form; this was found astonishing by engineers who, free from the prejudices of archival formalism, have no doubt about the fact that e-mail is only a method of transmission, just like a fax or a courier: any type of information can be transmitted through e-mail and what we see in its header is just a record of transmission, like the printed line on top of a fax or a piece of paper stuck over a FedEx package. The fact is that we should have known better; if we had looked at e-mail purely from a diplomatic point of view, we would have recognised it for what it is.

The second thing that we need to do is to look at concrete alternatives to electronic preservation of some types of records that are analogue to traditional records and require sequential consultation. The economics of perpetual refreshing and migration need to be factored into any policy recommendation, as well as the politics that may influence such choices over time, because these methods of preservation rely on someone in the future taking on responsibility for repeating the process. As Maggie Exon writes:

A task like information transfer or refreshment which needs to be repeated over and over again, will at some point fail to happen. This failure may take place a few years from now or a few hundred years but it will surely take place[21].

The identification of types of electronic records that do not need to be preserved in electronic form will allow focusing research on methods for ensuring the preservation of those types of electronic records that must be carried forward in electronic form, such as hypertext and multimedia records. For these records, it is possible to identify requirements for the design of the system that would minimise the loss when migration occurs, impede tampering and ensure that linkages to records outside the electronic system are allowed.

However, the third and most pressing need we have is to develop standard procedures for the control of electronic records from the moment they become semi-current onward. The most delicate time for the protection of the integrity of the records occurs when the creating body begins losing interest in them and is reluctant to invest any effort in their active maintenance, and the legitimate successor has not yet the ability to exercise its control on them, even when it has already been determined that they need to be permanently preserved. Here technical solutions have no place. Routine, process, standards need to be activated that are independent of any party's will to enforce them. They will then need to be followed by detailed procedures and rules, also external to the electronic system, designed specifically for inactive records and aimed to ensure that any technical operation carried out on them, as well as any archival operation, is documented and accomplished by the appropriate parties. The formulation of these procedures and rules must also include the assignment of responsibility for their application. The international debate has focused on the latter aspect, particularly in relation to physical custody of electronic records[22]. A resolution of the ensuing debate can only be based on rigorous research of the kind called for by many scholars working in different disciplines, and which entails the actual testing of well developed rules[23].

Conclusion

All this research work that needs to be carried out systematically, rigorously and collaboratively should aim to formulate the principles that will guide the development of international, national and organisational policies, strategies and standards, the specific criteria for each type of policy, strategy and standard, and the procedural methods for their implementation. The most important thing is to ensure that the policies, strategies and standards are consistent with one another, and this is only possible when they are based on the same concepts and inspired by the same principles.

Most literature consistently supports an approach that is respectful of national and organisational distinctions and specific requirements, but has, at the same time, a shared international theoretical basis[24]. In addition, everything we have learned so far about electronic records does nothing else than reinforce the ideas that any general technological as well as procedural solution will need to be based on a clear and detailed articulation of concepts and formulation of principles rooted in archival diplomatics, and that specific choices will have to derive from the interpretation and careful application of those same concepts and principles in light of a deep understanding of the context in which they will have to be made.

As the draft report on the Universal Preservation Format concludes, “[t]he integrity of digital information is a moral issue”[25], but it is also a political and economic one,

and it is essential to make such an issue as independent as possible of the whims of governments and the interests of the industry if we want to have any hope that the generations to come will receive a trustworthy record of their past. For the same reasons, it is also essential that any standard aimed to address this issue be independent of the pressure of interest groups within the records professions, groups that often try to put forward guidelines riddled with jargon, inconsistencies and outright errors[26]. Any such standard must have a strong conceptual basis, include a clear definition of terms derived from the theory of the records, and comprise consistent sets of decontextualised procedures with an explanation of their purpose and function. This does not mean that archival diplomatics must be the only discipline supporting it. As von Bertalanffy stated more than three decades ago:

[Often] similar concepts, models and laws have [...] appeared in widely different fields, independently and based upon totally different facts. There are many instances where identical principles were discovered several times because the workers in one field were unaware that the theoretical structure required was already well developed in some other field[27].

We must study concepts, laws and models from various fields to foster useful transfers from the one field to the other, to encourage the development of theory in emerging areas of endeavour and investigation, to eliminate the duplication of theoretical efforts in different fields, and to promote consistency of scientific knowledge[28]. However, in order to develop the body of knowledge of records management, we must bring them to bear onto our own discipline, concepts, laws and models, that is, on the core theory of the records, archival diplomatics.

Notes

1. Pemberton, M.J., "Records management: confronting our professional issues", *Records Management Journal*, Vol. 8 No. 3, 1998, p. 9
2. Diplomats was born in the seventeenth century as an analytical technique for determining the authenticity of records issued by sovereign authority in previous centuries. Its primary purpose was to establish the reality of the rights or truthfulness of the facts contained in such records. In the nineteenth century, historians adopted diplomats as a tool of documentary criticism for assessing the authority of medieval records as historical sources. In the twentieth century, archival theorists have incorporated it into archival theory by reconciling the concepts of the two disciplines and developing the new integrated discipline of archival diplomats.
3. For an understanding of archival diplomats, see Duranti, L., *Diplomats: New Uses for an Old Science*, SAA, ACA and Scarecrow Press, Chicago, IL, 1998.
4. The websites related to these projects are, respectively: www.slais.ubc.ca/users/duranti/ and www.interpares.org/
5. This section is largely taken from the introduction to the grant proposal for the InterPARES project, which appears on the related website.
6. *Armstrong v. The Executive Office of the President*, United States District Court for the District of Columbia. 810 F. Supplement 335 (DDC 1993); Friedman, P.L., *Court Opinion Transcript*. United States District Court for the District of Columbia. Civil Action No. 96-2840 (PLF), October 22, 1997.

7. Minister of Public Works and Government Services Canada, "Dishonoured legacy: the lessons of the Somalia affair", *Report of the Commission of Inquiry into the Deployment of Canadian Forces to Somalia*, Vol. 5, Minister of Public Works and Government Services Canada, Ottawa, 1997, pp. 1218-19.
8. For the definition of each component see Duranti, L. and MacNeil, H., "The protection of the integrity of electronic records: an overview of the UBC-MAS research project", *Archivaria*, Vol. 42, 1996, pp. 46-7.
9. Commission on Preservation and the Research Library Group, "Preserving digital information", Task Force on Archiving of Digital Information, May 1, 1996, p. 4, available at: www.rlg.org/ArchTF/
10. The intellectual form of a record is the whole of the rules of representation that allow for the communication of the action and of its administrative and documentary context.
11. The physical form of a record comprises the elements of its external make-up.
12. See, for example, Hedstrom, M., "Understanding electronic incunabula: a framework for research on electronic records", *American Archivist*, Vol. 54, 1991, pp. 334-55; Bearman, D., "Diplomatics, Weberian bureaucracy, and the management of electronic records in Europe and America". *American Archivist*, Vol. 55, 1992, pp. 168-81; Dollar, C., *Archival Theory and Information Technologies: The Impact of Information Technologies on Archival Principles and Practices*, Information and Documentation Series No. 1, in Bucci, O. (Ed.), Università di Macerata, Macerata, 1992; Holmgren, M., "The Swedish principle of public access to official documents – in relation to archival theory and electronic data processing", *The Principle of Provenance*, Swedish National Archives, Stockholm, 1994; Menne-Haritz, A. (Ed.), *Information Handling in Offices and Archives*, Saur, Munich, 1993; Bikson, T. and Frinking, E.J., *Preserving the Present: Toward Viable Electronic Records*, Sdu Publishers, The Hague, 1993; Weissman, R., "Archives and the new information architecture of the late 1990s", *American Archivist*, Vol. 57, 1994, pp. 20-34; Bikson, T., "Organisational trends and electronic media: work in progress", *American Archivist*, Vol. 57, 1994, pp. 48-68; Gutierrez, R., "Decolonising the body: kinship and the nation", *American Archivist*, Vol. 57, 1994, pp. 86-99; McDonald, J., "Managing records in the modern office: taming the wild frontier", *Archivaria*, Vol. 39, 1995, pp. 70-9; Nelson, M., "Records in the modern workplace: management concerns", *Archivaria*, Vol. 39, 1995, pp. 80-7; Cox, R. and Duff, W., "Warrant and the definition of electronic records: questions arising from the Pittsburgh project", *Archives and Museum Informatics*, Vol. 11 Nos 3/4, 1997, pp. 223-31.
13. See, for example, Duranti, L. and Eastwood, T., "Protecting electronic evidence: a progress report on a research study and its methodology", *Archivi & Computer*, Vol. 5 No. 3, 1995, pp. 213-50; Duranti, L. and MacNeil, H., "The protection of the integrity of electronic records: an overview of the UBC-MAS research project", *Archivaria*, Vol. 42, 1996, pp. 46-7; Delmas, B., "Manifeste pour une diplomatie contemporaine. Des documents institutionnelles à l'information organisée", *La Gazette des Archives*, Vol. 97, 1er trimestre, 1996, pp. 49-70; Blouin, F., "Cadre de reflexion pour la prise en compte de la diplomatie dans l'environnement électronique", *La Gazette des Archives*, Vol. 97, 1er trimestre, 1996, pp. 71-87.
14. Maccarn, D. and Shepard, T., "The Universal Preservation Format", draft document, revised December 29, 1998, circulated through the Electronic Records (ERECs-L) listserv.
15. Rothenberg, J., "Metadata to support data quality and longevity", *The Assault on the Longevity of Digital Data*, available at: www.computer.org/conferen/meta96/rothenberg_paper/ieee.data-quality.html See also Rothenberg, J., "Ensuring the longevity of digital

- documents”, *Scientific American*, Vol. 272 No. 1, 1995, discussed in Maccarn, D. and Shepard, T., “The Universal Preservation Format”, draft document, revised December 29, 1998, p. 9.
16. Bearman points out that “the task of continuing to devise methods to read old signals in old media is becoming more complex as the media proliferate, recording and layout methods become more proprietary, and firmware plays a greater role in decoding”. Bearman, D., “Archiving and authenticity. the Getty Art History Information Program: research agenda for networked cultural heritage”, 1995, quoted in Maccarn, D. and Shepard, T., “The Universal Preservation Format”, draft document, revised December 29, 1998, p. 10.
 17. The measures described are among the findings of a research project on the “Protection of the integrity of electronic records” carried out by this author and Terry Eastwood whose findings are summarised on the project website already cited: www.slais.ubc.ca/users/duranti/
 18. It needs to be pointed out that a record is created when it is made or received and set aside. This means that a record comes into existence when it is filed. Thus, if the routine of the office is to print e-mail messages, include them in a paper file, classify and register them, and then pass them to the competent person for handling, the actual records are paper records. In other words, it is almost irrelevant in what form the records are made or received. What is relevant is the form they have when they are acted upon.
 19. Dollar, C., “Appraising machine-readable records”, *American Archivist*, Vol. 41, 1978, pp. 423-30; Naugler, H., “The archival appraisal of machine-readable records: a RAMP study with guidelines”, UNESCO, Paris, 1983; Hedstrom, M., “New appraisal techniques: the effect of theory on practice”, *Provenance*, Vol. 7, 1989, pp. 1-21; Advisory Committee for the Coordination of Information Systems (ACCIS), *Management of Electronic Records: Issues and Guidelines*, United Nations, New York, NY, 1990; Cook, T., “The archival appraisal of records containing personal information: a RAMP study with guidelines”, UNESCO, Paris, 1991; Cook, T., “Mind over matter: towards a new theory of archival appraisal”, in Craig, B. (Ed.), *The Archival Imagination: Essays in Honour of Hugh Taylor*, Association of Canadian Archivists, Ottawa, 1992; Lowen, C., “The control of electronic records having archival value”, *Archivaria*, Vol. 36, 1993, pp. 64-73; Menne-Haritz, A., “Framework and aims of appraisal”, *Janus*, Vol. 2, 1997, pp. 8-17. Beekhuis, M. and Oost, H., “Project Invoering Verkoting Overbrengingatermijm (PIVOT). Logic model: institutional research”, Rijksarchiefdienst, Den Haag, 1992; O’Shea, G., “The medium is not the message: appraisal of electronic records by Australian Archives”, *Archives and Manuscripts*, Vol. 22 No. 1, 1994, pp. 68-93; Brown, T.E., “Myth or reality? Is there a generation gap among electronic records archivists?”, *Archivaria*, Vol. 41, 1996, pp. 234-43; Bailey, C., “From the top down: the practice of macro-appraisal”, *Archivaria*, Vol. 43, 1997, pp. 89-128; Hofman, J., “The Dutch experience in the field of electronic records”, *Journal of the Irish Society of Archivists*, 1997, pp. 37-41; Horsman, P., “Appraisal on wooden shoes: The Netherlands PIVOT project”, *Janus*, Vol. 2, 1997, pp. 35-41.
 20. The International Research on Permanent Authentic Records in Electronic Systems (InterPARES) aims to the development of international policies, strategies, and standards for the long-term preservation of authentic electronic records. It is directed by myself and carried out by national and multinational research teams from various countries, including, besides Canada, the USA, UK, Ireland, Sweden, The Netherlands, Italy, Australia, Hong Kong and China. An industry team includes multinational companies in the pharmaceutical, biochemical and computer fields. The research project is divided in four domains: 1. Requirements for preserving authentic electronic records; 2. Appraisal criteria and methods for electronic records; 3. Methods and responsibilities for preserving authentic electronic

records; and 4. Framework for the formulation of strategies, policies and standards. The website of the project, as already mentioned, is www.interpares.org/. The group of researchers works by means of task forces whose composition cuts across the various teams and is based on specific competence on the subject-matter and different disciplinary background. Thus, for example, the individuals composing the typology task force have all a deep understanding of records types but from the different perspectives of archival science, diplomatics, evidence law, history, computer engineering, and information science.

21. Exon, M., "Strategies for long-term preservation", para. 5, available at: www.nla.gov.au/3/npo/conf/npo95me.html
22. Acland, G., "Archivist-keeper, undertaker, or auditor?", *Archives & Manuscripts*, Vol. 19 No. 1, 1991, pp. 9-15; Bearman, D., "An indefensible bastion: archives as a repository in the electronic age", *Technical Report*, No. 13, Archives and Museum Informatics, Toronto, 1991; Thibodeau, K., "To be or not to be? Archives for electronic records", *Technical Report*, No. 13, Archives and Museum Informatics, Toronto, 1991; Dollar, C., *Archival Theory and Information Technologies: The Impact of Information Technologies on Archival Principles and Practices*, Information and Documentation Series 1, in Bucci, O. (Ed.), Università di Macerata, Macerata, 1992; Upward, F., "Institutionalising the archival document: some theoretical perspectives on Terry Eastwood's challenge", in McKemmish, S. and Upward, F. (Eds), *Archival Documents: Providing Accountability through Recordkeeping*, Ancora Press, Clayton, 1993; Cook, T., "Electronic records, paper minds: the revolution in information management and archives in the post-custodial and postmodernist era", *Archives & Manuscripts*, Vol. 22 No. 2, 1994, pp. 300-29; Upward, F. and McKemmish, S., "Somewhere beyond custody", *Archives & Manuscripts*, Vol. 22 No. 1, 1994, pp. 136-49; Duranti, L., "Archives as a place", *Archives & Manuscripts*, Vol. 24 No. 2, 1996, pp. 242-55; Eastwood, T., "Should creating agencies keep electronic records indefinitely?", *Archives & Manuscripts*, Vol. 24, 1996, pp. 256-67; Upward, F., "Structuring the records continuum Part One: post-custodial principles and properties", *Archives & Manuscripts*, Vol. 24, 1996, pp. 268-85; O'Shea, G. and Roberts, D., "Living in a digital world: recognising the electronic and postcustodial realities", *Archives & Manuscripts*, Vol. 24, 1996, pp. 286-311.
23. Michelson, A. and Rothenberg, J., "Scholarly communication and information technology: exploring the impact of changes in research process on archives", *American Archivist*, No. 55, 1992, pp. 236-315; Ross, S. and Higgs, E. (Eds), *Electronic Information Resources and Historians: European Perspectives*, Max-Planck-Institut für Geschichte and the British Library Board, Göttingen/London, 1993; Lyman, P., "Sociological literature in an age of computerised text", *The American Sociologist*, Vol. 19, 1988, pp. 16-31; Lyman, P., "Invention, the mother of necessity: archival research in 2020", *American Archivist*, Vol. 57, 1994, pp. 114-25.
24. Nordic Council of Ministers, "TEAM Project. To preserve and provide access to electronic records", Nordic Council of Ministers, Helsinki, 1996; Bearman, D. and Trant, J., "Research towards testable specificity", *Archives and Museum Informatics*, Vol. 11 Nos 3/4, 1997, pp. 309-21; Horsman, P., "Digital longevity: policies on electronic records in The Netherlands", *Archives and Museum Informatics*, Vol. 11 Nos 3/4, 1997, pp. 235-40; Moscato, L., "Australian approaches to policy development and resulting research issues", *Archives and Museum Informatics*, Vol. 11 Nos 3/4, 1997, pp. 241-50; O'Shea, G., "Research issues in Australian approaches to policy development", *Archives and Museum Informatics*, Vol. 11 Nos 3/4, 1997, pp. 251-7; Long, G., "Developing policy frameworks. Commentary", *Archives and Museum Informatics*, Vol. 11 Nos 3/4, 1997, pp. 259-60.
25. Maccarn, D. and Shepard, T., "The Universal Preservation Format", draft document, revised 29 December, 1998, p. 24.

26. I am thinking specifically of the proposed Records Management – Requirements Standard ISO/CD 15489-1 (1997), which is in conflict with the most basic theory of the records, does not define its terms, most of which are inappropriate and inconsistently used, and recommends procedures that are badly conceived, applicable only in a few environments, simplistically and inconsistently presented, and either so general as to be useless or so detailed as to be inappropriate for most contexts.
27. Von Bertalanffy, L., *General System Theory: Foundation, Development, Applications*, revised edition, George Braziller, New York, NY, 1968, pp. 33-4.
28. Checkland, P., *System Thinking. Systems Practice*, Wiley, New York, NY, 1981, p. 93. For example, an understanding of the many nuances of the concept of authenticity as it applies to records would be greatly supported by an analysis of the literature on restoration of works of arts.