Towards an archival theory of digital preservation: the conceptual findings of the InterPARES Project

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Since its inception in 1998, the InterPARES project has had the goal of developing the theoretical and methodological knowledge that will enable archivists to preserve electronic records over the long-term in such a way that their trustworthiness can be maintained intact. The first phase of InterPARES took the perspective of the preserver, focused on inactive records, and addressed digital records analogous to those on paper and maintained in document management systems and databases. These records were mostly textual and required by the creator for accountability purposes. The second phase of InterPARES, which began in 2002, takes the perspective of the creator, focuses on active records, and addresses digital records produced in dynamic, interactive and experiential environments in the context of artistic, scientific, and e-government activities. Both the composition of the research team and the methodologies involved in the two phases are dramatically different. Most researchers in InterPARES 1 were either archival scholars or archivists, joined by a few computer scientists and lawyers, while InterPARES 2 researchers are evenly divided in three groups: records creators (i.e., artists, scientists, administrators, and scholars of arts and sciences), records preservers (i.e., information and records managers, archivists, conservators, and archival and conservation scholars), and technology experts (i.e., computer scientists and engineers, and scholars of knowledge organization, information systems, multimedia, computer science and engineering). The methodology of InterPARES 1 had at its core archival and

diplomatic analysis of case studies selected on the basis of grounded theory. In contrast, InterPARES 2 relies on the principles of interdisciplinarity, transferability, open inquiry and multi-method design, thereby adopting a variety of methodologies derived from all the disciplines involved, as needed by each research activity.[1] Finally, InterPARES 1 comprised sixty researchers from thirteen countries, while InterPARES 2 comprises one hundred researchers from twenty countries. Ironically, the greater variety of cultures, disciplines, methodologies and perspectives within InterPARES 2 has facilitated the development of hypotheses, their analysis and the achievement of substantial results. Although, knowing how difficult it is to find any agreement on theory and methods within the archival community, the fact that it is easier to do so across professional and disciplinary communities should not be so surprising at all.

InterPARES has now conducted research for seven years and produced a large amount of findings. Today, I will focus on some of its theoretical findings and their concretization in archival concepts and principles. I believe that these findings greatly contribute to the development of an archival theory of digital preservation that is fully consistent with the fundamental tenets of traditional archival theory. We know that archival science is a system inclusive of theory, methodology, practice, and scholarship, which owes its integrity to its logical cohesion and to the existence of a clear purpose that rules it from the outside (i.e., the preservation of the documentary by-product of activities), determining the boundaries in which the system is designed to operate. Within this system, archival theory comprises the ideas archivists hold about the nature of archival material and the principles that govern the methods they use for controlling such

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[1] See "Overview of Intellectual Framework" posted on the public area of the InterPARES 2 website, at <www.interpares.org/InterPARES2/methodology/ >

material. InterPARES findings enrich and deepen these ideas and principles and, by doing so, broaden their application to the records generated by any future technology. Let's begin with the most basic idea archivist hold, the idea of record.

The InterPARES research team determined at the outset that, before plunging into the study of digital material, it was necessary to establish the nature of the object of this study, at least as a hypothesis that the actual investigation could support or overturn. In other words, the team needed to agree on the definition of record and on how it differed from document, information and data. It decided to adopt the traditional archival definition, which states that a **record** is any document created (i.e., made or received and set aside for action or reference) by a physical or organizational person in the course of a practical activity as an instrument and by-product of it. Then it proceeded to define **document** as information affixed to a medium in a determined form, **information** as a message intended for communication across space or time, and **data** as the smallest meaningful piece of information. Finally, it defined an **electronic record** as a record created (i.e., made or received <u>and</u> set aside for action or reference) in electronic form, meaning that a message received in electronic form but set aside in paper form is a paper record, while a letter received on paper but scanned in the computer and only used as a digital file is an electronic record.

However, to understand the concept of electronic record implied by the archival definition, that is, to be able to identify the necessary characteristics of such a record, the team decided to use diplomatic analysis. As a result, the following characteristics of a record were identified: 1) a fixed form, meaning that the binary content of the record must be stored so that its message can be rendered with the same documentary form it

had when first set aside; 2) a stable content; 3) explicit linkages to other records within or outside the digital system, through a classification code or other unique identifier; 4) an identifiable administrative context; 5) an author, an addressee, and a writer; and 6) an action, in which the record participates or which the record supports either procedurally or as part of the decision making process.

At this point the research team decided to accept as a working hypothesis the fundamental assumption of diplomatics that, regardless of differences in nature, provenance or date, from a formal point of view, all records are similar enough to make it possible to conceive of one typical, ideal documentary form containing all possible elements of a record. On the basis of this assumption, the team itself hypothesized that, while they may manifest themselves in different ways, the same formal elements that are present in traditional records exist either explicitly or implicitly in electronic records, and that all electronic records share the same formal elements. Thus, it created a template, that is, a decomposition of the ideal electronic record, first, into its constituent parts, and then, within the part "form," into its elements.[2] In the template, the parts and elements are defined and their purpose is explained.

The template is composed of four sections corresponding to the four necessary constituent parts of every record: documentary form, annotations, context, and medium.[3]

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[2] The reason why the constituent parts of the record ended up in the template that is supposed to represent the ideal form of a record is that all identified constituent parts used to be regarded as necessary extrinsic elements of form by traditional diplomatists. It was important to show their presence, definition and purpose, and the fact that they are now independent of form.

[3] In a previous research endeavour commonly known as the UBC-DoD project, the parts constituting the records were identified as: medium, form, action, persons, archival bond, content and context. See Luciana Duranti and Heather MacNeil, "The Preservation of the Integrity of Electronic Records: An Overview of the UBC-MAS Research Project," *Archivaria* 42 (Spring 1997): 46-67; and Luciana Duranti, Terry Eastwood and Heather MacNeil, *Preservation of the Integrity of Electronic Records* (Dordrecht, Kluwer Academic Publishing, 2002: Chapter 1. In the context of InterPARES, it was decided that action, persons, archival bond and content, contrary to the other constituent parts, continue to manifest themselves in formal

Within the **documentary form**[4] the team identified *intrinsic elements*, that is, the elements of a record that convey the action in which the record participates and its immediate context, and *extrinsic elements*, that is, the elements of a record that constitute its external appearance.[5]

The **annotations**[6] were divided into types on the basis of their function, and the **contexts** of the record[7] were categorized going from the general to the specific, and linked to the list of what would reveal them.[8]

The **medium**[9] was difficult to place within the template, because, although it is still necessary for an electronic record to exist, it is not inextricably linked to the message, does not store the record as such, but a bit-stream, and its choice by the record-maker or keeper can be either arbitrary or based on reasons related to preservation rather than to the function of the record. On these bases, the team decided that the medium

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elements and are inextricable from them, so they do not have to be identified separately from the form. As it regards the annotations, which were not among the parts identified in the MAS-DoD project, they were added to the constituent parts because they are often linked to the record rather than embedded in it, and need therefore to be looked at separately from the record form.

[4] Defined as "The rules of representation according to which the content of a record, its administrative and documentary context, and its authority are communicated.

[5] See Authenticity Task Force, "Template for Analysis," in *The Long-term Preservation of Electronic Records: the InterPARES Project*, cit. <http://www.interpares.org/book/index.cfm>.

[6] Defined as "Additions made to a record after it has been created." The types were: 1) additions made to the record after its creation as part of its transmission (e.g., priority of transmission, date of compilation and date of transmission in an e-mail record, the indication of attachments), 2) additions made to the record in the course of handling the business matter in which the record participates (e.g., date and time of receipt, action taken, name of handling office), and 3) additions made to the record in the course of managing it as a record (e.g., filing date, class code, registration number).

[7] Defined as "The framework of action in which the record participates." The categorization was as follows: 1) juridical-administrative context (manifested in, for example, laws and regulations), 2) provenancial context (manifested in, for example, organizational charts, annual reports, tables of users in a database), 3) procedural context (manifested in, for example, workflow rules, codes of administrative procedure), 4) documentary context (manifested in, for example, classification schemes, records inventories, indexes, registers), and 5) technological context (manifested in, for example, hardware, software, system models, system administration).

[8] For details related to annotations and contexts, see the Template for Analysis referenced above.

[9] Defined as "The physical carrier of the message."

should not be looked at as a constituent part of the record but analysed with the record technological context.

Strictly related to the concept of record is the concept of **records attributes**, which are the defining characteristics of each given record or of a record element in it. An attribute may manifest itself as one or more elements of form. For example, the name of the author of a record is an attribute, which may be expressed as a letterhead or a signature, both of which are intrinsic elements of documentary form, that is, record elements. In addition to attributes that manifest themselves in the form of the record, that is, on the face of the record, as record elements, every record has attributes that are implicit in other parts of the record, such as the name of the creator or of the medium, but in digital records they are also expressed, albeit outside the documentary form. Because of this, they are mostly transparent to the user, and manifest themselves as metadata included in either a record profile,[10] a topic map, or other digital entity linked to the record.

In addition to all the above, with electronic records we also have to differentiate elements and attributes from the record's digital components. A **digital component** is a digital object that may contain all or part of a record, and/or the related metadata, or more than one record, and that requires specific methods for preservation.[11] In other words, a digital component is a unit of storage.

The concept of digital record presented above, with all its characteristics, parts, formal elements, attributes and digital components, worked quite well with the records

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[10] A record profile is an annotation inextricably linked to the record that includes several fields, which are either automatically or manually filled in with the record's metadata.
[11] See Preservation Task Force Report in *The Long-term Preservation of Electronic Records: the InterPARES Project*, cit. <.http://www.interpares.org/book/index.cfm>.

examined in InterPARES 1 case studies, but appeared problematic to the research team when applied to the entities analyzed in InterPARES 2 case studies, the most salient characteristic of which is the lack of a stable content and/or fixed form, because fluidity is part of their nature and contributes to the accomplishment of their purpose as instruments of, or support for, action.. In order to make this clear, it is necessary to introduce a few more concepts developed by InterPARES, those of reliability, accuracy and authenticity.

In the case of these concepts, the definitions adopted by the InterPARES team did not belong in traditional archival theory, although archivists have in the past made assumptions about the meaning and implications of such concepts, based on their own legal context, and have acted upon them. The team used the definitions developed by a previous research project, commonly known as the UBC-DoD project,[12] in the context of which **reliability** is the trustworthiness of a record as a statement of fact, that is, its ability to stand for the facts it is about, while **authenticity** is the trustworthiness of a record as a record, and refers to the fact that a record is what it purports to be and has not been tampered with or otherwise corrupted. Reliability is the exclusive responsibility of the record creator and is assessed on the basis of the completeness of the record, the authority and capacity of its author, and the degree of control exercised on the creation process. **Accuracy**, a concern introduced by InterPARES 2, especially in relation to the records of science, can be subsumed under the concept of reliability and refers to the exactness and correctness of content, mostly dependent on the competence of the author and the controls on the process by which data are recorded. Differently from reliability

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[12] See Luciana Duranti and Heather MacNeil, "The protection of the integrity of electronic records: an overview of the UBC-MAS research project," in *Archivaria* 42, 1996, pp. 45-67.

and accuracy, authenticity is the responsibility of both the creator and the preserver as it depends on the controls exercised on the processes of transmission of the record across space (i.e., between persons, systems or applications) or time (i.e., when stored off line, or when the hardware or software used to process, communicate or maintain it is upgraded or replaced). Finally, **authentication** was defined as a declaration of authenticity, resulting either by the insertion or the addition of an element or a statement to a record. To make a distinction between authenticity and authentication was considered important because governments have been legislating about the use of digital signatures and other similar devises as means of maintaining authenticity.[13] The team wanted to emphasize the theoretical principle that authenticity is a property of the record that accompanies it for as long as it exists, while authentication is a means of proving that a record is what it purports to be at a given moment in time.

The team did not elaborate further the concept of reliability in the first phase of the project, because of its emphasis on the point of view of the preserver. Instead, it tried to elucidate the concept implied in the definition of authenticity by dividing it into two components: identity and integrity. *Identity* refers to the attributes of a record that uniquely characterize it and distinguish it from other records.[14] *Integrity* is the wholeness and soundness of a record. A record has integrity if it is intact and uncorrupted, that is, if

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[13] In its analysis of the extrinsic elements of electronic records, the InterPARES team recognized digital signatures as examples of electronic seals, functionally equivalent to medieval seals, which were not only a means of verifying the origin of the record and the fact that it was intact, but also made the record indisputable and incontestable, that is, had a non-repudiation function. The analogy is not perfect, because the medieval seal was associated exclusively with a person, while the digital signature is associated with a given person <u>and</u> a specific record, and because the medieval seal is an expression of authority, while the digital signature is only a mathematical expression.

[14] These attributes include: the names of the persons concurring in its formation (i.e., author, addressee, writer and originator); its date(s) of creation and transmission; an indication of the matter or action in which it participates; the expression of its relationships with other records; and an indication of any attachment(s). These attributes may be explicitly expressed in an element of the record or in metadata related to the record, or implicit in its various contexts.

the message that it is meant to communicate in order to achieve its purpose is unaltered. This means that a record's physical integrity, such as the proper number of bit strings, may be compromised, provided that the articulation of the content and its required elements of form remain the same.[15]

While in traditional archival theory, following jurisprudence, records that are relied upon by their creator in the usual and ordinary course of business are presumed authentic, with records in electronic systems, the presumption of authenticity must be supported by evidence that a record has not been modified or corrupted in essential respects during transmission and maintenance. To assess the authenticity of a record, the preserver must be able to establish its identity and demonstrate its integrity by observing the existence of certain conditions. These conditions are authenticity requirements and are used by the prospective preserver to guide the assessment of the authenticity of the records during the process of appraisal.[16]

It appeared quite clear to the InterPARES team that the **process of appraisal** had to be inevitably influenced by the team's understanding of the concepts of record and authenticity. Contrary to our century old tradition, authenticity had to become one of the values assessed by the appraiser, because, in the absence of an original, the future users of digital records will have only the word of the record preserver as the basis for trusting the records they will use as sources. Thus, the role of the appraiser becomes that of a neutral third party who acts as the inspector first and the warrantor later of the authenticity of the records that will be preserved. In addition, the team thought that

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[15] Integrity may be demonstrated by evidence found on the face of the record, in metadata related to the record, or in one or more of its contexts.

[16] The Authenticity Requirements developed by InterPARES can be found on the InterPARES web site in *The Long-term Preservation of Electronic Records: the InterPARES Project*, cit., Appendix 2 <.http://www.interpares.org/book/index.cfm>.

several activities extraneous to traditional appraisal methodology had to be introduced. Although it has been accepted for decades that archivists and records creators have to participate jointly in records scheduling and that, with electronic records, such an endeavour must occur as soon as possible in the life of the record,[17] insufficient emphasis has been put by the archival community on the necessity of monitoring the records identified for permanent preservation on a regular basis, in order to ensure that the inevitable ongoing changes of the technological environment of both the records and the creating office, and consequently of the business and documentary procedures of the creating office, do not alter the records, their interrelationships, and their relationships with the business processes to the point that a new appraisal is warranted.[18] Monitoring is a key activity also with respect to a new concern for the appraiser: feasibility of preservation. This was never a preoccupation with records on traditional media, but preservation of digital records is a very complex activity requiring technological competence and resources that sometimes are not accessible to archival programs and institutions. Thus, the appraiser must assess the records in light of the present and future capability of the archival program or institution to preserve them. As a consequence, the appraiser may advice the creator to make certain technological choices that make the records preservable or may postpone the acquisition till such a time when preservation is feasible.

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[17] The International Council on Archives Committee on Electronic Records' *Guide for Managing Electronic Records from an Archival Perspective* (ICA, 1997) even suggest that appraisal should happen before "conception" when the digital system is designed: see p. 33.
[18] Note that this new appraisal is not a "re-appraisal," because selection and disposal have not occurred yet. Re-appraisal is the re-evaluation of records already acquired by an archival program or repository as a consequence of the implementation of an appraisal decision. InterPARES strongly opposes re-appraisal, while supporting an ongoing assessment of the records that are still in the hands of the creator before implementation of the retention and disposition schedule occurs.

Does all the above represent a change in the archival theory of appraisal? Possibly, especially with regard to the influence that assessment of authenticity, monitoring, and advising in light of feasibility of preservation can do to the impartiality of the records in terms of the increased awareness of its records on the part of the creator and of the impact that the preserver's advice may have on their form, technological context, and interrelationships. Is this change consistent with traditional theory? Only if one is very careful in walking the fine line between supporting the creators through general guidelines for proper records creation and recordkeeping and influencing the way they create and keep specific aggregations of records. Ultimately, to protect the impartiality of the records, together with their naturalness and authenticity, the choices made must be the creator's and made for its own advantage, not for the preserver's benefit. But, if you think that these appraisal ideas constitute a break with the past, wait to hear InterPARES preservation ideas.

InterPARES 1 established early on that it is not possible to preserve an electronic record. It is only possible to preserve the ability to reproduce it. Thus, **preservation** of electronic records involves the creation of authentic copies of the records of the creator. The authenticity of these copies is guaranteed by a controlled process of migration of the acquired records to the archives technological environment, by the accurate documentation of any change that the records undergo during such process and every time that the archives technological environment is upgraded, by the implementation and monitoring of privileges concerning the access, use and reproduction of the records within the archives, by the establishment of procedures to prevent, discover, and correct loss or corruption of records, as well as procedures to guarantee the continuing identity

and integrity of the records against media deterioration and across technological changes; and, if authentication of individual records is required, by the existence of rules determining responsibility for and means of authentication.

However, the research team has convened that, ultimately, to all future users, the most important source of the authenticity of the records is **archival description**. It has always been the function, either explicit or implicit, of archival description to authenticate the records by perpetuating their administrative and documentary relationships, but with electronic records, this function has moved to the forefront. In fact, as original electronic records disappear and an interminable chain of non-identical reproductions follows them, the researchers looking at the last of those reproductions cannot find in it any information regarding provenance, authority, context, or authenticity. The authentication function of archival description is different from that of a certificate of authenticity, because it isn't simply an attestation of the authenticity of individual records, but a collective attestation of the authenticity of the records of a fonds and of all their interrelationships as made explicit by their administrative, custodial and technological history, the scope and content, and the hierarchical representation of the records aggregates. And, it is different both from the identity and integrity metadata attached to individual records, which are part of the record itself and are reproduced time after time with it, and from the additional metadata attached to records aggregations (e.g., file, series) identifying them and documenting their technological transformation. The unique function of archival description is to provide an historical view of the records and of their becoming while presenting them as a universality in which each member's

individuality is subject to the bond of a common provenance and destination. Never before archival description has had such a key function in the preservation of records.

Yet, in the context of preservation, the most important theoretical issue to solve is the determination of **the entity that we need preserve**, of its boundaries and characteristics. As mentioned earlier, InterPARES 2 is studying dynamic, experiential and interactive records having fluid form and unstable content. To preserve these records, what digital objects should we aim to preserve? The research team considered the possibility of trading the record characteristics of stability of content and fixity of form with the ability of the system containing the record to track and preserve any change. In other words, one could shift the requirements of stability and fixity from the record to the log of the changes to the record once the record is no longer live;[19] in this context, the entity identified as the record and to be preserved would be the last instantiation of the fluid entity, plus the complete log of changes, and the metadata of both. This option is conceptually sound only if the creator uses this set of digital objects as its record, but this scenario is very unlikely because it would be highly impractical for the creator.

Alternatively, one might look at each digital entity participating in the creator's activity as existing at any given time in one of two modes, as a record *in fieri*, that is, in becoming, when its process of creation is ongoing, that is, when the entity is accessed to add data or information, and as a record when the entity is accessed for use. This would imply the stabilization and maintenance of every instantiation accessed for use and its metadata. Conceptually, this option is as sound as the previous one, but it appears to be equally impractical for the creator.

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[19] Here, live is used to mean "subject to changes or additions."

As it regards the interactive records of government, one other option is to establish that, while the business procedure is in course, the interactive digital entity being produced constitutes the overall record of the transaction. If instantiations accessed for use by the parties at each given time are set aside with a fixed form and a stable content and linked to other records of the same transaction, they would also be records of the transaction. Then, it could be established that, once the business procedure is concluded, the final record of the transaction will consist of the data contained in the last instantiation of the interactive entity[20] and its metadata, properly linked to an exemplary of its form and a description of its digital environment (i.e., record functionality and system documentation) that would already be maintained in the recordkeeping system to which such record will be transferred. Most times, this set, properly registered, would constitute a record of the transaction adequate to serve both administrative and historical accountability, as well as legal purposes. In the few cases in which a complete and finished record would have to be re-produced, it would likely be sufficient to embed the data in the appropriate record form, and accompany this document with the description of the functionality of the original digital environment. The key to the reliability, accuracy and authenticity of such record would be the fact that the responsibility for generating and maintaining it as the source of future re-productions of the original interactive entity in its live state will reside with the creator (and, within the creator, with the record office): the record-source will be the record of the creator just like the interactive entity

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[20] Assuming that no data would be deleted in the course of the transaction, as good record making would recommend. If data were deleted as a matter of course during the transaction, a log of changes would have to accompany the data contained in the last instantiation. If it were part of the formal procedure to delete data in the course of the transaction, the record of the transaction would be complete without the log, but the office would have to keep a description of the procedure linked to the series of records subject to it in order to account for the deletions.

was. If a re-production of the original interactive entity from the record-source will be made by the creator for its purposes, such re-production will still be the record of the creator, while, if it will be issued to an external user for other purposes either by the creator or, after the record-source were transferred to an archives, by the preserver, such reproduction will be an authentic copy of the record of the creator.

Other theoretical constructs are being developed to identify the entity record in different types of digital systems, for example, Geographic Information Systems that participate into and support multiple business procedures. But, given the limitations of time, I prefer to discuss briefly another concept that I have indirectly already introduced with my last remark about who is responsible for re-producing the record, the concept of life cycle.

The concept of **life cycle** was first formulated in France about fifty years ago and called "the three ages of the documents." It really referred to the location where the records were kept: the office of origin, the intermediate archives or records centre, or the historical archives. Over the decades and across continents the concept of life cycle became many different things, mostly linked to what one did to the records: create, classify, maintain, dispose, select, describe, preserve, or make them accessible. With the advent of electronic records, the Canadian archivist Jay Atherton introduced the concept of the records continuum:[21] the activities carried out on the records were the same, but they were conducted jointly by creator and preserver. The continuum concept became very popular in Australia, but with a new twist. Records are created, and they are maintained by the creator or the preserver: regardless of whether maintenance lasts for a

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[21] Jay Atherton, "From Life Cycle to Continuum: Some Thoughts on the Records Management-Archives Relationship," *Archivaria* 21 (Winter 1985-86): 43-51.

nanosecond or forever, the activities involved are the same. The international community

has not been willing to go quite that far and, in the International Council on Archives'

guide,[22] it has returned to the concept of the life cycle for electronic records, but reducing

it to three activities: conception, creation and maintenance.

The InterPARES team has decided to shift the concept of life cycle from the

activities carried out on the records to the records themselves, and not only because, after

all, it is of the life of the records that we should be talking about, but because to do so is

consistent with the findings of the Project. The research team concluded early on in its

investigations that the chain of preservation for electronic records must begin when the

records are being created. The reasons are that appropriate controls must be established

on the records early on for them to be preservable, and that the activities involved in the

chain of preservation are nor sequential, but are at the same time simultaneous among

themselves and repetitive. Take for example creation, which happens once, and then

again, and again, every time the same record is re-produced and its relationships are re-

established. Then, consider appraisal, which starts early on and, through monitoring,

continues till the time comes for the selected records to be transferred to the care of the

preserver. Same thing can be said for description, storage, retrieval and provision of

access. However, all the activities involved in the chain of preservation, cyclical as they

may be, are not carried out on the same entities. Some of them are carried out on the

records of the creator, and some of them are carried out on the authentic copies of the

records of the creator.

InterPARES envisions the records life cycle as constituted of two phases. During

the first phase, records may be produced, re-produced, maintained, retrieved, appraised,

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[22] Cit., p. 30.

monitored, migrated, etc. No matter what is done to them, if it is done in the usual and ordinary course of affairs and for the purposes of those affairs, and if the creator keeps the outcome for further action or reference, the records resulting from any of these process are the records of the creator. During the second phase, records may be re-formatted for the preserver's technological environment, separated in their digital components, re-assembled, migrated, retrieved, re-formatted, made available through cyberspace or on DVD, etc. No matter what is done to them, if it is done for purposes of preservation and dissemination, and if the preserver does it as part of its own competence, having no connection with the interest of the creator, the records involved in these processes are authentic copies of the creators' records. Both the records of the creator and their authentic copies are records, but in a different state of transmission and perfection. Although technically the re-productions made by the creator are copies, as soon as they participate in further activity and reference they are original records in the creator's context.

This distinction between the two phases of the records life cycle is vital for identifying the entity record to be preserved, because it implies that, if the creator alters the form of the record in order to be able to keep it for future action or reference, the result of such alteration is perfectly acceptable as the creator's record to be acquired by the preserver, who would ensure its preservation by making an authentic copy of it to carry forward in time.

InterPARES is a long way from its conclusion and much knowledge is still in the course of being developed. However, I believe that the work which is yet to be done has a very strong theoretical foundation in the concepts that I have illustrated. Undoubtedly, in

light of further data, some of those concepts will change in whole or in part. What is not going to change are a few points of principle that InterPARES has been able to prove time after time, that is: first, technology cannot determine the solution to the permanent preservation of electronic records; second, archival needs must define the problems and archival theory must establish the correctness and adequacy of each technical solution, and, third, solutions to the preservation problem are inherently dynamic, thus ongoing research is vital to enable archivists to deal with the challenges presented by the new information technologies.