The Future of Our Memory: Lost in Obsolescence? The Memory of Our Future: Lost in Interactivity?"


in saeculis authenticus
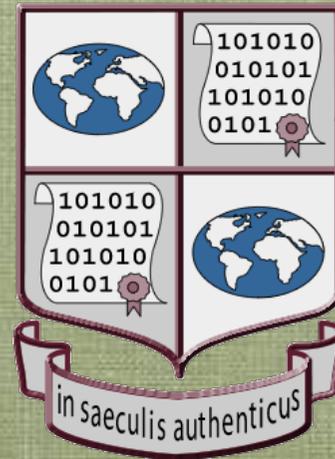
Dr. Luciana Duranti
InterPARES Project Director

# Advantages of the Digital Medium
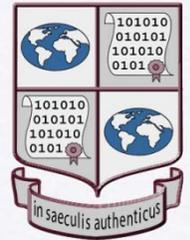
- Digital materials do not fade or become yellow and brittle

- It is easy to alter them without leaving a trace for editing or repurposing

- They occupy very little storage space

- They can be copied an infinite number of times

- They can be shared over the Internet

- They can be sent and received across the world within seconds
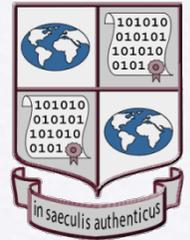
Disadvantages of the Digital Medium

- A computer is needed to read digital materials: The medium does not contain any given record or work but only bit-strings

- It is not possible to preserve digital materials but only the ability to reproduce them

- There is no longer an original

- Authenticity is no longer verifiable on the work itself

- The easiness of reproduction makes it difficult to identify the final version

…and more
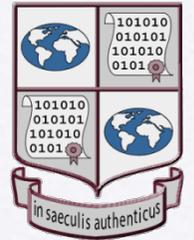
- The Internet makes intellectual property increasingly difficult to protect

- Viruses and technology failures make it easy to lose everything

- Technological obsolescence makes digital materials inaccessible very fast

- The information provided by the materiality of the object no longer exists

…and bad habits make it worse
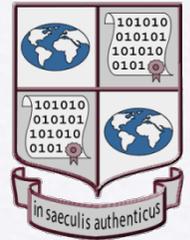
- Hybrid systems

- Creating materials in different applications and leaving them there

- Not doing regular back-up and upgrading of files

- Not keeping media in the right climatic environments

- Not refreshing the media

and worse…
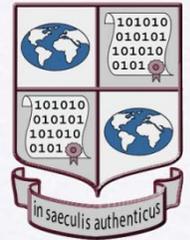
- Using proprietary or legacy systems

- Not migrating the materials to new technology

- Hoping that emulation will take care of long-term access

- Not protecting the documents from malicious or accidental tampering—trusting personal or institutional custody

- Using protection systems—encryption or digital signatures—that do not allow for preservation

InterPARES 1 Goal
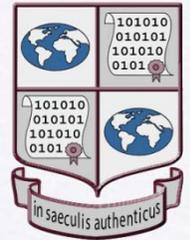
To develop the theoretical and methodological knowledge essential to the permanent preservation of authentic records generated and/or maintained electronically, and, on the basis of this knowledge, to formulate model policies, strategies and standards capable of ensuring that preservation.

InterPARES 1: 1999-2001
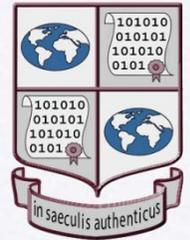
- Major Funding from SSHRC, NHPRC, UBC, NARA, NAC

- 13 countries in 4 continents, 60 researchers

- Public and private sector

- Professionals and academics (ratio 80% to 20%)

- Archival science, diplomatics and records management, plus computer science and engineering, jurisprudence, research methods

What Did We Study?
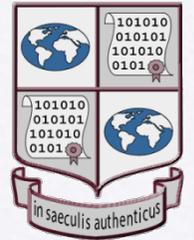
- Mostly textual records born digital in the course of administrative and legal activities

- Databases and document management systems

- Records in inactive or non-current status

- Characteristics of e-records and concept of authenticity

- Activities of appraisal and preservation from the preserver point of view

Methodology
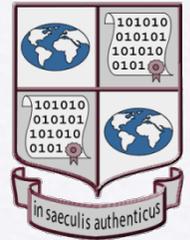
- Theory and methods of diplomatics, archival science and law for the definition of concepts and development of requirements and methods

- Grounded theory for selection of case studies

- Comparative analysis for the study of appraisal and preservation reports

- IDEF0 modeling for the representation and definition of the activities involved in appraisal and preservation

- Chemistry and computer engineering for the study of storage media and of digital preservation technology and technological methods of authentication

InterPARES 1 Products
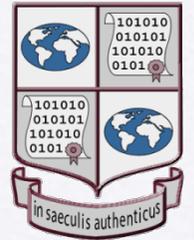
A body of concepts (e.g. record vs. document and data) and principles (e.g. trusted custodian), and a series of analytical instruments (e.g. a template) for studying new types of digital documents and developing new requirements and method as needed

Examples of Concepts

**Reliability**: the trustworthiness and accuracy of content

Authenticity: the trustworthiness of an entity as such. An authentic record is one that has not been tampered with or otherwise corrupted. Authenticity comprises identity and integrity.

Identity refers to the attributes of a record that uniquely characterize it and distinguish it from other records. **Integrity** refers to the wholeness and soundness of a record. A record has integrity if it is intact and uncorrupted

Authentication: a means of declaring authenticity at a point in time

Other InterPARES Products
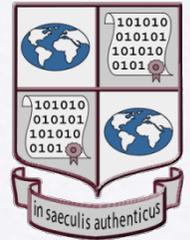
- Authenticity Requirements for those who generate and keep records and for those who preserve them (e.g. metadata for identity and integrity, access privileges, etc.)

- Selection and preservation methods and procedures (e.g. models representing activities and responsibilities)

- A framework for the development of policies, strategies and standards related to the proper creation, maintenance and preservation of digital records that can be proven authentic over time

# Most Important Findings
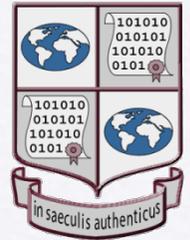
An electronic record must have:

- fixed form and unchangeable content;

- identifiable administrative and documentary contexts, and explicit linkages to other records within or outside the digital system; and

- five identifiable persons involved in their creation; and it

- must participate in or support an action either procedurally or as part of the decision making process

Most Important Findings (cont.)
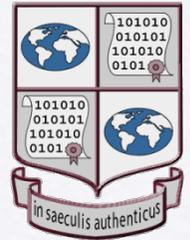
Most systems that should contain records do not, because the entities in them <u>lack fixed form and stable content</u>. The systems that do, contain bad records, primarily because of <u>lack of identifiable contexts and relationships</u>

Inactive records that are no longer kept in active systems often cannot be preserved because either they were not created and/or maintained in <u>preservable formats</u> or they are <u>obsolete</u>

Most Important Conclusions
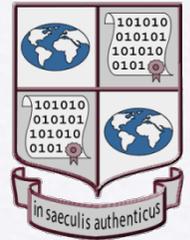
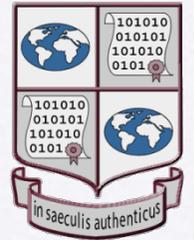The preservation of authentic electronic records

- is a continuous process that begins with the records creation and whose purpose is to transmit authentic records across time and space

- must be predicated on the concepts of trusted record-keeping system and the role of the preserver as a trusted custodian

- must incorporate records appraisal and archival description
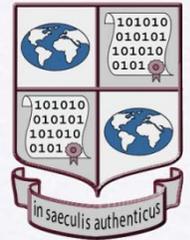
Most Important Conclusions (cont.)

The only way of preserving an inactive electronic record is to make an authentic copy of its last instantiation as an authentic record of the creator

The preserver must be concerned with both the assessment and the maintenance of the authenticity of electronic records throughout their life-cycle

Lessons Learned

- Solutions to the preservation problem are inherently dynamic due to technological change and the increasing complexity of its products

- Technology cannot determine the solution to the long-term preservation of electronic records

- Archival needs define the problem and archival principles must establish the correctness and adequacy of each technical solution, or…must they?

Usefulness of Theory
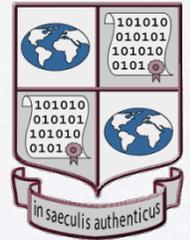
Archival and Diplomatic Theory

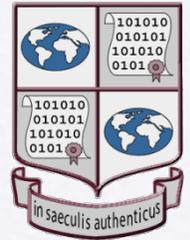- demonstrated when systems were designed to contain fluid data rather than records

- showed what attributes of a record's identity are implicit in the system and need to be made explicit

- supported the identification of the requirements for a presumption of authenticity

However…

- The classic concept of record limited our capacity to understand electronic systems containing a variety of complex entities that do not correspond to it

- That which is known is not always very useful to understand that which is unknown

- Theory, which decontextualizes the record, is not useful to deal with the variety and complexity of systems: a complementary inductive approach is necessary

Therefore…

We developed a new research project that

- examines all kinds of digital entities in complex systems and then develops a concept of record;

- is concerned with the entire life-cycle of the record and develops a chain of preservation model beginning with the design of the system and capable of ensuring accuracy and reliability in addition to authenticity;

- studies the digital entities created in the course of activities that have used complex systems well before government and business, that is, e-art and e-science; and

- uses the concepts and methodology of all the fields touched by our study

InterPARES 2 Goal
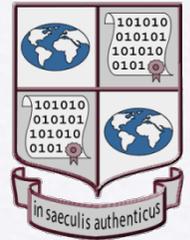
To ensure that the portion of society's recorded memory digitally produced in dynamic, experiential and interactive systems in the course of artistic, scientific and e-government activities can be created in accurate and reliable form and maintained and preserved in authentic form, both in the long and the short term, for the use of those who created it and of society at large, regardless of digital technology obsolescence and media fragility.

InterPARES 2: 2002-2006
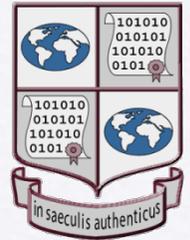
- Major funding from SSHRC, NHPRC, NSF, UBC, and UNESCO (for last 18 months)

- 21 countries in 5 continents, 100 researchers

- Public and private sectors

- Academics and professionals (80% to 20%)

- Archival science, diplomatics and records management; music theory, composition, performance; film theory, production, description; dance and theatre theory; a variety of hard and social sciences; jurisprudence; computer science and engineering

What Do We Study?
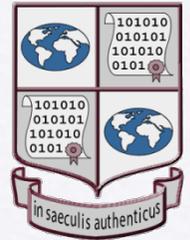
Dynamic entities: they depend for their content upon data extracted from a variety of systems which may have variable instantiations.

Experiential entities: objects whose essence goes beyond the bits constituting it to incorporate the behaviour of the rendering system and the effects of subjective user's interactions.

Interactive entities: objects to which each user intervention or input from another system causes a change of content and/or form.

Live, active materials, followed from creation to preservation, and obsolete inaccessible materials

Approaches taken by both creators and preservers who have concerned themselves with accuracy, reliability and authenticity

Methodological Principles
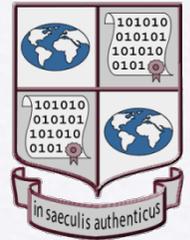
- Interdisciplinarity

- Transferability

- Open Inquiry

- Layered Knowledge Environment

- Multi-method design: surveys, case studies, modeling, prototyping, diplomatic and archival analysis, and text analysis, etc. to address domain and cross-domain research questions

Team Structure
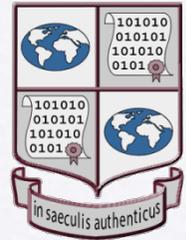
|	FOCUS 1 Artistic activities	FOCUS 2 Scientific activities	FOCUS 3 Governmental activities
DOMAIN 1 Records creation & maintenance	Working Group 1.1	Working Group 1.2	Working Group 1.3
DOMAIN 2 Authenticity, accuracy & reliability	Working Group 2.1	Working Group 2.2	Working Group 2.3
DOMAIN 3 Methods of appraisal & preservation	Working Group 3.1	Working Group 3.2	Working Group 3.3

Terminology
Policy
Description
Modeling

Matrix depicting Task Forces, Working Groups and Cross-domain Research Teams

Dr Luciana Duranti – Project Director - The InterPARES Project

Work Accomplished by Focuses
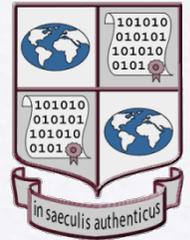
- 15 of the 21 case studies have been completed and represented in activity and entity models and analysed according to diplomatic and archival principles

- surveys of governments websites, of digital photographers, composers, and film makers, of the practice of preservation of interactive music, of file formats and encoding languages used for non-textual materials, and the analysis of a prototype for a persistent archives based on data grids

- annotated bibliographies and literature reviews, conceptual analyses of the findings of the reviews, and bibliographic databases for the management of references

Examples of Case Studies
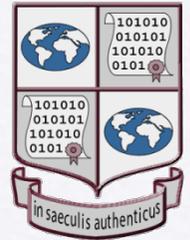
VanMap: the City of Vancouver Geographic Information System

- Linked to the other records of each business process in which it participates

- It is the by-product and residue of the transaction of affairs

- Its data do not exist anywhere else in a similar aggregation

Examples of Case Studies (cont.)

Obsessed Again…, a work for bassoon and interactive electronics written in 1992 by Canadian composer Keith Hamel. The work was designed to use commercial hardware and software but the required equipment has become obsolete. The case study team identified both digital and non-digital entities associated with the work, articulated the requirements for musical authenticity based upon the entities and the various interactions, is building a performable, authentic realization of the work, and developing a method for its long-term preservation.

Examples of Case Studies (cont.)
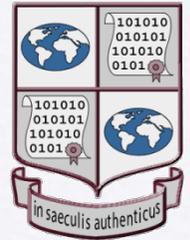
MOST satellite mission: Canada's first telescope. It monitors variations in the brightness of stars. The scientific data consist of a series of nearly uninterrupted measurements of star fields lasting up to two months. The repository for the data is UBC, but the data are to be made available to the public in a year. The team had to address the issue of data versus records, raw data versus research data metadata for identity and integrity, accurate and authentic preservation.

Example of Surveys
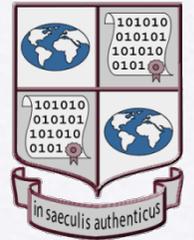
The MUSTICA Initiative. An survey of digital, interactive musical works created by composers at the Institute de Recherche et Coordination Acoustique/Musique (IRCAM) and Groupe de Recherches Musicales (GRM) of Institute National de l'Audiovisuel (INA). This research is partially funded by France's Centre National de la Recherche Scientifique (CNRS).

The study team developed a typology of interactive digital music compositions that supports discussion and analysis of the preservation needs of interactive, digital compositions by identifying the intellectual and physical components of a variety of works

Work Accomplished by Cross-Domains
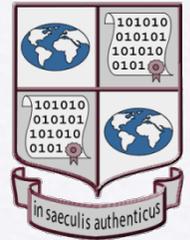
- **Terminology**: a terminology database including 4 lexicographic instruments, a Register, a Dictionary, a Glossary and a Thesaurus

- **Modeling**: Manage the Chain of Preservation model depicting all the activities involved in the management of electronic records throughout their lifecycle, from creation to permanent preservation

Work Accomplished by Cross-Domains (cont.)
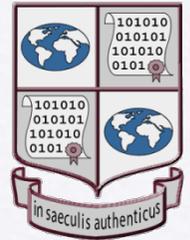
- **Description**: Metadata Schema Registry, which is a centralized repository of schemas that will aid to identify metadata sets, or the combinations of elements from several sets which are appropriate to serve various recordkeeping needs; identification of the relationship between metadata and archival description; collaborations with modeling and policy cross-domains

- **Policy**: the identification of barriers to preservation which currently exist in laws, regulations, policies and standards concerning copyright and intellectual rights, privacy and freedom of information, authenticity and authentication, open standards and open source, and records and archival management

Domains' Work in Course
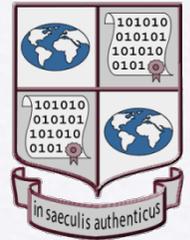
Development of

conceptual responses to the original research questions, primarily concerning the identification of the 'record' and of the preservable entities, and
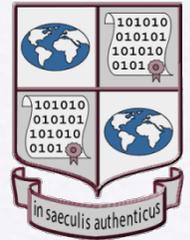
Production of:

guidelines for records creators and preservers; appraisal and preservation methodologies and procedures;

frameworks and models for the development of policies, strategies and legislation; and

descriptive schemas for digital entities

Findings to Date: Methodological

Surprisingly successful:

- looking at the arts and sciences for inspiration and guidance

- interaction with the creators both as co-investigators and as the interested party in the case studies and in the surveys

- continuous dissemination for feedback to the various stakeholders (e.g. scientists, arts conservators)

Expected:

The archival and diplomatic analyses of the preliminary results of the various research activities are fruitful only if one keeps in mind that these methods are retroactive by definition while we are examining live entities (not just active entities)

Findings to Date: Conceptual
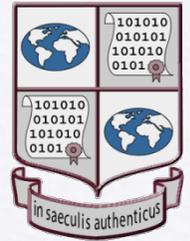
- Fix form and stable content are essential to the existence of a document, let alone a record

- Some systems (e.g. the VanMap) are conceptually one record at any given moment in time, but they also disappear as such at any given moment in time

- Most entities examined in the case studies exist as potential records: they may become at any time 'interim records', kept records in a recordkeeping system, or records within the system creating them

- Creators want to have records <u>and</u> maintain functionality

- The 'one size fits all' solution cannot work

Policy Framework: Principles
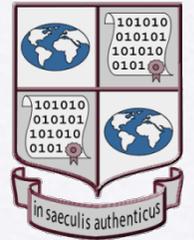
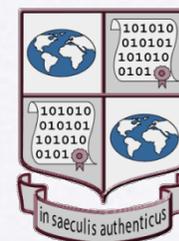An institutional policy should recognize that

- any solution to digital preservation is <u>dynamic</u>, by establishing that the institution should be continuously involved in research as part of its institutional responsibilities rather than just rely on external projects that may or may not happen, may or may not be applicable

- any solution to digital preservation is <u>specific</u>, by establishing that strategies and action plans be developed for each record creator, and in its context, for each type of digital record
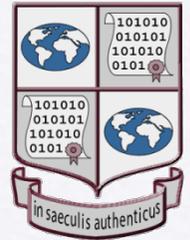
Policy Framework: Principles (cont.)

An institutional policy should recognize that

- constant <u>interaction with the creators</u> of the materials for which the institution is responsible, and constant monitoring of such material are essential to its preservation by establishing stable mechanisms and procedures for them

- the conceptual and methodological knowledge of <u>a variety of disciplines</u> is essential to the development of new archival knowledge, by establishing mechanisms for acquiring it

Policy Framework: Principles (cont.)

An institutional policy should recognize that

- ultimately, every strategy, method, procedure, action must respect archival concepts, principles, and purposes, by identifying <u>authenticity</u> of the preserved records as the absolute priority, and <u>archival description</u> as the primary instrument for maintaining it and attesting to it

- archives have a key role in digital preservation by presenting <u>the archivist is the only trusted custodian</u> who can ensure that our memory will have a future and that our future will have a memory

InterPARES Web Site

www.interpares.org