THE CONTRIBUTION OF ARCHIVAL PRINCIPLES TO A META-SCIENCE METHODOLOGY FOR DIGITAL HERITAGE

Maria Guercio
Sapienza Università di Roma, Digilab, Italy

Abstract

This article discusses the contribution of archival principles to the definition and implementation of a common methodology for digital heritage curation and protection, and identifies general implications for both the archival science itself and for a meta-science perspective. This theoretical approach has been successfully developed by the international archival community in the last fifteen years and its outputs have been able to support other disciplines and research projects dedicated to the curation and preservation of digital heritage by strengthening their conceptual frameworks and consistency. More comprehensive research is required in the future to clarify and reinforce the suggestions proposed here, but the experiences of many international projects in this sector – specifically those characterized by large and collaborative research and cross-disciplinary approaches such as DELOS, ERPANET, InterPARES, CASPAR and APARSEN – can confirm this preliminary analysis. They can also provide basic elements for better exploring the positive role of activities such as *integration* and *cooperation* as opposed to ambiguous concepts like *convergence*. In order to provide support for these suggestions, the article uses the archival concept of evidence of authenticity as an example of how it has been incorporated into international research outputs in the digital preservation field.

Keywords

meta-science, authenticity, digital records, preservation, curation

An assumption and its implications: science and meta-science

The line of reasoning that is proposed here for further discussion has a strong connection with Sue McKemmish and Anne Gilliland's chapter "Archival and Recordkeeping Research: Past, Present and Future," in Williamson and Johanson's 2012 *Research Methods: Information Man-*

agement, Systems, and Contexts. In that chapter, McKemmish and Gilliland provide "an overview of research in the archival multiverse, reviewing and reflecting on historical developments, current trends and future directions" and testifying to "the rapid diversification and expansion of archival and recordkeeping research over the past 25 years and the development of important research infrastructure".[1] They focus their analysis on issues relevant for sustaining and extending "archival and recordkeeping research to address the needs of our societies, organizations and communities" and on presenting and discussing "philosophical and theoretical frameworks used in archival and recordkeeping research drawn from archival science and other fields, particularly those that support the exploration of records and recordkeeping as they exist in multiple cultural and social contexts".[2] In concert with this work, the perspective of this article relates to the capacity of archival and recordkeeping research to provide conceptual frameworks and consistent terminology derived from its professional and disciplinary[3] tradition to other scientific fields. Specifically, the article focuses on the field's capacity to contribute to the development of a common scientific methodology for curating and protecting digital assets. Of course, many concepts have to be analyzed and validated in relation to the major outcomes of archival and recordkeeping research, including fundamental terms such as science and meta-science and their possible application in new environments and perspectives.

Science, according to *Webster's New Collegiate Dictionary*, is "knowledge attained through study or practice, or knowledge covering general truths of the operation of general laws as obtained and tested through scientific method".[4] In this context, the term can be assumed also to have the meaning, recognized in many vocabularies, of an "organized body of knowledge". Meta-science is (at the moment) more simply defined as "theory or science of science"[5] and is a scientific gen-

1 McKemmish, Sue; Anne Gilliland. Archival and recordkeeping research: past, present and future. // Research methods: information management, systems, and contexts. Prahran, VIC: Tilde University Press, 2013.

2 Ibid.

3 The term *discipline* is defined in this paper as a branch of specialized scientific knowledge for research and education, based on a systematic approach to its object, on robust principles and methods and on clear relations with other branches. A scientific discipline has its own technical language and criteria for outcomes assessment and control.

4 Webster's New Collegiate Dictionary. Science, *ad vocem* [cited 2013-8-5]. Available at: http://www.merriam-webster.com/dictionary/science

5 Webster's New Collegiate Dictionary. Meta-science, *ad vocem* [cited 2013-8-5]. Available at: www.merriam-webster.com/dictionary/metascience

eralization intended to provide a new space for exploring the complexity of the contemporary world and providing a contribution to theoretical and practical investigations with a multidisciplinary approach.

The concept of science does not require further investigation in this context. The term "meta-science," commonly used in the traditional scientific domains, has recently been adopted by scholars in information studies with the intention of expanding its use and its relationships beyond the traditional basic science domains where the expression was first and mainly adopted. As confirmed by Rosenbloom's 2009 article[6] assessing the related concepts from the perspective of the computing domain: "the Metascience Expression (ME) language has been developed to aid in understanding the structure of, and relationships among, great scientific domains", with the aim of "understanding and shaping the interactions among a coherent, distinctive and extensive body of structures and processes". According to a more extensive definition of the term, it "not only includes the traditional sciences and engineering, but also mathematics, the humanities and the 'profession'. In the world of information sciences, specifically and not by chance in computing science, this terminology "has been developed to aid in understanding the structure of, and relationships among, great scientific domains" and applied (among others) "to provide new insight into the relationship between science and society".[7]

The last sentence sounds familiar to archivists. Because meta-science "can be based on any number of scientific domains", this article can be seen as an exercise of meta-science in the archival and record-keeping field. Similarly to Rosenbloom's declaration that his exercise "has been done in isolation from the more traditional meta-science approaches" and for this reason it "should be viewed more as reflections from a computer scientist than as a deeply scholarly article within an existing tradition",[8] the analysis laid out in this article has to be considered a personal exercise, even though it has been based on much international research experience and investigation and can count on convergent perspectives with other scholars in the field.

6 Rosenbloom, Paul S. The great scientific domains and society: a metascience perspective from the domain of computing. // The international journal of science in society 1, 1(2009), 133-143 [cited: 2013-8-5]. Available at: http://cs.usc.edu/~rosenblo/Pubs/Y09_18145_TheGreatScientificDomainsandSociety_final.pdf

7 Ibid., p. 134-135.

8 Ibid.

The concept of science is here intended to extend beyond "the normal barriers that separate [...] research from applications". It can be defined as "the *understanding* and *shaping* of the *interactions* among a *coherent, distinctive* and *extensive* body of *structures* and *processes*". Rosenbloom's article provides a detailed explanation for this definition, but for scholars, students and professionals in archival science and recordkeeping it should be easy to recognize in the terminology here adopted the fundamental body of their scientific knowledge. Of course, the main thesis presented here is not to identify archival science itself as a meta-science, but simply to propose the archival and recordkeeping sciences as disciplines whose methodology and principles can provide relevant support to the meta-science goals of *understanding and shaping adequate structures and processes for building and preserving digital heritage*.

This perspective (if proved reliable) could have some positive consequences for the disciplines involved but, at least, implies larger scientific (and not only practical) recognition for crucial concepts and methods to be applied to other domains. Among other possibilities, it should have the capacity to strengthen more strategic and persistent alliances for the protection of digital heritage, as the 2012 Vancouver UNESCO Conference conclusions and recommendations clearly and strongly suggested.[9]

A common conceptual framework based on archival and recordkeeping terminology

The methods and principles developed by archival and recordkeeping research represent a robust, consolidated and open conceptual framework with high capacity for nourishing the research environment and stimulating new approaches for the future. Many aspects of this evolution can be considered enabling factors, as McKemmish and Gilliland have already pointed out, albeit from a different perspective:

- "archival science is emerging as a meta-field that cuts across so-called 'content disciplines'",

9 Unesco/UBC Vancouver Declaration. The Memory of the World in the digital age: digitization and preservation. Vancouver, British Columbia, 26 to 28 September 2012 [cited: 2013-8-5]. Available at: http://www.unesco.org/new/en/communication-and-information/resources/news-and-in-focus-articles/all-news/news/unesco_releases_vancouver_declaration_on_digitization_and_preservation/

- the archival research has been characterized in the last decade by "a significant expansion of the field's research front, with an increasing number of large, collaborative research programs",
- "the growing diversity of archival and recordkeeping research" [as illustrated in the table 4.1 of that chapter] shows "a move beyond the local, to span organisational, disciplinary, cultural and national boundaries",
- "the trend towards trans-disciplinary and trans-institutional collaborations tackling multiple facets of priority research problems is strengthening",
- "the crucial role played by domain experts/archival and recordkeeping professionals in institution-based research and development initiatives, as well as in collaborative research projects, highlights the important role of archival education programs",
- "while the construct of the Archive is itself an object of study, it provides the evidence for the study of other phenomena",
- "the maturation and rich potential of archival research methods" are clearly reflected when literature and projects are analyzed in detail see (table 4.4).

As previously underlined, McKemmish and Gilliland,[10] while recognizing "an increasing awareness and shared understanding of the role and importance of archival research in other fields" and "the potential for transformative research to occur in fertile trans-disciplinary research collaborations", mainly addressed methods and techniques derived and adapted from other disciplines "to address the needs of our societies, organisations and communities". The specific effort of this article is concentrated on the capacity of mature archival and recordkeeping research to support other disciplines' investigations and contribute to addressing "the needs of our societies, organisations and communities" by creating and protecting qualified digital heritage. The term to invoke is the same outlined by McKemmish and Gilliland: "transdisciplinarity" – rather than "convergence" and beyond "inter- and multi-disciplinarity". Interdisciplinary research implies that "its goal and objectives could only be achieved through the contribution of several disciplines, integrating methodologies, concepts, principles and techniques from a variety of fields as needed". Multidisciplinary research examines the same problem "in the con-

10 McKemmish, S.; A. Gilliland. Op. cit.

text of each separate discipline and solved it within such discipline, without any integration of theory or methods, after which the results were compared and the best solutions adopted".[11]

Transdisciplinarity (used for the first time in 1970 by Jean Piaget) is multi-referential and multi-dimensional. It involves the transfer of one or more methods or ideas from one discipline to another and – as the prefix "trans" indicates – implies thinking at the same time within, across and outside each discipline and beyond all disciplines. Its purpose is to gain an understanding of present reality, one imperative of which is the unity of knowledge. "Rigor, openness, and tolerance are the fundamental characteristics of the transdisciplinary attitude and vision. Rigor in argument, taking into account all existing data, is the best defense against possible distortions. Openness involves an acceptance of the unknown, the unexpected and the unforeseeable. Tolerance implies acknowledging the right to ideas and truths opposed to our own."[12]

This concept of transdisciplinarity can be employed for our disciplines to describe the increasing effort made by many international and national projects in the archival and recordkeeping field to support and broaden their vision. It can be interpreted also as a scientific and intellectual approach aimed at implementing capacities and tools for understanding the present complex world. It does not imply a new epistemology, but rather a more open attitude to developing, adopting and transmitting knowledge to future scholars and practitioners. It is based on the capacity to provide an overarching and more comprehensive methodology for developing human knowledge and preserving disciplinary diversity. Of course, any transdisciplinary project by definition is also disciplinary, interdisciplinary and multidisciplinary.[13]

With these concepts in mind and, as mentioned, in continuity with other positions in the field (McKemmish-Gilliland), but with a

11 Duranti, Luciana. Preserving authentic electronic art over the long-term: The InterPARES 2 Project. Paper presented at the Electronic Media Group Annual Meeting of the American Institute for Conservation of Historic and Artistic Works. Portland, Oregon. June 14, 2004 [cited: 2013-8-5]. Available at: http://www.google.it/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0CC4QFjAA&url=http%3A%2F%2Fcool.conservation-us.org%2Fcoolaic%2Fsg%2Femg%2Flibrary%2Fpdf%2Fduranti%2FDuranti-EMG2004.pdf&ei=NL3-UeutGIG34ASy2YHIBg&usg=AFQjCNHrrzLmcGzPX9l7R1WhndTIxtXZCQ&sig2=mK8YHUmyVbgGOdN21gPnhQ&bvm=bv.50165853,d.bGE

12 See: InterPARES 3 Final report [cited: 2013-8-5]. Available at: http://www.interpares.org/display_file.cfm?doc=InterPARES_International_Alliance_ip3_final_report.pdf

13 Ibid.

shift of emphasis, this article is intended to enlighten some recent developments of the archival and recordkeeping research. In so doing, it references the contributions of this research to other disciplines and to the present and future complexity, specifically but not exclusively related to digital heritage in terms of implementation of a *transdisciplinary* methodology beyond the documentary sectors, and (if possible) for a more comprehensive understanding and shaping of the digital heritage domain.

Because the perspective from which the literature and research outputs investigated here concerns the protection of digital heritage, some other assumptions have to be considered. More specifically,

- digital heritage protection includes its accurate creation, the persistent tracking, and documentation of all the relevant transactions involved in its maintenance and preservation,
- for facing the most complex challenges involved in this effort, the concepts and tools developed by the documentary sectors (specifically those related to the digital recordkeeping) can provide the best evidence for other domains and implement a related transdisciplinary methodology.

Of course, this approach can include many concepts relevant in the field that could be useful to investigate. In this article this effort will be concentrated, due to space and time constraints, on two main areas: a brief general overview of crucial terms, and a detailed exemplification based on outputs and deliverables developed by recent digital preservation research projects. This exemplification will be limited to the concept of authenticity in the digital context.

Concepts such as authenticity, reliability, trustworthy custody, digital continuity, provenance and context that have an archival foundation are already part of a common vocabulary in digital curation and preservation research, even if in many cases the definitions of common use are not rooted in the archival domain and lack methodological consistency. The glossaries developed by research projects in the e-science sector normally adopt only or mainly terms from the Open Archival Information Systems (OAIS) Reference Model that emanated out of the space data community and was approved as ISO standard[14] without paying much attention to the need for a standardized and qualified use

14 The OAIS Reference Model specifically states that it is consciously not necessarily using terminology that is used in archival science. The aim is to provide a cross-domain terminology.

of other terminology. Even the ISO Records Management standards often fail to control for coherence when the same concept is adopted in different cross-domain environments (also when it is refers to different concepts and subjects). European and wider international projects such as CASPAR, APARSEN, DigCCurrV, as well as the applied investigation behind the digital repositories standardization processes (e.g., audit checklist requirements and ISO 16363 relating to digital repositories certification) have largely exploited the main archival and recordkeeping concepts and terms (e.g., provenance, authenticity, record trustworthiness, record continuum) as part of their contribution to the creation of a coherent, distinctive and extensive body of structures and processes necessary for a scientific approach to the digital heritage protection, but without recognizing their lineage.

The lack of consistency of international research terminology (and of many international recommendations) is partially due to a lack of awareness that the unambiguous and consistent definition of concepts – when not confined to a specific discipline – requires time and attention, as the OAIS example clearly demonstrates: the OAIS glossary has been developed with the contribution of all the domains involved and can be/has been interpreted and accepted as a transdisciplinary output. For this reason, even if it presents overlapping areas and ambiguity, it has been adopted in many research areas including specific disciplinary domains that have their own vocabularies and are not accustomed to including external contributions. In the 2012 version of the standard, the OAIS model has also been able to evolve by adopting new definitions or refining those already present such as "authenticity", as it will be discussed later.

It could be useful to investigate the resistance to accepting more stringent cooperation among sectors where terminology is involved and when terms developed by documentary heritage disciplines are available. This aspect is relevant for projects related to digital heritage protection: an area whose dynamism and complexity should require more focus on a well-defined set of terms able to evolve consistently in collaboration with other disciplines. The identification of some basic research questions could help to better delineate this issue for discussion. They include the following crucial but still unsolved questions:

- which *archival concepts and methodological tools and standards* can be or have been already identified (even if not explicitly recognized) as relevant for and supportive of other domains?

- which *research areas* have been positively influenced in recent years (more or less explicitly) by the contribution of the archival and recordkeeping disciplines?
- which *projects* (promoted and led by archival institutions or with their significant presence and able to seriously contribute to "the development of important research infrastructure" in the digital heritage environment) have had continuity of funding? What impacts did they have?
- which *methodological tools* could support such analysis other than and beyond a historical reconstruction based on oral interviews of those involved and the examination of specific research outputs and deliverables?

Although substantive and accurate answers to these demanding questions require time and considerable dedicated investigation, some significant examples are already available thanks to a series of research projects funded by the European Commission and by other international funding bodies in the sector of digital preservation. They are related to concepts such as authenticity and integrity and their capacity to contribute to the definition of a common cross-reference research agenda and to the persistency of its conceptual infrastructure cannot be denied. The following discussion seeks to verify the relevance of these suggestions and to identify possible further developments in the same direction. This overview will include the InterPARES, CASPAR and APARSEN projects, with specific reference to their investigations relating to the concept of authenticity and the evidence necessary to establish it. Another promising research area is that addressing digital repositories' certification. In both these areas a crucial role is played by the standardization processes developed both by the ISO standard on records management and by archival requirements for business continuity. Other areas of development that might be looked at could include digital libraries and institutional repositories. In both cases a demanding effort is underway to support a more influential and significant role for archival institutions in implementing comprehensive and qualified functional requirements of digital infrastructures. One example is the APEX network, a European project which involves European national archives. There are also specific initiatives like the Sapienza Digital Library. In both cases, the projects are trying to transform static and unconvincing solutions for complex types of digital library by enriching a simple

(i.e., meagre) metadata structure with contextual information and thereby increasing the intelligibility of the digital resources made available on the web.

Authenticity evidence and digital heritage: the research continuity from InterPARES findings to CASPAR and APARSEN

Authenticity is a crucial concept increasingly recognized for its centrality among the terms commonly used and referred to by the communication, information and knowledge society. The InterPARES[15] projects have dedicated a large amount of their effort to defining this concept and the requirements to be supported when evidence of digital authenticity (a.k.a. *authenticity evidence* intended as proof or documentation relevant for presuming or supporting the assessment of digital authenticity) has to be preserved. It is not by chance that the documentary disciplines have defined authenticity in terms of the identity and integrity of digital resources. The knowledge and experience of archival institutions and scholars have in this respect undoubtedly been central. However, the concept of authenticity is central also for research on digital preservation and for building measures and tools for trusted digital repositories of any type. As generally recognized, in today's research environment, the information society by its nature directly works on the creation and narration of social and individual identities and, for this reason, requires tools, procedures and fundamentally solid concepts for entrusting and documenting their authenticity specifically when facing the challenges of the digital world, and not only in case of official records and their legal value. For this reason the conceptual framework for preservation developed by InterPARES on the basis of authenticity principles can be considered a crucial contribution of the archival community and its multi-century tradition to the definition of a common basic methodology for facing digital challenges to protect memory and ensure persistency

15 The series of InterPARES projects (1999-2017) can be defined as an incredibly productive and long-lasting international environment developed in the last twenty years with stimulating results, such as a common terminology, robust conceptual frameworks and significant occasions for international and cross-domain comparisons and advanced educational programs. The projects – this is an important aspect of their success strictly related to their original special nature – had a very clear and strong disciplinary (archival) focus but had and have also the capability of involving other communities with an interdisciplinary approach and (specifically in the second and third phases with InterPARES 2 and InterPARES 3 and presumably also in the future project just funded, the InterPARES Trust) of supporting other research environments with their basic conceptual framework.

Authenticity has also been creatively and thoroughly analysed by Paola Carucci who, in 1987, exported the diplomatics framework for analysis to study the genesis of the contemporary paper records.[16] This approach has been further investigated and creatively extended to the digital environment by Luciana Duranti and by the InterPARES research teams. On this basis, more inclusive principles and methods and a conceptual template for analysis have been elaborated and further refined by the InterPARES researchers over the last twenty years.

With specific reference to authenticity, therefore, a rich body of archival literature has been developed. Nevertheless, not many European projects have used this frame of reference, which, while not necessarily universally applicable in itself, is consistent and conceptually robust, and the term and its definition (developed by InterPARES researchers) have become a common basis for understanding. The only exceptions have been CASPAR and now the APARSEN projects (two European projects dedicated to the preservation of data and digital heritage for e-science, performing art, digital music and cultural resources). Thanks to the presence of archivists involved in this research and of course with the support of experts from other crucial areas, including specifically and not by chance scholars such as David Giaretta[17] who have been involved in the development of OAIS reference model, these projects have integrated InterPARES template elements for authenticity into the OAIS model. Their explicit aim has been to provide a more detailed definition of basic functions of the standard that are in compliance with archival requirements. It has to be mentioned that other European projects on digital preservation, even those that had specified the management of authenticity as part of their crucial requirements, have not proposed original solutions in this field and have basically ignored the real questions involved.[18]

This lack of interest is not easy to understand and is even more difficult to justify, specifically because today terms such as *trust* and *reliability*, which lie at the centre of any research and debate on digital pres-

16 Carucci, Paola. Il documento contemporaneo. Roma: Carocci editore, 1987.

17 Giaretta, David. Advanced digital preservation. Berlin; Heidelberg: Springer, 2011.

18 See the analysis on this aspect in APARSEN, Deliverable 24.1 Report on authenticity and plan for an interoperable authenticity evaluation system, April 2012 [cited: 2013-8-5]. Available at: http://www.alliancepermanentaccess.org/wp-content/uploads/downloads/2012/04/APARSEN-REP-D24_1-01-2_3.pdf

ervation, acquire their intelligibility and resonance if and when they can be concretely measured against the capacity to verify or, at least, presume the authenticity of the digital resources to be preserved. The tendency of ignoring the complexity of ensuring authenticity of digital objects in long-term digital preservation is emblematic of the present capacity to overcome critical factors by ignoring them. Of course, the implementation of tools able to support authenticity in digital preservation is a demanding (and unavoidable) task, both from the organizational point of view and because of the costs involved. Against this flow, CASPAR and APARSEN projects have recognized:

- the centrality of a conceptual framework for ensuring and presuming authenticity as part of the chain of custody for any kind of digital heritage,
- the meaningfulness of archival and recordkeeping concepts when defining functions and requirements in this area, and
- the essential need for transdisciplinary cooperation that includes, among others, roles and profiles from the archival domain (senior and junior academic scholars with competence on authenticity of digital records), experts for conceptual modeling and business workflows, IT developers and IT engineers with experience of orchestration systems for digital curation and preservation, scholars involved in the dynamic definition of the OAIS model, experts in domains and contents which require new concepts and tools for supporting authenticity (digital music, e-science, performing arts) and professionals responsible for managing digital repositories and auditors involved in certification processes.

As already discussed, the two projects have based their strategic developments in digital preservation on the conceptual framework built by InterPARES and its interrelating principles, policies and procedures. These were designed to compare and assess the quality and consistency of digital practices with regard to authenticity issues. More specifically, CASPAR and APARSEN researchers have recognized that the main principles and concepts, originally defined by the archival and recordkeeping communities, could be transformed into a series of interrelated assumptions able to support the level and the quality of integration and cooperation among investigators and domains and to define a common vision for further developments. The following list provides some examples of this effort in term of theoretical and practical findings:

- authenticity includes identity and integrity: CASPAR developed these InterPARES concepts and published a position paper on authenticity that provided the basis of the orchestration framework for digital preservation;[19]
- in any domain, ensuring evidence of authenticity for digital heritage necessitates the collection of appropriate documentation and information: APARSEN further applied this principle present both in InterPARES and in the activities on the audit checklist for digital repository certification in developing a systematic approach for auditing and certifying digital preservation repositories;
- a standardized workflow able to ensure the continuity of information collection from the creation phase onwards is required to make the preservation effort of digital heritage sustainable: APARSEN accepted and implemented principles related to the chain of preservation and business continuity as elaborated by the archival and recordkeeping communities and incorporated into the main standards on record management such as ISO 15489:2001 Code of Practice – Records Management and ISO 23081:2006 Metadata for Records; guidelines have been approved to define when and which evidence of authenticity should be collected, and how to structure and preserve it;[20]
- a definition of authenticity has been included in the updated version of OAIS in 2012 ("the degree of authenticity is judged on the basis of evidence") thanks to the direct contribution of CASPAR, APARSEN and InterPARES teams.

As already mentioned, the specific contribution of CASPAR and APARSEN to the implementation of tools to support evidence of authenticity has been developed on the basis of the previous research findings in the field. These include InterPARES' conclusions that while authenticity is an absolute in itself (i.e., something is either authentic or it is not), the presumption of authenticity is graduated

19 Factor, Michael; Henis, Ealan; Naor, Dalit; Rabinovici-Cohen, Simona; Reshef, Petra; Ronen, Shahar; Michetti, Giovanni; Guercio, Maria. Authenticity and provenance in long term digital preservation: modeling and implementation in preservation aware storage. // TaPP '09: First Workshop on the Theory and Practice of Provenance, San Francisco, 23 February 2009 [cited: 2013-8-5]. Available at: http://www.usenix.org/event/tapp09/tech/full_papers/factor/factor.pdf

20 APARSEN, Deliverable 24.1. Op. cit. See also APARSEN Project: Deliverable 24.2. Implementation and testing of an authenticity protocol on a specific domain, 2012 [cited: 2013-8-5]. Available at: http://www.alliancepermanentaccess.org/wp-content/uploads/downloads/2012/04/APARSEN-REP-D24_2-01-2_2.pdf

and its assessment is supported not only by the preservation system but also by the information collected during the whole chain of custody of digital resources/records. InterPARES links authenticity to the transformations that a digital resource undergoes in the various phases of its life and recognizes that authenticity is inferred from the trustworthiness of all the information collected and cannot simply be limited to 'technical evidence', i.e., mechanisms to validate the integrity at bit level (such as digests, electronic signatures and digital seals). 'Non-technical evidence' should also be collected, such as the identity of the author, evidence of the reliability of the creation system, trustworthiness of the custodian, and specifically when the bit stream is modified by transformations. Significant steps implemented by the CASPAR and APARSEN teams have been dedicated to the identification of a systematic methodology (qualified by a consistent terminology and a standardized approach) to collect and preserve evidence of authenticity evidence from the creation of digital assets onwards. The proposal is not limited to the recordkeeping environment even if recordkeeping and archival definitions, standards and tools constitute its conceptual framework. More functional requirements have been defined to support this methodology and to transform what was initially a theoretical approach into practical guidelines:

- a formal model based on a core set of events (compliant with ISO standards on record management and the European specifications MoReq 2 and MoReq 2010),
- event templates to specify and standardize controls and evidence to be gathered,
- definition of a normalized (but flexible) series of *authenticity evidence records* (AER) to ensure interoperability in the course of business processes and among digital repositories,
- operational guidelines to guide the implementation of the model.

APARSEN has transformed this proposal into specific tools and services[21] and is cooperating with SCIDIP-ES, another ongoing European project, to implement the model by creating detailed AERs related to provenance and context information and, more specifically, to collect and to support the interoperability of e-health data and various types of scientific data.[22]

21 APARSEN. Deliverable 21.1. Overview of preservation services. 2013 [cited: 2013-8-5]. Available at: http://www.alliancepermanentaccess.org/index.php/aparsen/aparsen-research/wp21-preservation-services/

Final remarks

Of course this general overview on such complex questions cannot and does not the pretend to be exhaustive: the aim has been simply to show by an example the potential for transdisciplinary use of archival and recordkeeping concepts and principles, when they are methodologically consistent, widely discussed, and interpreted with open minds. The interlocutory and provisional nature of this approach cannot allow for any conclusion, only for some general remarks. The first one comes from a keynote speech presented by Seamus Ross in 2007 at the Budapest conference on digital libraries. It is not recent, but from the point of view discussed here, it remains convincing:

> [The digital contents in any domain] "require knowledge of its context of creation, and [...] demand evidence of its provenance. These are processes to which archives respond well because they have developed an appropriate theoretical framework and have operationalised it in repository design, management and use over at least three centuries. The archival framework meets requirements surrounding the production, management, selection, dissemination, preservation and curation needs of information. It also supports a layering of services from repository services at the foundation to user services at upper levels."[23]

Some other considerations could be added to this general and shareable statement that could constitute a basis for future investigations in the direction of a more cooperative research environment:

- the archival and recordkeeping framework has proved its consistency with the requirements for documenting authenticity over time in a dynamic environment as recognized by many other scientific domains addressing digital preservation,
- in the last decade this framework has been developed and accepted as part of the archival discipline both with reference to

22 Salza, Silvio; Maria Guercio. Authenticity management in long term digital preservation on medical records. // I-Pres: proceedings of the 9th International Conference on preservation of digital objects, Toronto, October 1-5, 2012. Toronto: University of Toronto, 2012. Pp. 171-179 [cited: 2013-8-5]. Available at: https://ipres.ischool.utoronto.ca/sites/ipres.ischool.utoronto.ca/files/iPres%202012%20Conference%20Proceedings%20Final.pdf; Briguglio, Luigi; Salza, Silvio; Guercio, Maria. Preserving authenticity evidence to assess provenance and integrity of digital resources. Berlin; New York: Springer, 2013. Pp. 66-77.

23 Ross, Seamus. Digital preservation, archival science and methodological foundations for digital libraries. // ECDL 11, Budapest 2007. P. 8 [cited: 2013-8-5]. Available at: http://www.ecdl2007.org/Keynote_ECDL2007_SROSS.pdf

the vocabulary and to the functional model, but this effort has not been conducted in isolation: a large international community has actively participated to support a standardized approach with positive consequences for the potential re-use of principles, vocabularies, models,

- this common basis has provided a significant contribution to the collection of relevant information about the integrity and identity of digital resources necessary for the creation and preservation processes.

Of course, this effort has not been always linear. On the contrary it was, is and will inevitably be conflicting and contradictory. In particular, it has to be recognized that the development of a conceptual methodology for authenticity evidence outside the archival and recordkeeping community has required the considerable investment of time of many researchers and it has met with not irrelevant resistance before being accepted. For instance, it took 18 months for the CASPAR researchers charged with the task of developing methodology and tools for authenticity to convince the project team on the relevance of this approach. This effort and its success are mainly and increasingly based on international cooperation (especially when built on the will and the capacity to know and trust each other), multidisciplinary knowledge and transdisciplinary ambitions. Certain conditions were also instrumental in making this happen:

- the international community has been able to discuss openly, meet frequently and has been aware of its capacity to plan strategic roadmaps,
- advanced research projects have been largely funded,
- young scholars (open, curious, creative and with robust methodological knowledge in their own domain) have been educated and incorporated early into an open research environment. At the same time PhD programs have increased in number and in quality, and have an increasingly international perspective.

The future of our research and the quality of its findings heavily depend upon this capacity of sharing ideas among traditions, domains and generations.

References

APARSEN: Alliance for permanent access to the records of science network, 2011-2014, [cited: 2013-8-5]. Available at: http://www.alliancepermanentaccess.org/current-projects/aparsen

APARSEN, Deliverable 24.1 Report on authenticity and plan for interoperable authenticity evaluation system, April 2012 [cited: 2013-8-5]. Available at: http://www.alliancepermanentaccess.org/wp-content/uploads/downloads/2012/04/APARSEN-REP-D24_1-01-2_3.pdf

APARSEN Project: Deliverable 24.2. Implementation and testing of an authenticity protocol on a specific domain, 2012 [cited: 2013-8-5]. Available at: http://www.alliancepermanentaccess.org/wp-content/uploads/downloads/2012/04/APARSEN-REP-D24_2-01-2_2.pdf

Briguglio, Luigi; Salza, Silvio; Guercio, Maria. Preserving authenticity evidence to assess provenance and integrity of digital resources. Berlin; New York: Springer, 2013. Pp. 66-77.

Carucci, Paola. Il documento contemporaneo. Roma: Carocci editore, 1987.

CASPAR: Cultural, artistic and scientific knowledge for preservation, access and retrieval, 2006-2009 [cited: 2013-8-5]. Available at: http://www.casparpreserves.eu

CCSDS: Reference model for an archival information system – OAIS. Draft recommended standard, 650.0-P-1.1 (Pink Book), Issue 1.1, 2009 [cited: 2013-8-5]. Available at: http://public.ccsds.org/sites/cwe/rids/Lists/CCSDS%206500P11/CCSDSAgency.aspx

DiGCurV: Digital Curator Vocational Educational Europe [cited: 2013-8-5]. Available at: http://www.digcur-education.org/

Duranti, Luciana. Preserving authentic electronic art over the long-term: The InterPARES 2 Project. Paper presented at the Electronic Media Group Annual Meeting of the American Institute for Conservation of Historic and Artistic Works. Portland, Oregon. June 14, 2004 [cited: 2013-8-5]. Available at: http://www.google.it/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0CC4QFjAA&url=http%3A%2F%2Fcool.conservation-us.org%2Fcoolaic%2Fsg%2Femg%2Flibrary%2Fpdf%2Fduranti%2FDuranti-EMG2004.pdf&ei=NL3-UeutGIG34ASy2YHIBg&usg=AFQjCNHrrzLmcGzPX9l7R1WhndTIxtXZCQ&sig2=mK8YHUmyVbgGOdN21gPnhQ&bvm=bv.50165853,d.bGE

Giaretta, David. Advanced digital preservation. Berlin; Heidelberg: Springer, 2011.

Guercio, Maria. Conservare il digitale. Roma: Laterza, 2013.

Guercio, Maria. Digital preservation in Europe: strategic plans, research outputs and future implementation. The weak role of the archival institutions. // The Memory of the World in the Digital Age: digitization and preservation, Unesco Conference, Vancouver 26-28 September 2012. [Paris]: Unesco, 2013 [cited: 2013-8-5]. Available at: http://www.ciscra.org/docs/UNESCO_MOW2012_Proceedings_FINAL_ENG_Compressed.pdf

Guercio, Maria. MoReq1, MoRe2 e MoReq2010: raccomandazioni e prove tecniche di certificazione per la gestione informatica dei documenti. // Archivi 7, 1(2012), 7-32, 1 [cited: 2013-8-5]. Available at: http://www.anai.org/anai-cms/cms.view?munu_str=0_3_0&numDoc=62

Guercio, Maria. La notion d'authenticité en conservation numérique. // Musique et technologie : préserver - archiver - re-produire: musique et technologie, jeux vidéo. Paris: Institut national de l'audiovisuel, 2013.

International Research on Permanent Authentic Records in Electronic Systems (InterPARES) [cited: 2013-8-5]. Available at: www.interpares.org

International Research on Permanent Authentic Records in Electronic Systems (InterPARES) 3 Final report [cited: 2013-8-5]. Available at: http://www.interpares.org/display_file.cfm?doc=InterPARES_International_Alliance_ip3_final_report.pdf

ISO 16363. 2012 - Audit and certification of trustworthy digital repositories [cited: 2013-8-5]. Available at: http://www.iso16363.org/news/iso-16363-2012-now-published-on-iso-site-as-international-standard/

McKemmish, Sue; Anne Gilliland. Archival and recordkeeping research: past, present and future. // Research methods: information management, systems, and contexts. Prahran, VIC: Tilde University Press, 2013.

RLG-NARA, Task Force on Digital Repository Certification. Audit checklist for certifying digital repositories [cited: 2013-8-5]. Available at: http://www.rlg.org/en/pdfs/rlgnara-repositorieschecklist.pdf

Rosenbloom, Paul S. The great scientific domains and society: a metascience perspective from the domain of computing. // The international journal of science in society 1, 1(2009), 133-143 [cited: 2013-8-5]. Available at: http://cs.usc.edu/~rosenblo/Pubs/Y09_18145_TheGreatScientificDomainsandSociety_final.pdf

Ross, Seamus. Digital preservation, archival science and methodological foundations for digital libraries. // ECDL 11, Budapest, 2007 [cited: 2013-8-5]. Available at: http://www.ecdl2007.org/Keynote_ECDL2007_SROSS.pdf

Salza, Silvio; Guercio, Maria. Authenticity management in long term digital preservation on medical records. // I-Pres: proceedings of the 9th International Conference on preservation of digital objects, Toronto, October 1-5, 2012. Toronto: University of Toronto, 2012. Pp. 171-179 [cited: 2013-8-5]. Available at: https://ipres.ischool.utoronto.ca/sites/ipres.ischool.utoronto.ca/files/iPres%202012%20Conference%20Proceedings%20Final.pdf

Unesco/UBC Vancouver Declaration. The Memory of the World in the digital age: digitization and preservation. Vancouver, British Columbia, 26 to 28 September 2012 [cited: 2013-8-5]. Available at: http://www.unesco.org/new/en/communication-and-information/resources/news-and-in-focus-articles/all-news/news/unesco_releases_vancouver_declaration_on_digitization_and_preservation/

PRINOS ARHIVISTIČKIH NAČELA META-ZNANSTVENOJ METODOLOGIJI ZA DIGITALNU BAŠTINU

Sažetak

U članku se raspravlja o prinosu arhivističkih načela definiciji i implementaciji zajedničke metodologije za skrb i zaštitu digitalne baštine, te identificiraju općenite implikacije i za arhivističku znanost i za perspektivu meta-znanosti. Ovaj teorijski pristup uspješno je razvijen u međunarodnoj arhivističkoj zajednici u posljednjih petnaest godina, a njegovi ishodi uspješno su podupirali druge discipline i istraživačke projekte namijenjene skrbi i zaštiti digitalne baštine osnažujući njihove konceptualne okvire i konzistentnost. U budućnosti je potrebno provesti opsežnije istraživanje da bi se razjasnili i osnažili ovdje izneseni prijedlozi, ali iskustva mnogih međunarodnih projekata u ovom sektoru – osobito onih koje odlikuju velika suradnička istraživanja i multidisciplinarni pristup, kao što su DELOS, ERPANET, InterPARES, CASPAR i APARSEN – mogu potvrditi ove preliminarne analize. Oni također mogu osigurati osnovne elemente za bolje istraživanje pozitivne uloge aktivnosti kao što su *integracija* i *suradnja* u opreci prema neodređenim konceptima kao što je *konvergencija*. Kako bi se poduprli navedeni prijedlozi, u članku je korišten arhivistički koncept dokazivanja autentičnosti kao primjer načina na koji je taj koncept bio uklopljen u međunarodne istraživačke ishode u polju digitalne zaštite.

Ključne riječi: meta-znanost, autentičnost, digitalni zapisi, zaštita građe, skrb