

OUTSOURCING RECORDS MANAGEMENT TO THE CLOUD: caveat emptor or caveat venditor?

Corinne Rogers, PhD
University of British Columbia

Corinne Rogers (PhD, UBC) is Project Coordinator for the international research project InterPARES Trust and an adjunct professor at the School of Library, Information, and Archival Studies at the University of British Columbia (diplomats, digital records forensics, digital preservation). Corinne's doctoral research focused on the methods records professionals use to protect or assure authenticity of digital records in practice and how that differs from methods of proving or evaluating record authenticity. Other research interests include information ethics, and the application of digital forensics in archival practice.

INTRODUCTION

In 2017 most businesses, governments, and individuals are 'in the cloud' for various aspects of their professional, business, or personal activities. From the

original cloud service models of SaaS (software as a service), IaaS (infrastructure as a service), and PaaS (platform as a service), there now exist any number of 'as-a-service' offerings to tempt the user. The cloud has been promoted as a cost-saving opportunity for businesses and governments to streamline workflows and centralize IT services through outsourcing to giants like Amazon Glacier, Microsoft Azure, Google, AWS, and others. Cloud service providers promise greater security and lower costs than stand-alone IT shops through on-demand and measured service, broad network access, resource pooling, rapid elasticity and scalability. But have these promises been met? The latest research indicates that the promised cost-savings are illusive, and risks to security, privacy, and availability abound. Particularly for those responsible for records management and information governance, there are very real and urgent requirements for the management of records and data that were clearly understood in the analogue and even the pre-networked digital era, but which may be ignored or not met in the cloud.

Records professionals are facing increasing pressure to manage records and archives in online environments. Some organizations have developed a strategic cloud strategy; others may operate in an ad hoc fashion. Regardless of the degree of cloud readiness or sophistication, outsourcing the management of records and archives to the cloud raises a host of concerns for issues such as chain of custody, data privacy, records retention and disposition. Records managers and archivists, concerned with authenticity, reliability, and control of records and data across time and technological change, may find that cloud services do not meet core requirements.

This paper outlines the risks and challenges of managing records and archives in the cloud, and presents results of current research into these issues. It begins with an introduction to InterPARES (International Research on the Preservation of Authentic Records in Electronic Systems), and InterPARES Trust (Trust and Digital Records in an Increasingly Networked Society), followed by descriptions of several products of these projects that offer practical guidance to records professionals evaluating current cloud services or considering adopting new services for their organizations.

The InterPARES Project – Creating and preserving authentic, reliable digital records

International Research on Permanent Authentic Records in Electronic Systems, or InterPARES as it is commonly known, “[is aimed] at developing the knowledge essential to the long-term preservation of authentic records created and/or maintained in digital form and providing the basis for standards, policies, strategies and plans of action capable of ensuring the longevity of such material and the ability of its users to trust its authenticity” (InterPARES 2017). The project, directed by Luciana Duranti at the University of British Columbia, Vancouver, Canada, has involved researchers from around the world since its inception. It has been continuously funded by the Social Sciences and Humanities Research Council of Canada (SSHRC) and has been conducted in four phases to date.

InterPARES 1 began in 1998 and ran for three years. The goal of the project was to develop a body of theory and methods necessary to ensure that digital records produced in databases and office systems could be identified as records, as understood by archival science, and demonstrated to be authentic over time. Why? The researchers realized that in both archival science and jurisprudence, the records created and used in the usual and ordinary course of business can be presumed authentic. However, in digital systems, these records are at risk of alteration or corruption, either intentional or inadvertent. How can we assess the authenticity of digital records when they are transmitted over time and across space? The researchers studied these digital records from the perspective of the preserver, asking how archives should approach these objects when they come into archival custody. Authenticity is assessed on the basis of evidence – what evidence is necessary in digital systems to make a presumption of authenticity? In the course of the project, researchers developed concepts about the necessary and sufficient components of a digital record, using diplomatic and archival theory, and developed templates for analysing digital material, and benchmark and baseline requirements for assessing and preserving authentic records over the long term (Duranti 2001; Duranti, Eastwood, & MacNeil 2003; Duranti 2005; Duranti & Preston 2005b).

In the second phase of InterPARES (2002-2007), researchers expanded their scope of inquiry to the huge variety of records created in dynamic, experiential and interactive systems in the course of artistic, scientific and e-government activities. Researchers approached digital records this time from the perspective of the creator, asking what was required for records to be created in accurate

and reliable form and maintained and preserved in authentic form, both in the long and the short term, whether for the use of their original creator or of society at large, regardless of technology obsolescence and media fragility (Duranti & Thibodeau 2006; Duranti & Preston 2008).

All the products and dissemination resulting from these two projects are freely available under a creative commons license from the website, www.interpares.org. Key outcomes of InterPARES 1 include requirements supporting the presumption of authenticity of digital records, and the production of authentic copies of those records. The benchmark requirements supporting the presumption of authenticity are the conditions that serve as a basis for a preserver's assessment of the authenticity of a creator's digital records. Based on archival science and diplomatics and tested in digital environments, they include the elements of record identity and integrity determined necessary to assess authenticity – identity and integrity metadata. They also cover access privileges, security and protection against loss or corruption, establishment of documentary forms, means of authentication, and identification of authoritative records. It is rare that all of these conditions will be met – it is the degree to which they are met that allows the preserver to determine the strength of the presumption of authenticity (Duranti & Preston 2005a).

The baseline requirements supporting the production of authentic copies include the controls over record transfer, maintenance and reproduction, documentation of the reproduction process and its effects, and archival description necessary in order to be confident of producing copies of digital records that can be guaranteed authentic (Duranti & Preston 2005a). All of these requirements continue to be of importance when records are outsourced to the cloud, and two items in particular pose challenges: the requirement that unbroken chain of custody be maintained and demonstrable, and that security and control procedures are implemented and monitored.

InterPARES 1 and 2 were influential; their findings have been and continue to be implemented in organizations and governments worldwide. The impact of the findings is visible in legislation in Italy and China and in standards, including the DOD 5015.2 in the US, MoReq 2, OAIS, and most recently the Canadian General Standards Board 72.34, Electronic Records as Documentary Evidence, released on March 1 of this year. The findings have also been implemented in a wide variety of organizational policies and procedures, and in curriculum for continuing education and for university programmes.

InterPARES 1 and 2 also received criticism from some quarters for being presumed realistic only for large, resource-rich organizations. The question was posed: how can this research benefit small organizations with a single archivist, limited financial resources, and little or no support from management? This was taken on as a challenge in InterPARES 3 (2007-2012), which embraced the goal of putting the theory into effect in environments challenged by scarce resources (InterPARES 2017).

InterPARES Trust: Digital records online

The findings of the first three phases of InterPARES are relevant for all types of digital records in business systems and the interactive, dynamic systems of individuals and organizations. They are necessary, but not sufficient, for the records now being created, maintained and kept in the cloud. Phase 4 of InterPARES (InterPARES Trust 2013-2018) was approved by the Social Sciences and Humanities Research Council of Canada to investigate records in online environments – the records of social media, of open government, of citizen engagement, as well as business records created, managed, analysed, accessed, stored, and perhaps even preserved, in the cloud.

The researchers realized that the issues surrounding records and data online cut across disciplines as well as jurisdictions, and so the studies approved under the InterPARES Trust umbrella were organized in five research domains (infrastructure, security, control, access, and legal issues) and five cross-domains (terminology, resources, policy, social issues, education).

The research domains are:

Infrastructure: This domain considers issues relating to system architecture and related infrastructure as they affect records held in online environments. Examples include: types of clouds and their reliability; types of contractual agreements (service-level agreements or SLAs) and their negotiation, coverage, and flexibility; and costs, both up front and hidden.

Security: Topics in this domain include methods of securing records, issues of data breaches, audits and auditability, and risk assessment.

Control: The control domain focuses on the management of digital material, addressing issues of authenticity, reliability and accuracy, metadata, chain

of custody, and archival functions of retention and disposition, appraisal, description, and intellectual control.

Access: This domain includes issues related to open access and open data, intellectual rights, privacy, accountability, and transparency.

Legal: This domain concerns legal issues; of particular concern for records in online environments are issues of extra-territoriality, chain of evidence, and authentication, among others.

The research cross-domains:

Terminology: This cross-domain bridges disciplines by comparing common terms and their uses, developing a multilingual glossary of terms as used in the research, a multilingual dictionary with sources, and ontologies.

Resources: The research is supported by the development of annotated bibliographies and literature reviews of relevant published articles, books, case law, policies, statutes, standards, blogs, and grey literature.

Policy: The policy cross-domain considers policy-related issues emerging from the five research domains. In general, it addresses recordkeeping issues associated with the development and implementation of policies having an impact on the management of records in an online environment; policies can be broad, such as a national policy on information management, or very specific, such as a policy on adopting certain standards within an organization.

Social/societal issues: Research in this cross-domain analyses social change consequent to the use of the Internet, including the use/misuse and trustworthiness of social media, consequences of data leaks (intentional or accidental/force majeure), development issues (power balance in a global perspective), organizational culture issues, and individual behaviour issues.

Education: This cross-domain is concerned with the development of different models of curricula for transmitting the new knowledge produced by the project (InterPARES Trust 2017b).

GOALS

One of the key questions InterPARES Trust poses is: What is the impact of always-on, networked communication technologies and cloud computing services on records management and recordkeeping, maintaining trustworthy records, and on both client and citizen perception of the trustworthiness of these digital records? The project has articulated a number of goals to achieve its objective.

The first is to discover how current policies and practices regarding the handling of digital records in online environments affect the public's trust in these records – in other words, what are archivists and records managers doing when trying to maintain trustworthy records online? The second turns this around to ask what the public thinks – we know there is a waning level of confidence in online records and information – more so today than when this project began! What is the public's perception of the trustworthiness of institutional records?

Because of the international nature of this project, our third goal recognizes that we also must address how national or cultural contexts affect levels of trust, issues of trust, and solutions to trust issues. The fourth goal is to develop various instruments that will either assist or regulate the creation, management, storage, preservation, and access to digital records online. And finally, we recognize that it is not enough to make recommendations; our fifth goal is to test them in the field.

Archival and records management issues in the cloud

But why, really, is this necessary? If the findings of previous InterPARES projects apply to digital records regardless of their technical environment, why do we need another research project? The answer can be seen in industry statements about the cloud, in the rush of many organizations to embrace the latest technology, and the speed with which the technology develops and changes.

One does not have far to look to see how this new technology has been embraced:

“Enterprise adoption of the cloud has truly moved into the mainstream, with 68% currently using public or private cloud... a 61% increase over last year...”

“The greater the level of cloud adoption, the higher the level of business benefits achieved.”

“On average, per application deployed on cloud, organizations studied are achieving \$3 million in additional revenue... [and] \$1 million in cost reduction... (Mahowald et al. 2016)”

These quotes speak to the speed of development and adoption as well as the focus on cost reduction and benefits optimization.

What exactly do we mean by “cloud”? There is a popular joke that says, “There is no cloud – it’s just someone else’s computer”, and to a certain extent that is true. It reminds us that computing still relies on physical things – hardware, cables, and the laws of physics. However, it is also very superficial. Mary Branscombe, writing for ZDNet, responds: “if you’re saying that, the joke is on you, because it means you don’t understand what the cloud actually is” (Branscombe 2016).

The standard definition of cloud computing comes from the National Institute of Standards and Technology (NIST): cloud computing is “a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources that can be rapidly provisioned and released with minimal management effort or service provider interaction” (Mell & Grance 2011). These services can be delivered in one or a combination of deployment models, each with specific benefits and costs. Public cloud infrastructure is made available to the general public over the Internet. By definition external to the customers’ organization, public clouds are owned and operated by third-party providers and usage is subject to detailed service-level agreements. Concerns include privacy and security in a multi-tenancy environment, and multi-jurisdictional issues. These concerns are often addressed by adopting a private cloud infrastructure: this is operated for a single organization, that is, data in a private cloud does not share resources with data belonging to other individuals or organizations. A private cloud may be managed by the organization or by a third party and may be hosted within the organization’s IT infrastructure or externally. Between these two models are community clouds and hybrid clouds. A community cloud infrastructure is shared by two or more organizations with common privacy, security, and regulatory considerations. It may be managed by the organizations or a third party and may be hosted internally or externally.

The most complex is the hybrid cloud, composed of two or more clouds (private, community, or public) that remain unique entities but are bound together by standardized or proprietary technology that enables data and application portability. Branscombe simplifies the definition down to its essence – the cloud

isn't someone else's computer, but a data centre, full of identical hardware, where every deployment, update, investigation, and management process is automated (Branscombe 2016).

While IT personnel, senior management, and politicians may be eager to jump into the cloud, citing efficiency and financial benefits, there are challenges that must be addressed. Questions include issues of data security and protection of personal information, whether and how regulations and laws will be observed when data flows across jurisdictions, what guarantees are provided for continuity of service, and how data breaches will be handled. These speak to the trustworthiness of cloud service providers. Issues of trust are difficult to isolate and are often bound up with more easily identified issues of privacy, security, and jurisdiction.

When we think in terms of records, we bring another perspective to the challenges presented by cloud computing. We keep records as evidence of activity, and as memory of action, and we use them to prove accountability – in order to do this we must trust them. In archival terms, we trust records according to the degree to which we can demonstrate their authenticity, reliability, and accuracy. In legal terms, at least in common law countries, the trustworthiness of records is tested through the rules of admissibility of documentary evidence. In both cases, being able to demonstrate a chain of responsible custody is key.

Recordkeeping challenges are slightly different from data challenges – records are records largely because of their context and the expression of the relationships to their creators, the activities they participate in or document, and other records generated in the same activity – what we know in archival science as the archival bond (Duranti 1997; Duranti & Thibodeau 2006). This archival bond does not, generally, define data and information. So the questions we ask as records professionals have a different focus:

- Can the context of the records be protected?
- Can provenance be demonstrated?
- Can retention & disposition be carried out?
- Can access and usability be assured over time?

- Can intellectual rights be respected?

In order to begin to address these questions, we need to define what we mean by trust. InterPARES Trust, for the purposes of its research, has defined trust as the confidence of one party in another, based on an alignment of value systems with respect to specific actions or benefits, and involving a relationship of voluntary vulnerability, dependence, and reliance, based on risk assessment. This is a subjective value, existing on a continuum from absolute trust, to complete scepticism, or distrust.

With respect to records, we can outline a trust framework (see Figure 1). Records can be judged trustworthy if they can be shown to be authentic, reliable, and accurate. Authenticity is assessed on the basis of evidence that the record's identity can be determined and its integrity demonstrated. Authenticity must be continuously protected over time through monitoring and control. Reliability is the truthfulness of the record content, and is determined by the completeness of the record and the control exercised over its creation, and accuracy is part of reliability – the precision of the data that is the record content. Trustworthiness of records also depends on the trustworthiness of the records system (MacNeil 2001; Duranti & Thibodeau 2006; InterPARES Trust 2017a).

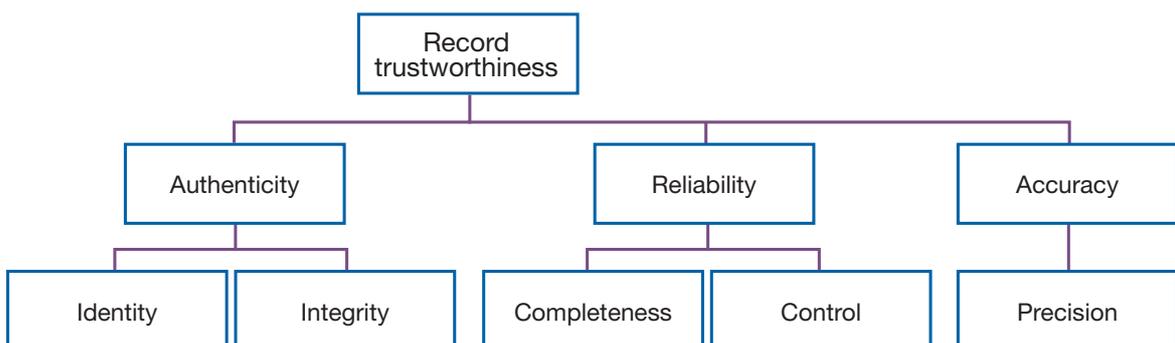


Figure 1. Trust Framework

And so this brings us back to the cloud – do cloud services meet our standards for trustworthy records systems? Whether you are managing records in paper-based in-house systems or managing digital records or other organizational

assets, a trustworthy system is a management framework consisting of the relevant laws and policies that are established for accountability, standards and practices, systems and technologies, the people, the organizational structure, and awareness and education and training.

The considerations for adopting cloud services, then, are not simply the responsibility of the IT department, but should be undertaken in a holistic way to include managerial concerns, including records management, financial issues, legal liabilities, security matters, and finally, technical solutions that meet the needs and resources of the organization.

Guidelines to assist decisions to outsource records to the cloud

The trust relationship most frequently studied in InterPARES Trust is that between consumers of cloud services – individually or as communities of users – and cloud service providers (CSPs) in the consumption of cloud services, and the vehicle through which trust is dictated is the service contract, service-level agreement, or terms of service. The relationship between CSPs and users often reflects an imbalance of power: the user is dependent on the services of the provider with little chance of negotiating the terms of the relationship. While a government or large organization has the capacity to negotiate the terms of their contract with these providers, most of us have no choice but to accept the boilerplate contracts written by the service provider. Boilerplate provisions are typically drafted by the dominant contractual party to suit its purposes and are non-negotiable.

In order for the contract to be an instrument of trust, its terms must be transparent, understandable, and comprehensive in terms of our needs. This demands that we articulate our needs and requirements at the outset. Unfortunately, the concerns of records managers – things like protecting the authenticity of records, implementing retention and disposition schedules, or the availability of metadata to prove provenance and chain of custody – are rarely at the top of decision makers' minds when outsourcing IT functions to the cloud.

The terms of cloud service contracts and the status of the relationship between CSPs and customers have been discussed in the information technology, legal, and archival literature (c.f. Bradshaw, Millard, & Walden 2011; Office of the Information & Privacy Commissioner for British Columbia 2012; Badger et al. 2012; The National Archives, UK 2014). Common themes of interest

include issues around storage and jurisdiction, data segregation, security, and accessibility. The records management literature is also concerned with issues specific to records: retention and disposition, protection of evidential capacity, and long-term viability (c.f. Barnes 2010; Baset 2012).

Researchers from the North American team of InterPARES Trust undertook two studies of several major service providers' boilerplate contracts, looking at the terms specifically from the point of view of records managers and archivists (McLelland & Hurley 2014; Bushey, Demoulin, & McLelland 2015; Bushey et al. 2015). As a result of these two studies, InterPARES Trust has issued a flexible and practical tool – a checklist of issues and terms that cover records and recordkeeping issues that should be considered when reviewing or negotiating a cloud service contract. The target audience of the checklist is records managers, archivists, chief information officers (CIOs), and others responsible for assessing cloud services. By identifying the common challenges and issues for recordkeeping in any context, the checklist can be used as a metric against which to measure existing contracts, or a guideline for negotiating new contracts. Its goal is to promote understanding of boilerplate cloud service contracts, and provide a tool for assessing the degree to which a given cloud service meets organizational recordkeeping and archival needs and requirements (Bushey et al. 2016).

The teams confirmed that several types of legal documents exist to govern the relationship between CSP and client: terms of service, service-level agreements, privacy policies, and acceptable use policies. They found little, if any, standardization of terms among and between these instruments, which are often “incomprehensible to the majority of users” (Bradshaw, Millard, & Walden 2011, p. 32). Most contain wide-ranging exclusions of liability that favour the provider, as well as a clause saying that terms may change, often without the need to provide notice to the client.

The researchers identified recordkeeping requirements through different instruments, including legislation, regulations, policies, standards, and guidelines, taking into account the variation in different jurisdictions, industry sectors, and professions. However, the fact that records serve as documentary evidence of legal transactions, support critical operations of an organization, and may contain personal, sensitive, or confidential information, means that, regardless of jurisdiction, sector, or profession, there are common risks, concerns, and requirements.

A review of legal literature revealed that, at the time of review, relatively few cases had been decided that deal specifically with cloud computing contracts. Of those that had, numerous well-established legal tenets apply and will likely be influential in the future. Traditional contract law has “a solid connection to cloud contract law”. The issue of inequality of bargaining powers between CSPs and clients may arise through the traditional legal issue of unconscionability. The importance of privacy and security in relation to cloud computing, given the ease of sharing information across jurisdictional boundaries, cannot be understated. Furthermore, jurisdictions differ in their guiding laws, as do different industry sectors, and their case law precedents can change quickly. Finally, conflict of laws, which determines the jurisdiction of legal action, is another important issue to consider. Where boilerplate contracts are in force, it is the CSP who dictates the choice, with potentially serious implications for the client (Bushey, Demoulin, & McLelland 2015).

Issues of import to records managers and archivists were identified through a review of recordkeeping standards and the tenets of archival science. The researchers reviewed ISO 15489 (2001) – Information and Documentation-Records Management (ISO 2001), and ISO 14721 (2012) – Space Data and Information Transfer Systems – Open Archival Information System Reference Model (OAIS) (ISO 2012), as well as ARMA (Association of Records Managers and Administrators) International’s Generally Accepted Recordkeeping Principles (ARMA International 2014).

Regardless of jurisdiction, sector, or profession, the researchers identified common risks associated with cloud computing: unauthorized access to information and records, breach of privacy, loss of access to and management of records (which impacts authenticity and integrity), lack of transparency of service and account management, server location, data destruction, and data recovery. They then identified seven key topics of interest for the customer considering cloud services arising from law and recordkeeping standards: data ownership; availability, retrieval and use; data storage and preservation; data retention and disposition; security, confidentiality and privacy, data location and cross-border data flow; and end of service/contract termination.

Through a comparative analysis of available boilerplate contracts mapped against recordkeeping and archival requirements for management and preservation of records that can be proven to be reliable and presumed authentic, the researchers

then developed the checklist to aid in a risk assessment for adopting cloud services. The checklist consists of questions grouped into eight sections:

- Terms of Agreement
- Data Ownership and Use
- Availability, Retrieval, and Use
- Data Storage and Preservation
- Data Retention and Disposition
- Security, Confidentiality, and Privacy
- Data Localization and Cross-border Data Flows
- End of Service; Contract Termination

The checklist, available in English, French, Spanish, and Dutch, has been integrated with other projects in InterPARES Trust, including a comprehensive tool to establish a Standard of Practice for archives, and checklists for ensuring trust in storage in IaaS and retention and disposition in a cloud environment (these and other products and reports are available at www.interparestrust.org/trust/research_dissemination). It was released for comment in the fall of 2015 and tested in several organizations, including the International Federation of Red Cross and Red Crescent Societies, which evaluated a SaaS recruiting tool for use in their human resources department.

The cloud is ubiquitous – at some point each of us will be faced with records in the cloud, whether in our personal or professional life. Industry advice may be basic: “Simply adopting the cloud is not enough; you should increase your cloud maturity level... Go with a provider you trust” (Mahowald et al. 2016). But how to increase your cloud maturity level, and how to evaluate the trustworthiness of a cloud service provider, may not be easy, particularly if your concern is for the ongoing authenticity and reliability of records over time. InterPARES Trust is one resource that can help.

REFERENCES

- ARMA International. "ARMA Generally Accepted Recordkeeping Principles". ARMA International, 2014. <<http://www.arma.org/r2/generally-accepted-br-recordkeeping-principles>>.
- BADGER, Lee; GRANCE, Timothy; PATT-CORNER, Robert; VOAS, Jeff. "Cloud Computing Synopsis and Recommendations." NIST *Special Publication 800-146*. Gaithersburg, MD: National Institute of Standards and Technology, 2012.
- BARNES, F. "Putting a Lock on Cloud-Based Information". *Information Management Journal* (2010) <<http://content.ama.org/IMM/JulyAug10/IMM0710puttingalockoncloud-basedinformation.aspx>>.
- BASET, Salman. "Cloud SLAs: Present and Future". *ACM SIGOPS Operating Systems Review* (2012) <<http://www.cs.columbia.edu/~salman/publications/baset-sla-osr.pdf>>.
- BEAGRIE, Neil; CHARLESWORTH, Andrew; MILLER, Paul. "Guidance on Cloud Storage and Digital Preservation." United Kingdom: The National Archives (2014). <<http://www.nationalarchives.gov.uk/documents/archives/cloud-storage-guidance.pdf>>.
- BRADSHAW, S.; MILLARD, C.; WALDEN, I. "Contracts for Clouds: Comparison and Analysis of the Terms and Conditions of Cloud Computing Services." *International Journal of Law and Information Technology*. No. 19 (3) (2011). pp. 187–223. <https://doi.org/10.1093/ijlit/ear005>.
- BRANSCOMBE, Mary. "Stop Saying the Cloud Is Just Someone Else's Computer - Because It's Not." ZDNet (2012). <<http://www.zdnet.com/article/stop-saying-the-cloud-is-just-someone-elses-computer-because-its-not/>> [DOA: 12, July, 2016].
- BUSHEY, Jessica; DEMOULIN, Marie; HOW, Elissa; MCLELLAND, Robert. "Trust in Cloud Service Provider Contracts, Final Report." InterPARES Trust (2015).
- BUSHEY, Jessica; DEMOULIN, Marie; HOW, Elissa; MCLELLAND, Robert. "Checklist for Cloud Service Contracts". NA14. InterPARES Trust (2016). <https://interparestrust.org/trust/research_dissemination>.
- BUSHEY, Jessica; DEMOULIN, Marie; MCLELLAND, Robert. "Cloud Service Contracts: An Issue of Trust". *The Canadian Journal of Information and Library Science*. No. 39 (2) (2015). pp. 137–38.
- DURANTI, Luciana. "The Archival Bond". *Archives and Museum Informatics*. No. 11 (3–4) (1997). pp. 213–18.
- DURANTI, Luciana. "Concepts, Principles, and Methods for the Management of Electronic Records". *The Information Society*. No. 17 (2002), pp. 271–79.
- DURANTI, Luciana. "The Long-Term Preservation of Accurate and Authentic Digital Data: The InterPARES Project". *Data Science Journal*. No. 4 (October, 2005). pp. 106–18.
- DURANTI, Luciana; EASTWOOD, Terry; MACNEIL, Heather. *Preservation of the Integrity of Electronic Records*. Springer Science & Business Media: 2003.
- DURANTI, Luciana; PRESTON, Randy (eds.). "Requirements for Assessing and Maintaining the Authenticity of Electronic Records". In *The Long-Term Preservation of Authentic Electronic Records: Findings of the InterPARES Project*. San Miniato: Archilab, 2005a. <www.interpares.org>.
- DURANTI, Luciana; PRESTON, Randy (eds.). *The Long-Term Preservation of Authentic Electronic Records: Findings of the InterPARES Project*. San Miniato: Archilab, 2005b.
- DURANTI, Luciana; PRESTON, Randy. *Research on Permanent Authentic Records in Electronic Systems (InterPARES) 2: Experiential. Interactive and Dynamic Records*. Padua: Associazione Nazionale Archivistica Italiana, 2008.

- DURANTI, Luciana; THIBODEAU, Kenneth. "The Concept of Record in Interactive, Experiential and Dynamic Environments: The View of InterPARES". *Archival Science*. No. 6 (1) (2006). pp. 13–68.
- InterPARES. "www.interpares.org". InterPARES Project. 2017. <www.interpares.org>.
- InterPARES Trust. "InterPARES Trust Terminology Database". InterPARES Trust (2017a). <<http://arstweb.clayton.edu/interlex/>>.
- InterPARES Trust. "Www.interparestrust.org". InterPARES Trust (2017b). <www.interparestrust.org>.
- ISO 2001. "ISO-15489 (2001) Information and Documentation-Records Management". ISO-15489 (2001). <http://www.iso.org/iso/iso_catalogue.htm>.
- ISO 2012. "ISO-14721:2012 - Space Data and Information Transfer Systems – Open Archival Information System (OAIS) – Reference Model". ISO-14721 (2012). <http://www.iso.org/iso/catalogue_detail.htm?csnumber=57284>.
- MACNEIL, Heather. "Trusting Records in a Postmodern World". *Archivaria*. No. 51 (Spring) (2001). pp. 36–47.
- MAHOWALD, Robert; PERRY, Randy; CASEMORE, Brad; MCGRATH, Ben. "Cloud Going Mainstream: All Are Trying, Some Are Benefiting; Few Are Maximizing Value". *White Paper*. Ben IDC (2016). <www.idc.com>.
- MCLELLAND, Robert; HURLEY, Grant. "Contract Terms with Cloud Service Providers, Final Report". NA10. InterPARES Trust (2014). <<https://interparestrust.org>>.
- MELL, Peter; GRANCE, Timothy. "The NIST Definition of Cloud Computing." *NIST Special Publication 800-145*. Gaithersburg, MD: National Institute of Standards and Technology, 2011.
- Office of the Information & Privacy Commissioner for British Columbia. "Cloud Computing Guidelines for Public Bodies". 2012. <[http://www.oipc.bc.ca/pdfs/public/CloudComputingGuidelines\(February2012\).pdf](http://www.oipc.bc.ca/pdfs/public/CloudComputingGuidelines(February2012).pdf)>.

ABSTRACT

In 2017, most businesses, governments, and individuals are 'in the cloud' for various aspects of their professional, business, or personal activities. From the original cloud service models of SaaS (software as a service), IaaS (infrastructure as a service), and PaaS (platform as a service), there now exist any number of 'as-a-service' offerings to tempt the user. The cloud has been promoted as a cost-saving opportunity for businesses and governments to streamline workflows and centralize IT services through outsourcing to giants like Amazon Glacier, Microsoft Azure, Google, AWS, and others. Cloud service providers promise greater security and lower costs than stand-alone IT shops through on-demand and measured service, broad network access, resource pooling, rapid elasticity and scalability. But have these promises been met? The latest research indicates that the promised cost-savings are illusive, and risks to security, privacy, and availability abound. Particularly for those responsible for records management and information governance, there are very real and urgent requirements for the management of records and data that were clearly understood in the analogue and even the pre-networked digital era, but which

may be ignored or not met in the cloud. Records managers and archivists, concerned with authenticity, reliability, and control of records and data across time and technological change, may find that cloud services do not meet these core requirements. This paper outlines the risks and challenges of working in the cloud, and presents results of several research studies conducted as part of InterPARES Trust that offer guidance for those evaluating current cloud services or considering adopting new services for their organizations.

RESUMÉ

En 2017, la plupart des entreprises, administrations et particuliers ont localisé divers aspects de leurs activités professionnelles, commerciales ou personnelles « en nuage ». Depuis les premiers modèles de services en nuage comme les logiciels, infrastructures et plateformes à la demande (respectivement, SaaS, software as a service, IaaS, infrastructure as a service et PaaS, platform as a service), un grand nombre d'offres « à la demande » toutes plus

prometteuses les unes que les autres sont maintenant proposées aux utilisateurs. L'informatique en nuage a été présentée comme une solution économique permettant de rationaliser les flux de travail et de centraliser les services informatiques des entreprises et des administrations en confiant certaines tâches à des géants comme Amazon Glacier, Microsoft Azure, Google ou AWS. Les fournisseurs de services en nuage annoncent une sécurité renforcée et des coûts inférieurs par rapport à des plateformes informatiques autonomes grâce à des services mesurés à la demande, un accès étendu au réseau, la mise en commun des ressources, une excellente réactivité avec beaucoup d'élasticité et une grande extensibilité. Mais ces promesses ont-elles été tenues ? Les études les plus récentes révèlent que les économies annoncées sont illusoire, tandis que les menaces pour la sécurité, la confidentialité et l'accessibilité sont légion. Des contraintes bien réelles et urgentes s'imposent pour la gestion d'archives et de données, notamment pour les responsables de la gestion des archives et de la gouvernance de l'information. À l'époque des systèmes analogiques et même du numérique (avant le développement des réseaux), ces exigences étaient clairement appréhendées, mais elles risquent d'être ignorées ou de ne pas être respectées avec des échanges en nuage. La tâche des gestionnaires d'archives et des archivistes consiste à s'assurer de l'authenticité, de la fiabilité et de la maîtrise des documents et des données au fil du temps, indépendamment des évolutions technologiques. Or, ces professionnels peuvent estimer que les services en nuage

ne jouent pas le rôle fondamental qui leur est dévolu. Le présent article aborde les risques et les écueils du travail en nuage, avant de présenter les résultats de plusieurs études menées dans le cadre du programme de l'InterPARES Trust et offrant des orientations pour évaluer les services en nuage proposés actuellement ou pour envisager l'adoption de nouveaux services. Or, ces professionnels peuvent estimer que les services en nuage ne jouent pas le rôle fondamental qui leur est dévolu. Le présent article aborde les risques et les écueils du travail en nuage, avant de présenter les résultats de plusieurs études menées dans le cadre du programme de l'InterPARES Trust et offrant des orientations pour évaluer les services en nuage proposés actuellement ou pour envisager l'adoption de nouveaux services.

RESUM

El 2017 pràcticament la totalitat de les empreses, els governs i els individus era «al núvol» per diversos aspectes de les seves activitats professionals, econòmiques o personals. Des dels models de serveis en núvol originals, com SaaS (programari com a servei), IaaS (infraestructura com a servei) i PaaS (plataforma com a servei), ara hi ha una sèrie d'ofertes «com a servei» per temptar els usuaris. El núvol s'ha promogut com una oportunitat d'estalvi per a les empreses i els governs que agilitzen els fluxos de treball i centralitzen els serveis de TI mitjançant l'externalització a gegants com Amazon Glacier, Microsoft Azure, Google i AWS, entre altres. Els proveïdors de serveis en núvol prometen més seguretat i uns costos més baixos que les botigues d'informàtica independents gràcies a un servei mesurat i segons demanda, un ampli accés a xarxes, un agrupament de recursos i una elasticitat i una escalabilitat ràpides. Però s'han complert aquestes promeses? En les recerques més recents

s'assenyala que els estalvis promesos són il·lusoris i que els riscos per a la seguretat, la privadesa i la disponibilitat són abundants. Especialment per als responsables de la gestió de documents i el control de la informació, hi ha necessitats molt reals i urgents pel que fa a la gestió de documents i dades que es comprenien molt bé en l'era analògica i fins i tot en l'era digital anterior a les xarxes, però que es passen per alt o no se satisfan al núvol. Els gestors de documents i els arxivers, que prioritzen l'autenticitat, la fiabilitat i el control dels documents i les dades al llarg del temps i amb l'evolució tecnològica, poden opinar que els serveis en núvol no responen a aquestes necessitats essencials. En aquest article es descriuen els riscos i els reptes de treballar en núvol i es presenten els resultats de diversos estudis de recerca duts a terme com a part del projecte InterPARES Trust, que ofereixen orientació per a les persones que avaluen els serveis en núvol actuals o es plantegen adoptar els serveis nous als seus organismes.

RESUMEN

En 2017 prácticamente la totalidad de las empresas, los gobiernos y los individuos estaban «en la nube» por diversos aspectos de sus actividades profesionales, económicas o personales. Desde los modelos de servicios en la nube originales, como SaaS (software como servicio), IaaS (infraestructura como servicio) y PaaS (plataforma como servicio), ahora hay toda una serie de ofertas «como servicio» para tentar a los usuarios. La nube se ha promovido como una oportunidad de ahorro para las empresas y los gobiernos que agilizan los flujos de trabajo y centralizan los servicios de TI mediante la externalización a gigantes como Amazon Glacier, Microsoft Azure, Google y AWS, entre otros. Los proveedores de servicios en la nube prometen más seguridad y unos costes más bajos que las tiendas de informática independientes gracias a un servicio proporcionado y a la carta, un amplio acceso a redes, un agrupamiento de recursos y una elasticidad y una escalabilidad rápidas. Pero ¿se han cumplido estas promesas? En las investigaciones más recientes se señala que los ahorros prometidos son ilusorios y que los riesgos para la seguridad, la

privacidad y la disponibilidad son abundantes. Especialmente para los responsables de la gestión de documentos y del control de la información, existen necesidades muy reales y urgentes en cuanto a la gestión de documentos y datos que se comprendían muy bien en la era analógica e incluso en la era digital anterior a las redes, pero que se pasan por alto o no se satisfacen en la nube. Los gestores de documentos y los archiveros, que priorizan la autenticidad, la fiabilidad y el control de los documentos y los datos a lo largo del tiempo y con la evolución tecnológica, pueden opinar que los servicios en la nube no responden a estas necesidades esenciales. En este artículo se describen los riesgos y los retos de trabajar en la nube y se presentan los resultados de varios estudios de investigación llevados a cabo como parte del proyecto InterPARES Trust, que ofrecen orientación para las personas que evalúan los actuales servicios en la nube o se plantean adoptar servicios nuevos en sus organismos.