InterPARES Trust

Preservation of Records Entrusted to the Cloud

Perspectives of the InterPARES Trust Project

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InterPARES Projects

- InterPARES Trust – continuation of previous research
  - **InterPARES 1:** **Inte**rnational **R**esearch on **P**ermanent **A**uthentic **R**ecords in **E**lectronic **S**ystems (1999-2001)
  - **InterPARES 2:** Experiential, Interactive, Dynamic Records (2002-2006)
  - **InterPARES 3:** **T**heoretical **E**laborations into **A**rchival **M**anagement (TEAM): Implementing the theory of preservation of authentic records in digital systems in small and medium-sized archival organizations (2007-2012)
  - InterPARES 1, 2, and 3: http://interpares.org

InterPARES Trust

- InterPARES Trust: Trust and Digital Records in an Increasingly Networked Society (iTRUST)
  - 2013-2019
  - http://www.interparestrust.org
- Project director
  - Dr. Luciana Duranti, School of Library, Archival and Information Sciences (SLAIS), University of British Columbia (UBC), Vancouver, Canada
- Funding
  - Social Sciences and Humanities Research Council of Canada Partnership Grant

Project organization

- Partnership includes
  - more than 70 institutional partners
    - universities
    - national and regional archives and libraries
    - government agencies
    - intergovernmental and transnational agencies
    - businesses
  - 499 researchers


Management


Team North America


Team Europe


Team Latin America


Team Asia


Team Australasia


Team Africa


Transnational Team


Supporting Partners

Goals

- to generate the **theoretical and methodological frameworks** that will support the development of integrated and consistent local, national and international networks of **policies, procedures, regulations, standards and legislation** concerning digital records entrusted to the Internet
- **to ensure public trust** grounded on evidence of good governance
- **to ensure a strong digital economy**
- **to ensure a persistent digital memory**

Objectives

1. To discover **how current policies and practices** regarding the handling of digital records by institutions and professionals **affect the public's trust** in them

2. To **anticipate problems in maintaining any trust in digital records** under the control of entities suffering a waning level of confidence from the public

Objectives …

3. To establish **what significance national/cultural contexts have** with regard to the **level of trust digital records on the Internet enjoy**

4. To **articulate model policies, procedures, and practices** for creating, managing, accessing, and/or storing records on the Internet
   - especially in social media and cloud computing environments and through mobile technologies

Objectives …

5. To **test articulated model policies, procedures, and practices** in a variety of contexts so that, from them, international standards, guidelines and best practices can be developed

6. To **formulate proposals and models** for law reform, **and functional requirements** for the systems in which Internet providers store and manage digital records

Organization of research

- Domains
  - Infrastructure (12)
  - Security (6)
  - Control (33)
  - Access (13)
  - Legal (5)
- Cross-Domains
  - Terminology (1)
  - Resources (4)
  - Policy (8)
  - Social/Societal Issues (11)
  - Education (3)

- Each of the 7 teams has a domain chair for every domain
- Cross-Domain chairs work at the project level
- Total of 96 studies

Infrastructure domain

- Ensuring Trust in Storage in Infrastructure-as-a-Service (IaaS) (EU08)
- Managing records in networked environments (AF02)
- Trusted Certification Based on Long-Term Preservation of Digital Archival Resources (AS03)
- Dark Repositories as a Service (AA03)
- Contract Terms for Cloud-Based Record Keeping Services (NA10)

Security domain

- The Use of Cloud Services for Records Management in International Organizations (TR01)
- Standard of Practice for Trust in Protection of Authoritative Records in Government Archives (NA03)
- Security Classification of Records in the Cloud in International Organizations (TR03)

Control domain

- Comparative Analysis of Implemented Governmental e-Services (EU09)
- Ensuring authenticity and reliability of electronic records to support the audit process (AF06)
- Retention and Disposition in a Cloud Environment (NA06)
- Preserving and managing records' life-cycle in a multi-provenance government digital environment (LA01)
- Analysis of the Interoperability Possibilities of Implemented Governmental e-Services (EU15)

Access domain

- A Case Example of Public Trust in Online Records: The UK *care.data* Programme (EU17)
- Ensuring Trustworthiness of the Agent of Public Trust in China (AS02)
- Patents, Petitions and Trust – From Traditional to Online Environments (NA13)

Legal domain

- Legal Issues in Recordkeeping in the Cloud (NA25)
- The impact of Italian legal framework for cloud computing on electronic recordkeeping and digital preservation systems (EU35)
- Developing Model Cloud Computing Contracts (NA14)

Cross-Domain studies

- Core Terminology for InterPARES Trust (Terminology)
- Economic Models for Cloud Storage - A Critical Review of the Literature (Resources)
- Information Governance Maturity in EU Public Administrations (Policy)
- Role of Cyber Tools and Social Media in the Development of the Ukraine Crisis (Social/Societal Issues)
- InterPARES Trust Curriculum Mapping of Archival Competencies (Education)

PaaST study

- **Preservation as a Service for Trust (PaaST)** (NA12, Control domain)
  - results of all studies are input for this study
  - work with Object Management Group (OMG)
  - possible future ISO standard

Research questions

- Can the data be trusted?
- Can the records from which the data are derived be trusted or even traceable?
- Are digital records complete? Are they authentic?
- How were they generated and by whom (human, computer, program, protocol)?
- How are digital records stored and under what jurisdiction?
- Who has access to digital records? How secure are they?

TRUSTER Preservation Model (EU31)

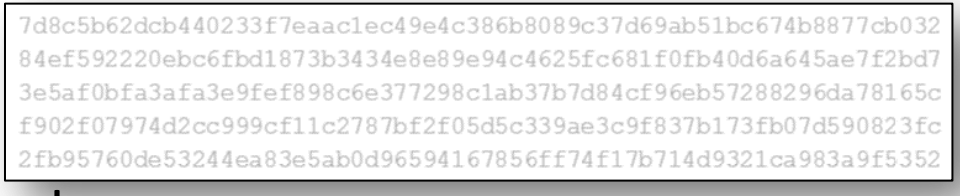
- **Model for Preservation of Trustworthiness of the Digitally Signed, Timestamped and/or Sealed Digital Records**
- Involved partners
  - Faculty of Humanities and Social Sciences, Zagreb, **Croatia**
    - researchers, GRAs and PhD students
  - Financial Agency (FINA), Zagreb, **Croatia**
  - Teched Consulting Services Ltd., Zagreb, **Croatia**
  - Enigio Time AB, Stockholm, **Sweden**
  - Natasha Kramtsovsky, Moscow, **Russia**
  - Victoria Lemieux, UBC, Vancouver, **Canada**

TRUSTER Preservation Model …

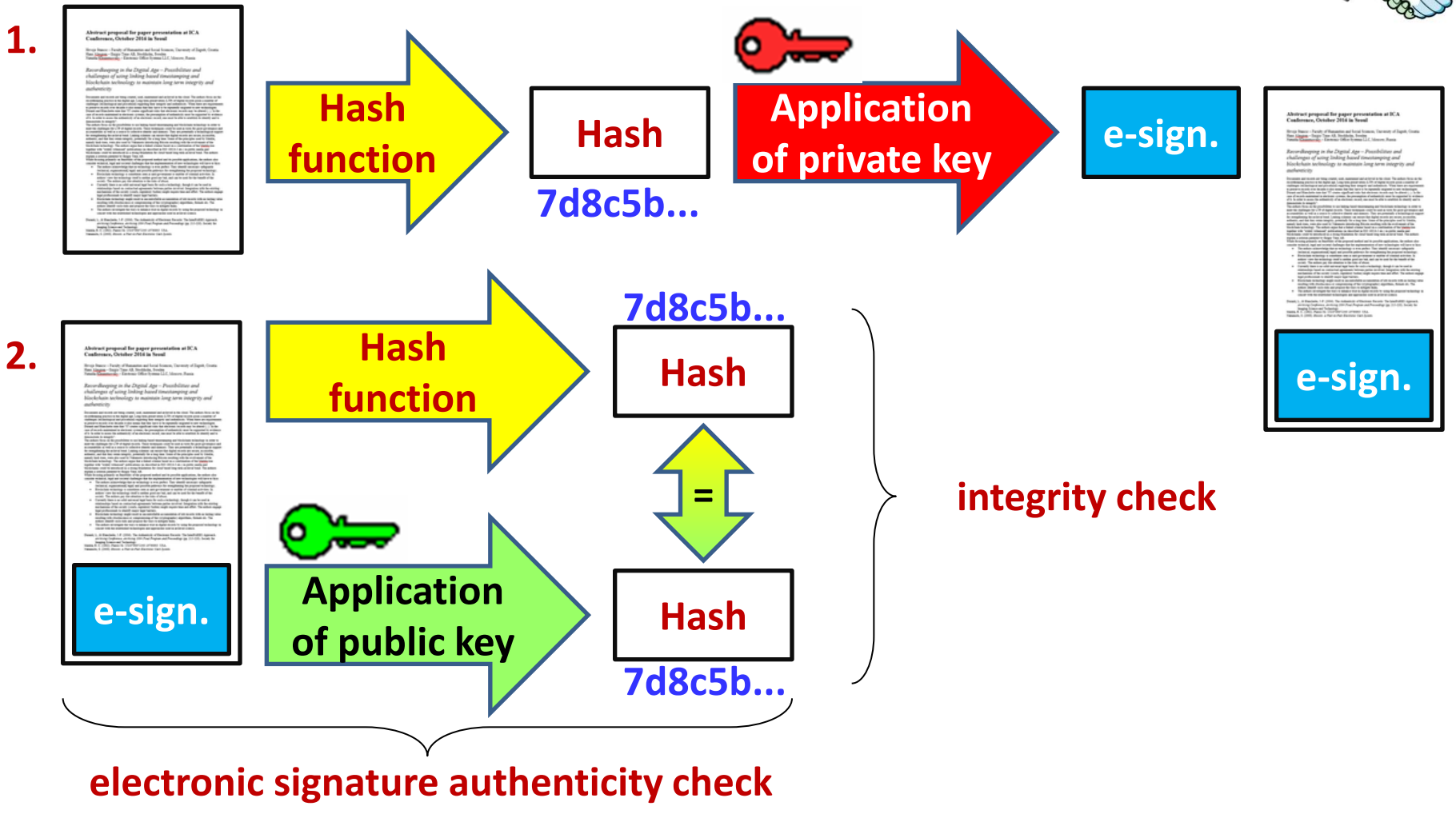
- Long term records management vs. long term archiving
  - records are expected to live over decades in a business context as active records used by transactional systems vs. digital archive
- How to preserve the trustworthiness of the digital records with digital signatures, certificates, timestamps or seals added to them?
  1. Preserve the digital signatures
  2. Eliminate the signatures
  3. Record the trace of the signatures as metadata
  4. Record the digital signatures' validity information to the blockchain

TRUSTER Preservation Model …

- Hash or message digest
  - one-way function that calculates the unique fix-length string out of any document
  - it is not possible to recreate the original document by knowing its hash
  - (theoretically) extremely difficult and nearly impossible to create "collisions" i.e. meaningful records with the same hash value (produced by a given hash function)
- Hash in combination with electronic signatures can be used to check
  - record's **integrity**
  - **authenticity** of electronic signature

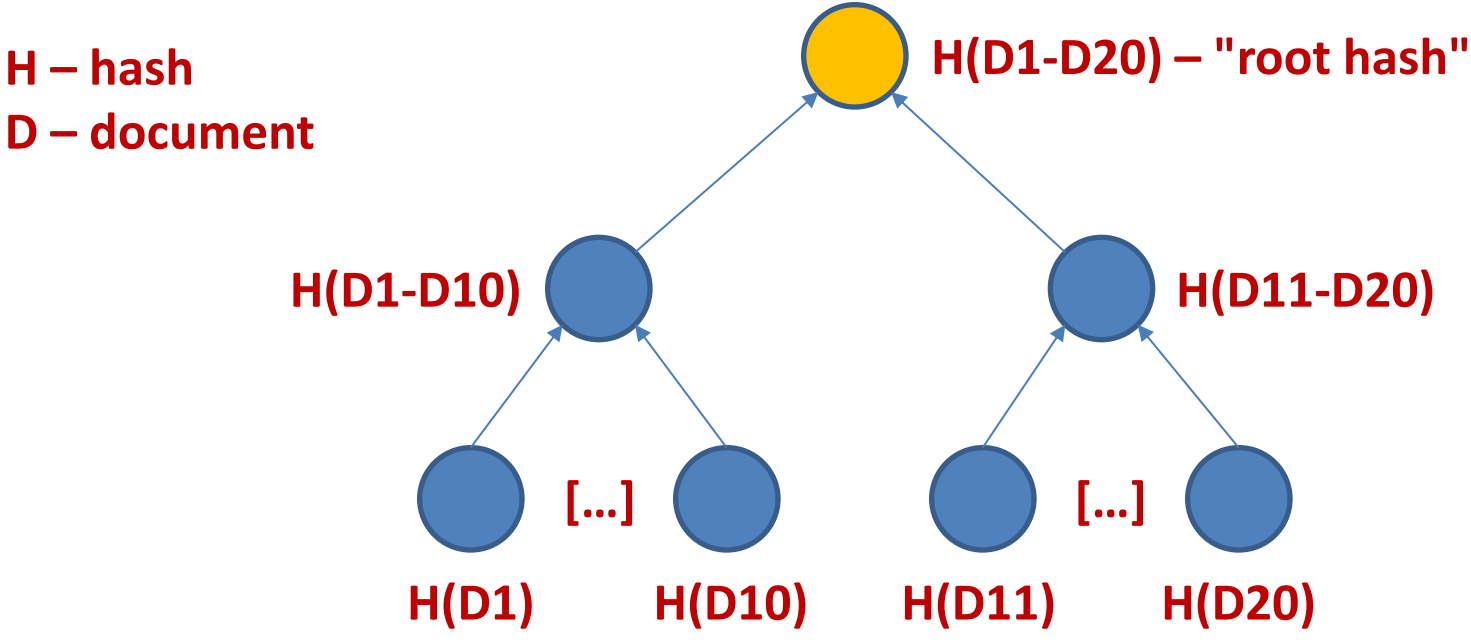


TRUSTER Preservation Model …



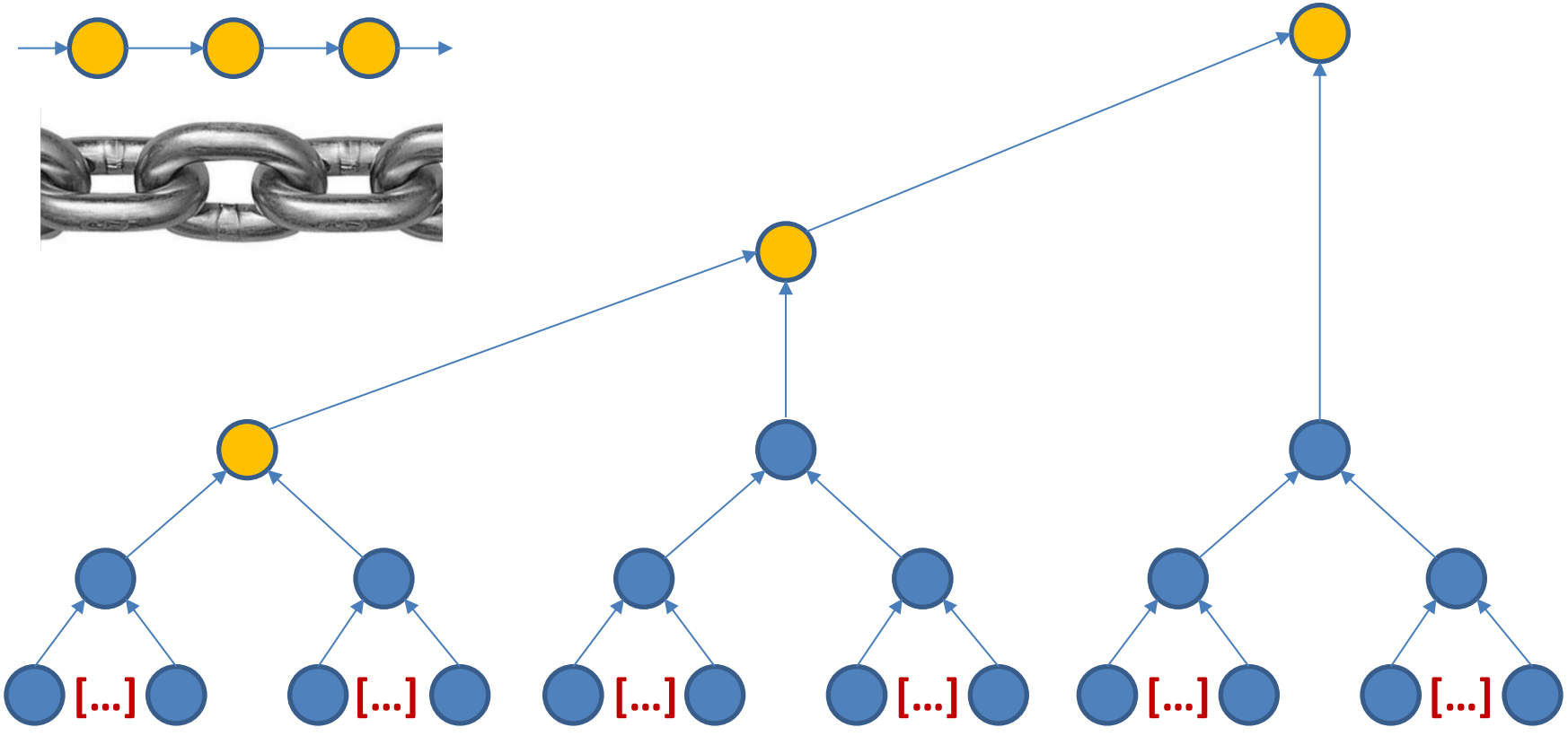
TRUSTER Preservation Model …

- Several (or many) hash values may be hashed thus forming a **Merkle or hash tree**
  Merkle, R. C. (1982). *Patent No. US19790072363 19790905.* USA



TRUSTER Preservation Model …

- Blockchain formation

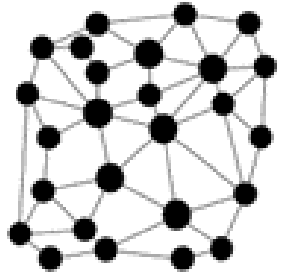


TRUSTER Preservation Model …

- Blockchain
  1. hashes of individual events or files are created and timestamped
  2. the group of hashes are hashed (a block is created), timestamped and made public (over the distributed network) in regular intervals (e.g. every second, every minute, or every 15 minutes)
  3. hash of the previous block is included in the next block
- underlying technology enabling Bitcoin and many other applications

TRUSTER Preservation Model …

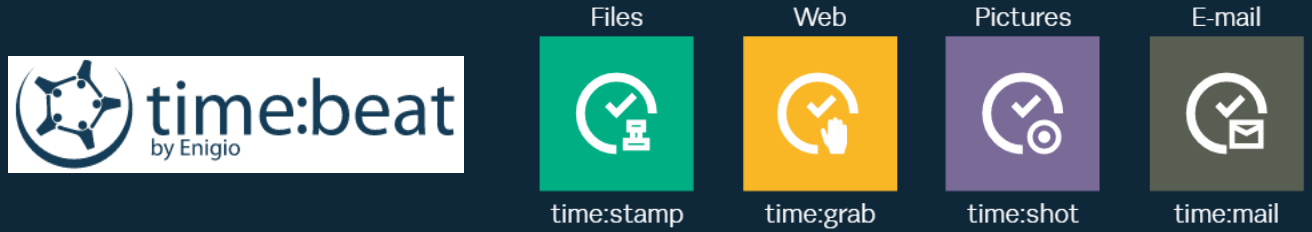
- Blockchain uses the concept of distributed ledger
  - every participant (server) records every event in its ledger
  - consensus is used in order to ensure that all ledgers are the exact copies and to determine truth
  - event (e.g. transaction or document) is valid only if qualified majority agrees upon it
  - no single point of control and attack



Distributed Network

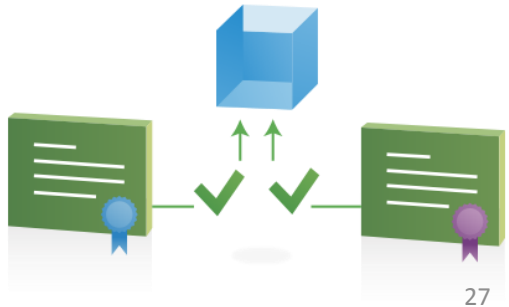
TRUSTER Preservation Model …

- Case studies
- Testing the use of blockchain for long term preservation of integrity of digital records
  - Enigio Time's **time:beat** solution (https://timebeat.com/)



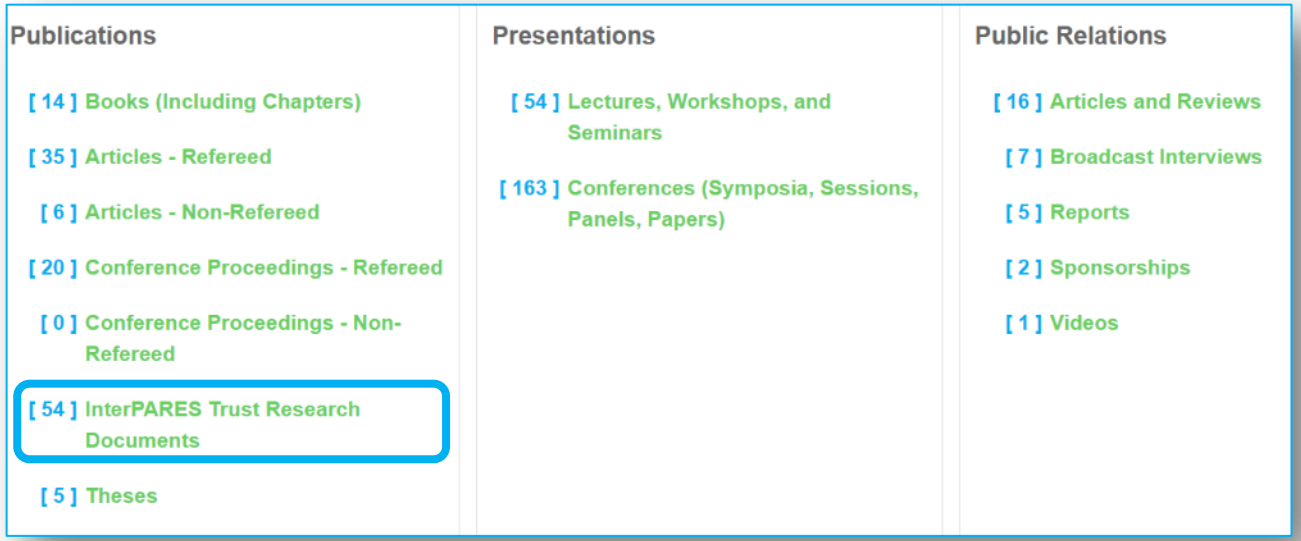
TRUSTER Preservation Model …

- By using the blockchain one can
  - confirm **integrity** of an archived record
  - confirm that the record was **existing or created** at a certain point in time (i.e. not after it was timestamped and registered in the blockchain)
  - confirm **sequence** of records
  - support/enhance **non-repudiation** of a digital record
  - improve the **validation** possibilities of digitally signed records during the long-term preservation



Conclusions

- InterPARES Trust
  - research results – freely online (https://interparestrust.org)



Publications

[14] Books (Including Chapters)

[35] Articles - Refereed

[6] Articles - Non-Refereed

[20] Conference Proceedings - Refereed

[0] Conference Proceedings - Non-Refereed

[54] InterPARES Trust Research Documents

[5] Theses

Presentations

[54] Lectures, Workshops, and Seminars

[163] Conferences (Symposia, Sessions, Panels, Papers)

Public Relations

[16] Articles and Reviews

[7] Broadcast Interviews

[5] Reports

[2] Sponsorships

[1] Videos

  - will influence policies, procedures, regulations, standards and legislation concerning digital records entrusted to the Internet

InterPARES Trust

THANK YOU!

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