

# Report on the 1st Linked Archives International Workshop (LinkedArchives 2021) at TPDL 2021

Carla Teixeira Lopes  
University of Porto/INESC TEC  
Portugal  
*ctl@fe.up.pt*

Cristina Ribeiro  
University of Porto/INESC TEC  
Portugal  
*mcr@fe.up.pt*

Franco Niccolucci  
PIN - Servizi Didattici e Scientifici per l'Università di Firenze scrll  
Italy  
*franco.niccolucci@gmail.com*

Irene Rodrigues  
University of Évora  
Portugal  
*ipr@uevora.pt*

Nuno Freire  
ROSSIO Infrastructure, NOVA FCSH  
Portugal  
*nunofreire@fcsb.unl.pt*

## Abstract

The International Workshop on Archives and Linked Data was a satellite event of the 25th International Conference on Theory and Practice of Digital Libraries (TPDL 2021). TPDL 2021 was an online event with free registration, and the same applied to the workshop. Linked Data and Semantic Web technologies offer new possibilities for digital curation and preservation. The growing interest in archival records and the availability of technologies that can take large volumes of data and process them leads archives into the world of Linked Data. The workshop gathered almost 100 researchers and specialists engaged in initiatives crossing Linked Data technologies, Archives, and Cultural Heritage in general, discussing advances and challenges in this area. Overall, the workshop was a very successful event, which may require in the future more than the two two-hour sessions we dedicated to it this year.

**Date:** 13 September, 2021.

**Website:** <https://linkedarchives.inesctec.pt/>.

## 1 Introduction

Cultural Heritage deals with treasures that are expected to survive generations. Many digital initiatives have explored segments of this global asset, with much more to uncover. They tend to

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be oriented by the organizations that have traditionally curated these valuable objects: libraries, museums, archives. In a networked world, one would expect such boundaries to dilute and access cultural heritage to encompass documents and artifacts from diverse sources. Still, such an endeavor needs to take advantage of the specialized knowledge existing in these areas to capture their assets in a simultaneously rigorous and engaging manner for a vast audience.

The Linked Archives International Workshop started from the perspective of archives, the guardians of immense volumes of information, both historical and current, driven by the need to keep a record of our past processes, achievements, and results. The growing interest in archival records and the availability of technologies that can take large volumes of data and process them is leading archives into the world of linked data. In this vision, the archives' information is joined with data from other cultural heritage institutions and more informal sources. Later, users can explore archives in rich interfaces where the data are available in their context, with explicit metadata.

The idea for the workshop came from the team of an ongoing Portuguese national project, EPISA – Entity and Property Inference for Semantic Archives.<sup>1</sup> The project is preparing models and prototypes for archival information systems based on linked data and ready for the semantic web. As the elements of the project team made contact with organizations and groups with similar interests, they perceived the need to discuss models, technologies, and infrastructures. TPDL 2021 presented the opportunity to do this in a European-centered community.

## 2 Organization

The workshop aimed to gather researchers and specialists engaged in cross Archives and the Semantic Web initiatives and those planning similar initiatives in other cultural heritage organizations. We adopted an interdisciplinary point of view, aiming to stimulate the dialogue between the technically-oriented communities, researchers from the digital humanities, and specialists from cultural heritage institutions.

The organizers invited 12 scholars and specialists to join the members of the Organizing Committee in the Program Committee. Two or three members of the Program Committee reviewed each paper.

Given the specialized nature of the workshop, the number of submissions surprised the organizers: 22, of which only one was rejected for being off-topic. Some of the remaining 21 papers contributed mature work, while others presented preliminary results or relevant case studies. We decided to accept these 21 contributions and assign them short presentations to allow for discussion and question-answering in the spirit of a workshop.

The workshop was composed of 2 sessions of 2 hours, one starting at 11 am UTC and the second at 2 pm UTC, to accommodate participation from different time zones. Sessions were live, run on Microsoft Teams, and recorded.

Two keynote speakers provided rich visions of the area. María Póveda, from the Artificial Intelligence Department of the Universidad Politécnica de Madrid and part of the Ontology Engineering Group research lab, presented a view of the Computer Science aspects in Linked Data

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<sup>1</sup><http://episa.inesctec.pt/>

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for Cultural Heritage. Francesca Tomasi, Professor in Archival Science, Bibliography and Librarianship at the University of Bologna, provided the Information Science counterpart.

The 21 accepted contributions were organized in four blocks according to their main focus: *Linked Data Infrastructures, Perspectives and Viewpoints, Linked Data Modelling, and Projects in Archives*. The authors presented each paper in a flash presentation of 5 minutes. A period of discussion followed each block of presentations. Before the workshop, all the contributions were published on the website as working notes.

After the workshop, we published the slides and videos of the presentations. Besides allowing later access to these materials, it allowed asynchronous access to all who could not attend the live sessions due to time zone constraints.

Most of the contributions are published in the workshop proceedings [Lopes et al., 2021]. Full and short papers are available for mature works and abstracts for preliminary works.

The call for papers announced that extended versions of the best papers would be selected to be published in the ACM Journal on Computing and Cultural Heritage (JOCCH). Four papers were invited to submit extended versions to the journal after the proceedings were completed.

### 3 Participation

As seen in Figure 1, 11 different countries, most of them European, are associated with the accepted submissions. Note that submissions involving more than one country are counted for every involved country. There was one submission involving the United Kingdom and Germany and another involving France and Switzerland.

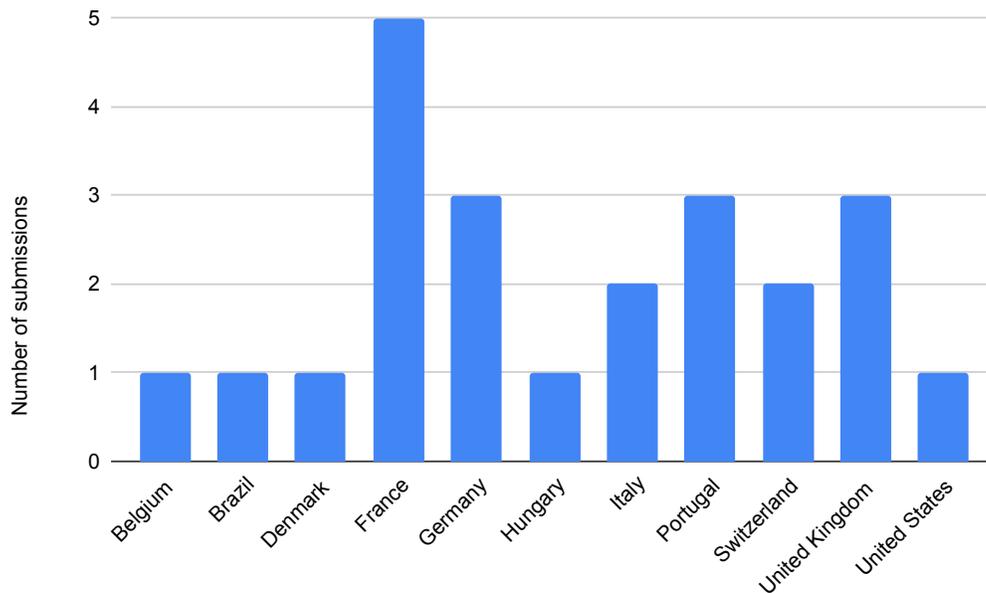


Figure 1: Number of submissions per country.

Table 1: Institutions involved in the submissions.

Name	Country	Type
Advanced Information Collaboratory	(Worldwide)	Research Network
Archives Départementales de la Gironde	France	Archives
Archives Nationales	France	Archives
Archives Portal Europe Foundation	(Europe)	Other
Centre National de la Recherche Scientifique	France	Research Institution
Danish National Archives	Denmark	Archives
Eötvös Loránd University	Hungary	Higher Education
Evolved Binary	United Kingdom	Private
Germanisches National Museum	Germany	Museum
Institute for Computer Science and Control	Hungary	Research Institution
Instituto Politécnico de Coimbra	Portugal	Higher Education
Leibniz Institute for Information Infrastructure	Germany	Infrastructure Institution
Metaindex	France	Other
Sparna	France	Private
State Archives of Belgium	Belgium	Archives
Swiss Federal Archives	Switzerland	Archives
The National Archives	United Kingdom	Archives
The University of North Carolina at Chapel Hill	United States	Higher Education
Universidade Federal de Santa Maria	Brazil	Higher Education
Universidade Federal Fluminense	Brazil	Higher Education
University of Applied Sciences of the Grisons	Switzerland	Higher Education
University of Bologna	Italy	Higher Education
University of Copenhagen	Denmark	Higher Education
University of Évora	Portugal	Higher Education
University of Liverpool	United Kingdom	Higher Education
University of Maryland	United States	Higher Education
University of Minho	Portugal	Higher Education

An analysis of the institutions associated with the accepted submissions shows us that, from the 27 institutions, 12 (44%) were Higher Education Institutions. Six institutions (22%) are archives, with all except one being national archives. The other submissions came from research institutions, networks, private companies, museums, and other organizations. More information about each institution is given in Table 1.

We identified eight research projects, shown in Table 2, associated with the accepted submissions. As can be seen, several countries are doing research related to the use of linked data in archives.

The participation in the workshop was quite substantial: 288 people signed up for the workshop as part of the TPDFL 2021 registration, and 97 attended, with some fluctuations in the two sessions.

Table 2: Projects associated with the submissions.

Acronym/Name	Title/Short Description	Countries
<a href="#">ARTchives</a>	The knowledge graph of art historians’ archives	Italy, United States
<a href="#">COURAGE</a>	Cultural Opposition - Understanding the Cultural Heritage of Dissent in the Former Socialist Countries	Several
<a href="#">DRAS-TIC Fedor</a>	Digital Repository at Scale that Invites Computation	United States
<a href="#">EPISA</a>	Entity and Property Inference for Semantic Archives	Portugal
<a href="#">Link-Lives</a>	Link-Lives – A Research Project	Denmark
<a href="#">OFF-SITE</a>	An off-site ethnography of post-revolution Iran	France
<a href="#">Project Omega</a>	Towards a single pan-archival linked data catalogue	United Kingdom
<a href="#">TRANSRAZ</a>	Nuremberg Address Knowledge Graph	Germany

## 4 Keynotes

Two keynote speakers provided rich visions of the area. María Póveda, from the Universidad Politécnica de Madrid, presented a view of the Computer Science aspects in Linked Data for Cultural Heritage. Francesca Tomasi, from the University of Bologna, provided the Information Science counterpart.

### 4.1 FAIR principles and ontologies for the Semantic Web

María Poveda (Universidad Politécnica de Madrid and Ontology Engineering Group Research Lab) started the day with her presentation, entitled “FAIR principles and ontologies for the Semantic Web: the meeting point” [Poveda, 2021]. María discussed the broad adoption of ontologies nowadays and the lack of guidelines on how they should be published to make them Findable, Accessible, Interoperable, and Reusable (FAIR principles). Given this, María reflected on the technical and social needs of publishing FAIR ontologies on the web and explored how to do it with existing initiatives and systems.

### 4.2 Modeling contexts in linked archival data

Francesca Tomasi (Professor in Archival Science, Bibliography and Librarianship at the University of Bologna) started the second session with a presentation entitled “Modeling contexts in linked archival data (and documents)” [Tomasi, 2021]. Francesca reflected on the influence of new models, such as the Records in Context conceptual model from ICA, on the “information layers” that archives deal with. Contexts such as creator, provenance, and the hierarchical organization of the fonds need to be transposed to the new models. Moreover, new aspects have to be considered, namely agents, with different roles, functions, and involvement in events; and provenance, still crucial for documents, is also essential for assertions about the documents. The talk was supported on a couple of examples, the first from a structured collection, namely the catalog of the Federico Zeri photo archive, and the second a semantic digital edition of the notebook written by the Italian politician and classical philologist Paolo Bufalini, a semi-structured document.

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## 5 Contributions

Contributions were organized into four blocks of presentations according to the nature of their content.

### 5.1 Linked Data Infrastructures

This topic had seven presentations on seven different subjects. Four presentations were on aspects of information extraction in archival metadata. Two proposed infrastructural workflows to maintain linked data archives. And, finally, one proposed a tool to automatically convert the archival metadata into a linked data model, the RIC-O.

Greg Jansen, Mark Conrad, Lyneise William, and Richard Marciano proposed a prototype infrastructure for linked archives in the first presentation [Jansen et al., 2021]. Their approach was studied using the digital assets of the National Park Service Mary McLeod Bethune Council House National Historic Site. The second presentation, a paper by Laurent Millet-Lacombe [Millet-Lacombe, 2021], showed an open-source online application, Metaindex, a NoSQL Database, to explore a set of documents from the French National Archives. The third presentation, a paper by Marilena Daquino, Lucia Giagnolini, and Francesca Tomasi [Daquino et al., 2021], focused on some aspects of the ARTchives project that aims to build a Linked Open Data native catalog of art historians' archives. The fourth presentation, a paper by Luís Filipe da Costa Cunha and José Carlos Ramalho [Cunha and Ramalho, 2021], proposed a Named Entity Recognition tool specially trained in a corpus containing texts from three fonds of the Portuguese National Archives. The fifth presentation, a paper by Thomas Francart, Florence Clavaud, and Pauline Charbonnier [Francart et al., 2021] proposed the RiC-O Converter, a Software to Convert EAC-CPF and EAD 2002 XML files to RDF Datasets Conforming to the Records in Context ontology. The sixth presentation, a paper by Paulo Martins, Leandro Costa, and José Carlos Ramalho [Martins et al., 2021], made an overview of the project Major Minors that uses Arquivo.pt, the Portuguese Web archive, to generate a knowledge graph. The last presentation, a paper by Davide Varagnolo, Cássio Rodrigues, Ana Martins, Dora Melo and Irene Pimenta Rodrigues [Varagnolo et al., 2021] proposed a method for extracting events and entities from the records of the Portuguese National Archives.

### 5.2 Perspectives and Viewpoints

This topic gathered four presentations discussing interesting issues on modeling archives in linked open data models.

The first presentation, a paper by Anna-K Mayer, Mark Fichtner, and Kathrin Fischeidl [Mayer et al., 2021], discussed some aspects of their experience in developing a semantic web information system for the Historic Archives of the German National museum using CIDOC-CRM. The second, a paper by Federico Nanni [Nanni et al., 2021], presented the Archives Portal Europe and discussed new options for information retrieval and their development. In the third presentation, Ashleigh Hawkins [Hawkins, 2021] discussed the advantages of Linked Data models in archives. Finally, the fourth presentation, an article by Natalia Pashkeeva [Pashkeeva, 2021], debated relevant issues related to dealing with access restrictions in Linked Data Archives representations supported in the experience with the Iran National Archives.

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### 5.3 Linked Data Modelling

Six papers addressed the topic of linked data modeling for archival data. Two data models dominated the discussions around this topic: Records in Contexts (RiC) and CIDOC-CRM. Four of the papers addressed the possibilities and challenges of modeling linked archival data with RiC. In ‘ICA Records in Contexts-Ontology (RiC-O): a Semantic Framework for Describing Archival Resources’ Florence Clavaud and Tobias Wildi [Clavaud and Wildi, 2021] presented an overview of the new Records in Contexts Ontology. This ontology is part of the Records in Contexts (RiC) standard, which the International Council on Archives has developed to describe and contextualize archival resources in an understandable way beyond the possibilities of the existing archival standards. The paper explains the rationale for creating a new standard for archival description, and particularly the ontology. The authors present an overview of the RiC Conceptual Model, focus on RiC-O’s design principles and content, and finally present the roadmap and future perspectives of RiC.

Three papers presented cases of application of RiC. Gabriel Poisson presented the application of RiC at the Archives départementales de la Gironde for modeling conservation data. Marcos de Souza and Daniel Flores [de Souza and Flores, 2021] presented a study applying RiC in the description of a record instance of the Federal University of Santa Maria in Brazil, aiming to help institutions, archivists, and IT professionals to foresee how the RiC model will impact the description process and description tools. The third paper, by Jone Garmendia and Adam Retter [Garmendia and Retter, 2021], discussed the application of RiC in developing a Pan-Archival Linked Data Catalogue. The authors evaluated standards, conceptual models, and ontologies as most fit-for-purpose to underpin a new Pan-Archival Catalogue.

The application of CIDOC-CRM to archival data was addressed in two papers. First, Ghazal Faraj and András Micsik presented mapping efforts on several datasets to the CIDOC-CRM ontology to unify access to multiple, heterogeneous sources of cultural heritage data. In the second paper, Francesca Giovannetti and Francesca Tomasi [Giovannetti and Tomasi, 2021] rethought archival finding aids through linked open data. Through the analysis of their case study of the Giuseppe Raimondi Archive, they show how the adoption of linked open data can broaden the role of the digital finding aid to serve as a platform for archival and textual research.

### 5.4 Projects in Archives

Four papers reported the outcomes of ongoing or recently finished projects in archives. Valerie Vrancken [Vrancken, 2021] presented the project ‘TEMAS: a Thesaurus of Early Modern Documentary Forms’, a project at the Belgian State Archives that developed a bilingual thesaurus (Dutch/French) that offers definitions for and maps (quasi-)synonyms of more than 450 early modern documentary forms. TEMAS is currently available in pdf and as a relational database.

Jean-Luc Cochard [Cochard, 2021] presented a project at the Swiss Federal Archives. The paper entitled ‘Linked Data at the Swiss Federal Archives’ presents an infrastructure for publishing data as linked data. The author also reflects how the infrastructure allows the Swiss Federal Archives to acquire in-depth knowledge on the subject and consider integrating linked data into its core applications and the services it offers to the public.

The Danish-based project Linked-Lives was presented by Bárbara A. Revuelta-Eugercios, Olivia Robinson, and Anne Løkke [Revuelta-Eugercios et al., 2021]. The project is carried out

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by the Danish National Archives and the University of Copenhagen in partnership with Copenhagen City Archives. It aims to link individual-level Danish records in census and parish record sources from 1787-1968 to create a multigenerational database for research. The project uses a combination of domain expertise and machine learning techniques. Link-Lives is creating its manually-linked data to train machine learning and explore the impacts of different approaches to linking.

Oleksandra Bruns, Tabea Tietz, Mahsa Vafaie, Danilo Dessí, and Harald Sack [Bruns et al., 2021] presented the outcomes of their research about the requirements for modeling temporal data in archival records. The authors also discuss the challenges presented by the RDF model. Their analysis is based on research projects in which archival records are analyzed and integrated into knowledge graphs for research and exploration.

## 6 Concluding Remarks

The Linked Archives International Workshop was motivated by the need to examine current technologies and data models in the description of archival assets. In doing so, the organizers took a broader look at the use of Linked Data in cultural heritage. They disseminated the call in communities dealing with cultural heritage, semantic web technologies, asking for contributions on ways scholars, cultural heritage institutions, and the general public are addressing the use of linked data. More and more, specialized data from archives and museums, for instance, is hard to separate from the global information infrastructure. In fact, it has a lot to gain from its interconnection.

The discussions in the workshop, despite the limited time, highlighted topics that are familiar to those who are pioneering the use of Linked Data in Cultural Heritage. Cultural Heritage assets are complex, take diverse forms, and have traditionally been managed in rather strict compartments, with different standards and requirements in the applications that govern them. The semantic models, with a common connection to many commonsense concepts — e.g., document, event, person, location —, are an opportunity for integration. For instance, the CIDOC-CRM model, a detailed event-based data model and ontology, has been adopted outside the museum community.

A limitation for the adoption of Linked Data in cultural heritage is the availability of solid technologies. Graph databases and their applications have to manage the dependency on technologies that evolve rapidly and may not be mature enough to support the long-term solutions required in heritage institutions. The scale of projects that deal with vast collections, such as archives, has to be considered. The examples presented in the workshop have highlighted these challenges.

The workshop was aimed at a specialized audience, and the number of participants showed that Linked Data is a concern for people who deal with heritage assets at different levels. We believe that Cultural Heritage specialists are concerned with managing their assets in a global information infrastructure. Still, there is also a growing curiosity from people in various domains and applications using libraries, archives, and museums as sources of relevant materials.

In short, the workshop was an opportunity to gather people with similar concerns and a great diversity of experiences, and many topics are well worth the ongoing discussion that the workshop has nurtured.

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