Deployment of the Records in Contexts Standard for the Management of Collections at the SAPA Foundation

Baptiste DE COULON
baptiste.decoulon@sapa.swiss
Responsable plateforme en ligne, Fondation SAPA

Résumé

The Swiss Archives of the Performing Arts (SAPA Foundation) migrated the metadata of its collections to RDF in 2021, following the recommendations of the new Records in Contexts standard. This migration coincided with the launch of a new portal for its collections based on Linked Open Data principles. After two years of implementation, the Foundation wanted to assess its experience in order to benefit institutions considering a similar path.

Mots-clés

Records in Contexts (RiC), Gestion des collections, Fondation SAPA, RDF (Resource Description Framework), Données ouvertes liées (Linked Open Data)

Baptiste de Coulon
Responsable plateforme en ligne, Berne

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1. Introduction

"Dear, dear! How queer everything is today! And yesterday things went on just as usual. I wonder if I've been changed in the night? Let me think: was I the same when I got up this morning? I almost think I can remember feeling a little different. But if I'm not the same, the next question is,

Who in the world am I? Ah, that's the great puzzle!"

Lewis Carroll, Alice's Adventures in Wonderland

To what extent do current technological disruptions compel us to question some of our professional practices? Is our profession and are our professional identities still the same as yesterday? Indeed, don't we feel a little different this morning?

This article attempts to address these questions in the form of an initial assessment of the adoption of the new archival description standard, Records in Contexts (hereafter RiC), by the SAPA Foundation.

This article was written with the hope of assisting other institutions in preparing for this evolution.

Preliminary Remarks: We have tried to include only information that may be useful to others. It does not represent a complete assessment of our choices. Our analysis will remain brief. We are happy to elaborate upon specific aspects upon request.

2. SAPA Foundation

The SAPA Foundation, Swiss Archives of the Performing Arts, was established in 2017[1]. Its mission is to ensure the proper preservation of information and archives related to the performing arts in Switzerland. It does not aim to accomplish this task alone but also serves as a center of expertise to support third-party institutions in this mission. The SAPA Foundation inherited collections from several previous institutions, and there was a need to harmonize their metadata schemas to make them compatible.

In 2021, the SAPA Foundation implemented a new system for the management of archival data, known as the Archival Information System (AIS), and a new portal for its collections[2]. The tool selected to support these two functions[3] natively utilizes metadata formalized in the Resource Description Framework (RDF). This provided the opportunity to implement the new RiC standard through its RDF formalization and define RDF formalizations to accurately represent activities related to the performing arts[4]. The SAPA Foundation is one of the very first international archival institutions to do this in its production systems.

The choice of the RDF language was recommended to the SAPA Foundation to manage the complex legacy of heterogeneous metadata gathered by its predecessor institutions.

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[1] https://sapa.swis
[2] https://www.performing-arts.ch
[3] Metaphacts Semantic Platform for Cultural Heritage and Digital Humanities :
https://hub.docker.com/r/metaphacts/glam-community
[4] See Birk Weiberg's works (Weiberg, 2020)

As part of this migration, the SAPA Foundation was able to distinguish two principal types of metadata to handle: those related to the documents in its collections and those associated with the "Panorama", a term it has coined. The Panorama includes information about individuals, groups, events, works, and the connections between them. The uniqueness of SAPA lies in the fact that these two sets of metadata are of roughly equivalent size informationally, with approximately 100,000 primary units described in each. We will see that the attention given to this Panorama is an important factor that will have implications for our RDF formalization.

3. Performing Arts and RDF

Work has already been undertaken to model the performing arts domain in RDF format. There is a working group within the W3C dedicated to this subject[5], as well as a very active community in this field[6]. Their work also includes the development of best practices for modeling within the Wikidata knowledge base[7]. Several iconic institutions for cultural heritage preservation in this field, such as the Pina Bausch Foundation and the Merce Cunningham Trust, have already implemented RDF models for organizing their data (Bardiot, 2022). However, none of them have yet deployed the new Records in Contexts standard to represent their collections.

4. Records in Contexts

Efforts to develop a new archival description standard were initiated by the International Council on Archives (ICA) during its 2012 congress in Brisbane. This standard aims to unify all prior standards developed since the 1990s into a single conceptual model. It was decided to follow the recommendations of the Semantic Web (Gueguen et al., 2013) and thus to use an RDF formalization (Francart, 2020). This new standard under development has the name Records in Contexts. It is divided into two parts: a conceptual model (RiC-CM[8]) and an ontology (RiC-O[9]).

5. Identified Needs

The needs identified by the SAPA Foundation, which determined the choice of RDF and RiC, are as follows:

Adaptation to Current Digital Requirements: This was deemed essential to manage the inevitable transition to mass deposits of born-digital or digitized documents in archival services. The volumes and characteristics of digital documents, even when originating from a good

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[5]Performing Arts Information Representation Community Group (PAIR-CG) :
https://www.w3.org/community/pair-cg/
[6] Linked Open Data Ecosystem for the Performing Arts (LODEPA) :
https://linkeddigitalfuture.ca/fr/communaute/
[7] WG6 Wikidata/Wikipedia
[8] https://www.ica.org/en/records-in-contexts-conceptual-model
[9] https://www.ica.org/en/records-in-contexts-ontology

integrated document management system, require new tools, for which it is suggested build upon the new description standard . This adaptation has the following aspects:

- **Unification**: The new standard should allow for the consolidation into a common formalization of the descriptions of all of the components of a set of documents . These components include their content, technical characteristics, legal requirements determining access and preservation, the individuals managing them, the functions they originate from, and the events that shape their existence. This unification was also expected in our case to allow for the merging together of the previous data models[10].
- **Automation**: The new standard should offer a technical encoding of the metadata that automates its creation and management. It should be flexible enough to encompass the widest possible range of situations. Additionally, gateways should be provided to facilitate easy querying of the data for archivists and the general public.

RDF and RiC should allow for better management of **digital archiving processes**, in particular by integrating the existence of document copies into digital archive management workflows.

The life cycle of a set of documents does not end with their acquiring of the status of archives. Their preservation and dissemination entails additional administrative activities, not entirely distinct from those of the period of their creation. Such activities should fit into a **continuum of metadata** to the same degree as those of all other cycles of a document set's life (Kern et al. 2015).

Adapting to the technical requirements imposed also raises the hope of achieving better interconnection between archival descriptions and external descriptive data that is already available, thereby **moving away from the logic of data silos**. This would benefit rationalization of work, enrichment of descriptions, and improved cross-referencing. This would result in Linked Data.

If descriptive data is adapted for the digital environment and interconnected with other data, it should be easy to automate its retrieval and **make it available for free reuse**. This would lead to Linked Open Data.

6. Initial Assessments

After summarizing the expectations that the adoption of this new standard and its technical encoding raised for SAPA, we will now present the assessments that we can draw after an initial implementation phase. The exercise is complicated by the fact that some of the questions raised have yet to be resolved in practice.

7. Technical Assessment

The RIC standard is expressed in the form of an ontology (RiC-O), and **ontologies are not intended to be simple**. Their purpose is to represent reality, which is inherently complex. Unlike human conversations, which are filled with nuances and shortcuts due to our shared

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[10] One sees the same ambition, but based on the Linked Art RDF model, in Yale University's LUX portal: https://lux.collections.yale.edu/

history, culture, and knowledge, ontologies are languages between humans and machines. Machines have no past, and everything must be explicitly defined for them. It is undoubtedly laborious for humans to read and query ontologies with the necessary strictness, but it is the only way to enable machines to reason about the data (referred to as machine reasoning).

Is the RDF formalization of an ontology used only for metadata exchange, or is it also intended to be a format for internal utilization of the metadata? This is an important question that should be addressed from the outset. Indeed, **ontologies are not databases**. They cannot have the immediate efficiency of a custom formalization within a database filled with implicit notions. Ontologies are not meant to yield simple and immediately usable tools. Their purpose is to explicitly describe a reality so that, in 20 or 50 years, other humans and machines still can understand it. There is a tension between the efficiency requirements of a working tool and the intention that an ontology be built to last.

Combining the two is not impossible but requires genuinely innovative work that largely remains to be done.

Ontologies are complex objects that require **specialized knowledge**. Institutions wishing to implement a data migration project to RDF should internally have individuals trained for this purpose, or at least individuals interested and willing to be trained in ontologies.

Based on our experience, we propose to distinguish **three main kinds of metadata** covered by the RIC standard:

- Record Resources (i.e., descriptions of the contents of sets of documents).
- Instantiations (their materializations).
- What we have called the "Panorama," that is to say networks of groups, events, rules, and individuals contributing to the creation and management of these documents.

According to our observations, the RiC standard and its RDF formalization is particularly well suited to describing Record Resources. However, for the other two kinds, other standards like CIDOC-CRM or PREMIS will need to be used.

In this regard, it's important to understand that the RDF implementation of RiC, meaning the set of classes and properties defined by the RiC ontology (RiC-O), cannot suffice for an RDF description of an archive document set. It is necessary to use an **assembly of ontologies**. This is intentional and desirable, but may be a bit confusing at the beginning. Adopting RiC means not only taking RiC into use, but also a whole set of other ontologies. Indeed, it is simpler (and more efficient) in the implementation of RDF-described data not to recreate classes or properties that already exist elsewhere, but to reuse them. RDF metadata schemas are thus often a combination of more or less specialized ontologies. This may appear to hinder the unification of descriptions, but in the end, the ontologies used are often the same. There are generic ones that could be considered high-level (RDFS, OWL, etc.) that allow expressing core RDF functions such as: this entity "belongs to" (rdf:type) to such-and-such an entity class. There are also very specific ones tailored to a specific domain (Ebucore[11] for audiovisual data, PREMIS[12] for digital preservation activities, etc.).

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[11] https://tech.ebu.ch/metadata/ebucore
[12] https://www.loc.gov/standards/premis/

An assembly of ontologies can be easily comprehended, managed, and used only if it is published in a **specific, or house, ontology** in OWL format[13]. In this regard, best practice suggests that the various reference ontologies (CIDOC-CRM, FRBRoo, RIC, etc.) should not be directly used in the assembly, but rather indirectly through the <rdfs:subClassOf> property. Therefore, a custom, house ontology should be created. At SAPA, this is referred to as "spao" (Swiss Performing Arts Ontology). All classes and properties would be created in this ontology and linked to the reference ontologies through <rdfs:subClassOf>. This has the advantage of allowing the house ontology to be independent of updates to the reference ontologies and to be able to link to several of them. For example, the class <spao:Person> would have an <rdfs:subClassOf> link to both <rico:Person> and <crm:E21_Person>.

From a technical standpoint, ontologies and their RDF formalization require the establishment of **unique identifiers** (URIs) for all described entities. However, even if these identifiers are necessary for the internal functioning of software for handling of RDF descriptions, their availability within user interfaces for collections aimed at the general public (and sometimes at archivists) is unfortunately still too rare. Yet, to not publish these identifiers and ensure **their long-term persistence** works against the integration of archival metadata into the semantic web and prevents their serious reuse by third parties. The SAPA Foundation has thus decided, to this end, to publish all of its identifiers and commit to maintaining them in the long term[14]. This has allowed SAPA, for example, to reference them as external identifiers in Wikidata[15]

As a consequence of the afore-mentioned challenges, the market **currently lacks ready-made software tools** for editing archival descriptions that comply with the RiC standards and its RDF formalization. The issue of the absence of the production of new tools by specialized companies will, of course, be resolved in due course[16], but the question of the sharing of development costs and the preservation in the public domain of expertise in this field should be considered a priority from now on[17].

SAPA has chosen to use a generic RDF software framework published under an open-source license[18]. This software is not specifically adapted for use with archival collections. And, despite developments having been made, we have only been able to create a tool with basic archival functionalities so far. The development of an advanced domain-specific tool goes beyond the scope of a single institution. This effort should be carried out collectively.

The question of the distinction between the AIS (*Archival Information System*) itself and online reading rooms is a crucial aspect for developments in this field, and this is due to the nature of RDF itself. It is necessary to have two separate RDF data repositories (commonly called triple stores) for production and dissemination. This is because hiding RDF information without

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[13] https://www.w3.org/2001/sw/wiki/OWL

[14] SAPA uses the Universally Unique Identifier (UUID), as for ex: http://data.performing-arts.ch/r/198c11e9-95d7-434c- b8cd-b5dc021d15a3

[15] See «SAPA ID» (P8974) : http://www.wikidata.org/entity/P8974

[16] For example, the Swiss company docuteam had made the announcement for its new AIS-compatible RDF docuteam context, which is scheduled to be available in 2024.

[17] We mention the very good effort made in this regard by the Swiss Association Memoriav, which has published under an openlicence all the code of its new portal : https://gitlab.switch.ch/memoriav

[18] Metaphacts Semantic Platform for Cultural Heritage and Digital Humanities : https://hub.docker.com/r/metaphacts/glam-community

having made a prior selection from it at the time of exporting metadata between one repository and another is not straightforward.

The ICA working group on RiC[19] has proposed to use RDF for formalization of data. This formalization is particularly suitable for data available on the web, but RDF is not widely used by IT services in general, which **complicates technical support**. So far, RDF has garnered more interest in an academic setting. It is in this regard challenging to find technical partners with competence in this field. The web industry has predominantly used other technologies to handle graphs, that are like RDF but distinct from it[20]. One criticism of RDF formalization that has put forward relates to issues with query performance. In view of all this, it is not straightforward to rely on commercial external services to support institutions in this field[21].

Regarding digital archiving, the practical advantages of the choice of the RiC standard and its RDF formalization still remains to be proven. Theoretically, these advantages have been demonstrated, but in practice, the question of **where to store complete descriptive metadata** is still to be resolved.

Synchronizing this metadata between digital repositories and production databases remains a challenge. It's worth noting that the *Oxford Common File Layout* (OCFL[22]) standard seems promising due to the possibility of incremental updates.

In our case, we already use around ten ontologies in addition to RiC[23], including our house ontology "spao." While we have made substantial efforts to document our internal tools, finding a solution for providing external access to this documentation has not been resolved yet. Therefore, choosing effective solutions to offer **comprehensive documentation** of one's data models for the public is a task not to be underestimated.

The proliferation of possible domains and the atomization of information with RDF make it challenging to create complete **input forms**. Ergonomics is sometimes sacrificed for comprehensiveness. Graphical solutions will undoubtedly be found in the future to address these issues, but they will not eliminate the complexity of implementation and of making updates.

Several **functional solutions remain to be found** in the coming years to enable serious use of the RIC standard. For example, there is a technical difficulty in removing an RDF record, with its numerous links. It requires the establishment of rigorous validation processes. Additionally, the automated publication of PDF inventories from RDF entities is yet to be achieved. Sharing scripts for this would be welcome. Lastly, creating advanced search

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[19] Expert Group on Archival Description (EGAD) : https://www.ica.org/en/about-egad
[20] For example Neo4j and GraphQL.
[21] We are fortunate to work with the Swiss Art Research Infrastructure (SARI) : https://www.sari.uzh.ch/en.html. However, there are some few companies active in this field in Europe such as Zazuko (https://zazuko.com/) in Switzerland or Sparna (http://www.sparna.fr/) in France.
[22] https://ocfl.io/
[23] Functional Requirements for Bibliographic Records object-oriented extension to the the CIDOC Conceptual Reference Model (FRBRoo), CIDOC Conceptual Reference Model (CIDOC-CRM), RDA Registry (RDA), Preservation Metadata: Implementation Strategies (PREMIS), Resource Description Framework Schema (RDFS), Simple Knowledge Organization System (SKOS), EBU Core Metadata Set (EBUCore), Schema.org, Ordered List Ontology (OLO), Web Ontology Language (OWL), SAPA Ontology (SPAO).

interfaces for RDF metadata that are suitable for non- experts is also a significant challenge that remains to be addressed[24].

All RDF metadata pertaining to our collections is now exposed under a CC0 license[25] and accessible through an advanced query interface[26] (technically known as a SPARQL endpoint). To our knowledge, this is a first for the entire dataset of an institutional archive portal[27]. However, this offering has seen limited use, except for a specific use case that we will revisit. We have identified **three barriers to opening and reusing our data**.

- The first, which is the smallest, is the need to learn the SPARQL query language. While it can be acquired with pleasure and interest by those who have time to practice it regularly, it can nevertheless be challenging for those less comfortable with computers or with less time to dedicate to it.
- The second is more complex. Indeed, in order to query the underlying data, one must understand its model, i.e. the choices of properties and classes used as well as their relationships/connections. This comes back to the issue of documentation.
- And finally, the last one lies in the fact that metadata repositories (triple stores) exposed to the public must be able to handle significant scaling-up. And surmounting this this final hurdle is not without financial consequences.

8. Assessment from an archivist's perspective

Lack of a community of practice: The recent formalization of RiC in the form of RDF[28] form suggests that the community of archivists testing its implementation is still relatively small. However, it seems fortunately that things are rapidly changing on this front[29].

Disruption in archival practices: The adoption of the RiC standard is closely tied to thinking in terms of triples linked within graphs. This choice of modeling in the form of a certain graph necessitates a number of radical changes in archival description practices. These changes have not, so far, been well- documented due to a lack of experience. Moreover, according to our observations, the initial software tools for archival description that implement RiC tend to hide these changes, to avoid disrupting archivists in their work. Nevertheless, these changes exist and have potential benefits, which we need to harness. Specific aspects to consider include :

- The **need for educational efforts**: Understanding triples and RDF graphs is almost indispensable in order to grasp the scope of the new RiC standard inspired by them. However, this remains technical, and the learning curve for our colleagues can be steep. True pedagogical tools which allow for it are still lacking.
- The duality of "**Record Resource**" (RR) vs. "**Instantiation**": The standard introduces a fundamental distinction between describing a document's content (RR) and its physical materialization (Instantiation). This distinction is not initially easy for archivists

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[24] See on this note the interesting possibilities offered by tools such as http://sparnatural.eu/
[25] https://creativecommons.org/share-your-work/public-domain/cc0/
[26] https://www.performing-arts.ch/sparql
[27] For a Swiss example of use of RDF but partial. See Plüss & Padlina (2022).
[28] https://www.ica.org/en/records-in-contexts-ontology
[29] See the meeting on RiC organized by the Swiss Archivists Association on the 15. September 2023.

to grasp but significantly facilitates data processing afterward. A document is initially described in terms of its content, and descriptions of its different materializations are then linked to this primary description. For example, an analog version of a document and its digital version created through digitization constitute two distinct instantiations of the same document. While this might appear complex for certain analog textual documents, it is essential for digital-born documents or digital copies of documents on unstable media, such as audiovisual tapes. However, the specific definition of the content of RR is a challenge for each institution.

- Note that the standard also introduces **distinctions among RR** in establishing subsets of the following nature: rico:RecordSet, rico:Record, rico:RecordPart. However, these distinctions are not straightforward to manage in practice, even though they make sense ontologically. Indeed, the relationships between these types of entities are not the same. Records are included (rico:isOrWasIncludedIn) in Record Sets, but a Record is constituted of Record Parts are constitutive (rico:isOrWasConstituentOf).

Challenges related to the atomization of information in RDF graphs. Archivists who are used to creating and reading descriptions of document sets on a sheet or, more likely, in a simple relational database where added information exists in the form of text attached to the described entity might find it helpful to think of the implementation of RiC via RDF as a shredder. In a graph-based description, **information becomes atomized**. Each piece of information added to a description is a separate entity linked to the document set description through a property. These entities are not hierarchically structured among themselves; they are conceptually linked through the primary classes of the ontology used. In a way, it's as if an old archive description were passed through a shredder, leaving behind only small bits of paper. However, thanks to the graphs, the meaning is not lost. The analysis even suggests that meaning is enriched because the relationships are much more explicit than in traditional description methods (Crupi, 2012).

A shift towards automation and increased technicality. The adoption of new standards and encoding languages increases the technicality of descriptions and pushes for automated metadata imports and **decreased manual input**. Our experience has shown that most new descriptions are ultimately made through bulk imports from data prepared as spreadsheets or directly extracted through digital file analysis. Manual input through forms tends to be used mainly for correcting details and minor errors without the need for re-import. This is a change in practice which may lead to reliance on advanced IT skills which might eventually be found outside the institution.

Challenges related to duplicate record. Due to the use of bulk imports and the atomization of information in a graph-based model, duplicate records multiply rapidly. Therefore, establishing a **quality control** strategy and implementing it is essential. For instance, you can decide to keep two entities with identical information where it matters little (e.g., dates). However, for other cases, like people records, it is better to reconcile them in some way. Merging is not entirely straightforward in a graph-based model, and this functionality needs to be as user-friendly as possible for archivists to avoid becoming too time-consuming.

Limited interconnection between internal and external entities. There is limited interconnection between internal database entities and those found in external open databases. This interconnection only makes sense in what we call the "Panorama," or in the

case of thesauri/taxonomies, for example of materials. As archival collections are intended to consist of original and unique documents, the opportunity to link an RR with external identical RRs is almost non-existent. We see here a clear difference with libraries.

A shift towards context-centered archiving. The adoption of the new standards places a greater emphasis on context. It is no longer the collections that tend to be the focus of descriptive efforts, but rather the context, which we refer to as the "Panorama" at SAPA. This context is managed separately from the collections and is given equivalent status to the collections. This shift is reinforced by the fact that it involves information shared with other institutions and where collaborative work and data exchange are most fruitful. Therefore, what initially appeared to be a specific feature of our foundation, the importance of Panorama data, could become the norm for other institutions in the future. It's important to consider this aspect from the outset, particularly for public archives, to develop information on administrative history (Coutaz, 2021).

9. Perspectives

Shared description efforts. With the newfound centrality of context, there is a potential shift of descriptive efforts towards tools external to our institutions but shared with others. Wikidata is currently the preferred tool for this purpose (de Coulon, 2018). Describing contextual entities (people, groups, events, etc.) may be done collectively within such tools in the future. This opens up exciting possibilities and raises questions about the complementarity and redundancy of our databases. Institutions may need to engage in what could be termed "crowd-sourced Linked Open Data."

An example of reuse. Despite the challenges mentioned, it's essential to recognize that the opening of our data has already found practical applications that encourage us to view this feature as highly positive. For example, the Memoriav association has decided to distribute through its meta-portal for research into Swiss audiovisual heritage, Memobase[30], all metadata which institutions submit to it, not only that related to the preservation projects it has supported. In this context, initial experiments in exporting selected metadata using our SPARQL endpoint show that we can automate these data exchange tasks in the future, and avoid laborious manual carrying out of these.

Availability of a SPARQL endpoint. The availability of a SPARQL endpoint provides archivists (and the public) with **new superpowers** in the form of advanced and detailed access to archival data. To our knowledge, this has been very rare, if not nonexistent, until now. Therefore, the transition to the standard should not happen without requiring the putting in place, at least internally, of such an exploration tool.

10.   Conclusion

The new standard Records in Contexts supported by the International Council on Archives is only a brick in a larger transformation of our archival descriptions to RDF. It is a question of a

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[30] https://memobase.ch

complete overhaul of our professional practices which goes beyond the new standard itself. There exists a great potential for enrichment and automation in the treatment of metadata in this way, but the accompanying changes for teams (and the public) should not be under-estimated. It would moreover not be honest to promise a collision-free transition from one way of doing things to another. SAPA is still in the process of working towards this changing of practices. What is at stake is to succeed in making the most of the opportunities offered by new technological advances whilst minimizing constraints.

In summary, three aspects seem to us fundamental to succeed in a project for an adoption of RDF for an archival institution: to assemble a collection of ontologies into a house ontology and publish it in the form of OWL, to offer internal and public access to the metadata via SPARQL endpoints, and to make use of a system of URIs for descriptive articles which should be equally visible to the public.

These three aspects guarantee that the project has a truly healthy foundation from a technical point of view. It remains then to establish tools for administration and search built upon this metadata.

There are still immense challenges in this regard. These challenges will only be solved if all our teams find their niche in addressing them. That said, only the general engagement of our professional community in this direction will enable us to get there. We're counting therefore on you!

11. Acknowledgments

Bibliography

Bardiot, C. (2022). Comment transmettre l'héritage des arts de la scène ?. Dans B. Bohet et V. Pringuet (dir.), Les devenirs numériques des patrimoines (p. 303-315). Éditions de la Maison des sciences de l'homme.

Coutaz, G. (2021, 26 février). L'histoire administrative, la grande oubliée de la gouvernance de l'information. *Archivalise(s) ; Archivistique et diplomatique des données et des documents.* https://archivalises.hypotheses.org/651

Crupi, G. (2012). Universo bibliografico e semantic web. Dans F. Ciotti et G. Crupi (dir.), Dall'Informatica umanistica alle culture digitali, Quaderni DigiLab (vol. 2, p. 277–306). Università Sapienza di Roma.

de Coulon. B. (2018). Archives et Wikidata. *Arbido*, 2018(2). https://arbido.ch/fr/edition-article/2018/automatisierung-versprechen-oder-drohung/archives-et-wikidata

Francart, T. (2020, 20 avril). RiC-CM, RiC-O : les Archives se dotent de leur modèle conceptuel

(Records in Contexts). *Blog de SPARNA*. http://blog.sparna.fr/2020/04/20/rico-records-in-contexts- archives-modele-conceptuel/

Gueguen, G., Marques da Fonseca, V., Pitti, D., et Sibille-de Grimoüard, C. (2013). Vers un modèle conceptuel international pour la description archivistique. Conseil international des archives. https://www.ica.org/sites/default/files/EGAD_French.pdf

Kern, G., Holgado, S., Cottin, M. (2015). Cinquante nuances de cycle de vie. Quelles évolutions possibles ?. *Les Cahiers du Numérique*, 11 (2), 37-76. https://doi.org/10.3166/lcn.11.2.37-76

Plüss, R. & Padlina, R. (2022). Wissensnetz der Zürcher Ehedaten des 16.–18. Jahrhunderts: Eine Anwendung von Semantic-Web-Technologien im Archiv. *ABI Technik*, *42*(4), 230-241. https://doi.org/10.1515/abitech-2022-0043

Weiberg, B. (2020). Modeling Performing Arts: On the Representations of Agency. *Arti dello Spettacolo / Performing Arts*, 6, 50-56. http://dx.doi.org/10.17613/6tsm-4787