

The Open Memory Apulia platform. How Open Data turns in Digital Heritage (DH)

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Abstract

In 2020, the EU proclaimed the need to turn the digitization processes to create and manage records related to the identities of European Communities, transforming data into historical sources of the present time for future generations. In this scenario, the Open Data paradigm plays a decisive role in creating and managing innovative models of digital libraries (DLs). In this paper, we describe the current state-of-the-art of this paradigm, showing how Open Data are essential for communities and discussing the issues that this argument could generate. Afterwards, the research on pilot Open Data DL *Open Memory Apulia* is presented, focusing on an innovative approach to managing the resources. The digital asset's metadata includes information on digital records' content, their relations with context, and their provenance, according to a dynamic path compliant with quality and certification requirements. The aim is to foster active interaction of users with the collection, linking the datasets enclosed within the DL by relationship metadata.

Keywords

Open Data, metadata, Digital Library (DL), Open Memory Apulia

1. State-of-the-art

In the Digital Transformation and digitalization of processes, data represents the new border of society in terms of connections [1], considering the daily amount of data created, accessed, managed, used, and reused [2]. This sharp growth generates numerous positive spill-over effects in all life sectors [3]. The EU recently outlined a data strategy to create a single data market to ensure Europe's global competitiveness and data sovereignty [4]. Open Data plays a first-rate role in reaching this goal.

The global Open Data movement has a long-time lifecycle [5] [6]². However, it was defined around 2007 as a necessity in the Government sector [7], reaching the pick with the democratization of data launched by the United States [8]³.

At first, it was and is essential to publish digital data in an open format accessible to all citizens, without copyright or other limits of use and reuse, allowing public bodies to make transparent procedures and decisions by opening data to the participation of citizens [9]. Secondly, it was necessary also for "the creation of economic value through the development of new activities based on open data"

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² The Open Data movement started in 1972, during the United Nations Conference on the Human Environment in Stockholm, to develop international engagements that rely on scientific knowledge to guide activism, decision-making, and policy development.

³ The President of the United States, Barack Obama, claimed these openings in 2009 when he wrote in the Open Government Directive Memorandum: "Information maintained by the Federal Government is a national asset. My Administration will take appropriate action, consistent with law and policy, to disclose information rapidly in forms that the public can readily find and use". Obama's declaration has accelerated the democratization of data, opening new perspectives for the direct interaction of people with information.

[10]. To reflect on the overall concept of data, its transformation into resources and its potential as memory it is necessary to understand the value of open data [11]. This is possible analyzing open data's complexity and outlining their importance in several different contexts. The capabilities of open data overpower the administrative needs and offer user communities the opportunity to interact, reuse and integrate the available information, develop services and applications, create new knowledge, and generate economic and social benefits [12].

It is fundamental to address the concept of data by focusing on its cultural value and how it becomes an asset. The English word data comes from the Latin *datum*, that is, theoretically: *what is given, what is transferred* [13]. More specifically, a *datum* is the raw materialization of every tangible and intangible entity: a fact, a phenomenon, an event, storytelling, etc., where only the essential information can be inferred by its external shape. This *raw datum* becomes a *resource* when it integrates the information that answers the six questions of *who, what, where, when, why, and how*, and it is also contextualized, adding relation metadata.

Furthermore, when a resource is managed, used and reused for any purpose, it can record in its metadata further information about its lifecycle and user interaction that lasts over time. When this information is *intelligible, understandable and learnable*, the resource becomes a *record* evolving into a source of knowledge [14]. To this goal, open data play a crucial role.

According to the Open Knowledge Foundation's *Open Definition* project [15], open means that anyone can freely *access, use, reuse, modify, share* and *redistribute* data and content for any purpose. The topic elements of Open Data are:

1. *Availability and access*: Open Data must be available entirely, for a price not exceeding reasonable reproduction and preferably by downloading via the Internet. The data must also be available in a valuable and editable format;
2. *Reuse and redistribution*: the data must be subject to a licence allowing reuse and redistribution and possibly combining them with other databases;
3. *Universal participation*: everyone needs to be able to use, reuse, and redistribute data. There must be no discrimination in the field of initiative or against individuals or groups.

The methodology for openness requires that the data should be:

- “Complete. The data must include all the components (metadata) that allow them to be exported, used online and offline, integrated and aggregated with other resources and disseminated on the network.
- Primary. Data shall be presented in a granular manner.
- Timely. Users must be able to access and use data on the network quickly and immediately.
- Accessible. Data must be made available to as many users as possible without using barriers.
- Machine-readable. The data must be *machine-readable*, i.e. automatically processable by the computer.
- In non-proprietary formats. The data must be encoded in open and public structures, over which there are no entities (companies or organizations) that have exclusive control; the level of maximum openness of a datum, according to the classification “5 Stars Open Data” created by Tim Berners Lee, is represented by *Linked Open Data*.
- License-free. Open data must be characterized by licences that do not restrict its use, dissemination or redistribution.
- Reusable. Users must be empowered to reuse and integrate them to the point of creating new resources, applications and utilities.
- Searchable. The data must be easily identifiable on the network, thanks to catalogues and archives easily indexed by search engines” [16].

The above topics and requirements are similar to the requirements of the *FAIRification Process* of metadata. In fact, *Accessibility* and *Reuse* are two of the *FAIR Principles* together with *Findability* and

*Interoperability*⁴. Consequently, all of them are needed to manage data and metadata for certifying and validating their origin and openness.

2. The Open Data for Heritage

In the last years, Open Data has positively impacted the cultural heritage field, thanks to the added value that data and user-interaction bring to heritage [17]. The most recent perspective of digitization projects is to allow users to reuse digital object: “digitized material from cultural institutions can be re-used to develop, among others: learning and educational content, documentaries, animations and design tools. However, re-use of data is only possible if the digitized data is *open*, which means that end users can re-use and further distribute the data” [18].

Nevertheless, theories of transformation relating to Open Data to achieve digital equity [19], especially in the cultural field, still need changes. To address this gap, academics have recently defined this kind of data as *open cultural data*, underlining the need to clarify the stringent relation between Open Data and culture [20]. The aim is to allow the citizens to re-appropriate their heritage by making metadata narratives on the identities of the communities and turning them into new historical sources of the present digital age for future generations’ knowledge [21].

In 2011, the Vice President for the Digital Agenda of the European Commission, Neelie Kroes, launched a call focused on the contribution of the MAB sector to innovation: “I urge cultural institutions to open up control of their data... there is a wonderful opportunity to show how cultural material can contribute to innovation, how it can become a driver of new developments. Museums, archives and libraries should not miss it” [22].

To this goal, Cultural Institutions are scheduled to increase the relevance of awareness about data related to traditional knowledge and anthropic cultural resources through primary education and training (capacity building) on data access, interpretation, and use.

Italy has started this literacy process too⁵, and one of the first steps to reaching basilar knowledge in the field of cultural heritage data came from projects inspired by the Open Data paradigm. Once again, the aim is to generate knowledge and culture in a participatory and creative way through a “peculiar” language belonging to the new digital cultural ecosystem and formed by metadata. In particular, the Italian Ministry of Culture (MiC) has created a database including all the datasets that it makes usable and downloadable in open mode, with data reuse according to the license terms indicated for each dataset⁶. However, the Italian strategy to improve the knowledge of Open Data and Open Cultural Data continues and advances, creating some interesting suggestions, even at the local level, fostering interest in the Open Data movement, and orienting the cultural institutions towards such policies of openness.

Among the national initiatives, the ArCO project is relevant⁷, because it is based on a network of metadata ontologies for structuring cultural heritage knowledge. A project that the Central Institute for Cataloging and Documentation (ICCD) started in 2017⁸. More concretely, “ArCo is the Knowledge Graph of the Italian Cultural Heritage: it consists of 7 vocabularies describing the cultural heritage domain and data from the General Catalogue of the Italian Ministry of Cultural Heritage and Activities (MiBAC) published as RDF” [23].

ICCD collaborates with the Institute of Cognitive Sciences and Technologies (ISTC) of the CNR to realize the project. The digital collections have been published in the General Catalog of Cultural Heritage, overcoming simple Open Data and using Linked Open Data (LOD). The project aims at enhancing the cultural heritage by making the data accessible, traceable and reusable by users.

The metadata declared to be structured based on ontological models that:

- *reflect* the structural analysis of the ICCD ministerial files used for the description of cultural heritage return all the complexity of the “cultural asset” object described;
- *enhance and strengthen* the *semantic richness* of the Catalog and the explicit and implicit relationships present in the cards;

⁴ <https://www.go-fair.org/fair-principles/>

⁵ Some illustrative examples: GOVLAB, Open data 200, <https://italy.opendata500.com>, (last consulted: 16/12/2022), DatiOpen.it, il portale italiano dell’Open Data, <http://www.datiopen.it>, (last consulted: 16/12/2022).

⁶ MIC, Open Data e Linked Data, <https://www.beniculturali.it/open-data-e-linked-data>, (last consulted 16/12/2022).

⁷ ArCo project, Home Page, http://www.iccdold.beniculturali.it/index.php?pageId=581&draft=0&sespre=MW_, (last consulted: 16/12/2022).

⁸ ICCD, Home Page, <http://www.iccd.beniculturali.it>, (last consulted: 17/12/2022).

- *ensure interoperability through semantic alignment operations through equivalence relationships with other specific ontologies of the cultural heritage domain (including CIDOC-CRM and EDM) and other consolidated or developed ontologies and conceptual models in more specific fields.*

3. The DL Open Memory Apulia

Recently, the pilot Open Memory Apulia⁹ digital library (DL) has been designed and developed by the Department of Research and Innovation for Humanities (DIRIUM)¹⁰ and the spin-off D.A.BI.MUS. S.r.l.¹¹, both of the University of Bari Aldo Moro¹². The DL has been developed using the DMS CKAN¹³ to create, manage, enhance, preserve, and disseminate the digital heritage data of the Apulia region, recording and working them with Open Data to improve user-centered interaction.

The DL includes 31 datasets of three digitization projects realized over the last two years, related to the following historical archives: *Penal Colony of the Tremiti Islands* - nine datasets¹⁴, *Giuseppe e Salvatore Tatarella Foundation* - ten datasets¹⁵, *Church Santa Maria Della Porta Palo del Colle* - twelve datasets¹⁶.

The data are published under a Creative Commons license CC BY SA 4.0 for reuse of digital records (Italia, s.d.), providing for the acknowledgement of authorship to the author, citing the source, and the redistribution of the derivative product from the alteration, transformation, and development of the dataset using the same license (Creative Commons)¹⁷.

The homepage of the digital library has a simple and intuitive way to use it. In the foreground, it is possible to observe a field for data search; some tags identified as frequent are primary information, such as news on the project creators, the number of datasets available, and the institutions responsible for the original archives. At the top, users can query the collections by the links to the following search fields:

- Data
- institutions
- information.

Furthermore, the logos of social media, which the digital library relies on enhancing, promoting and sharing knowledge of the Apulia region, are shown.

The lower area is populated with information regarding the Open Memory Apulia project, the type of data management system and APIs used, and the institutions that collaborated in its implementation. The website allows navigation in four languages: Italian, German, French and English.

The *data section* includes the links to the collections, and it briefly describes the original funds and the CSV and XLSX format structured for creating the metadata path. Its search field allows sorting the datasets according to their relevance, the ascending or decreasing alphabetical order and based on the last modification. On the left, a menu is organized in filters that group indexed items: Entities, Themes, Tags, Formats, Licenses on resources, Sub-themes, Source catalogues, and Regions, for allowing the users to access the datasets by multiple and different ways.

The *dataset* interface shows the link to access digital collections and related metadata path as well as further information, describing a collection as a whole resource. The metadata path embeds: ID,

⁹ Open Memory Apulia, Home Page, <http://openmemoryapulia.it>, (last consulted: 16/12/2022).

¹⁰ Dipartimento di Ricerca e Innovazione Umanistica (DIRIUM), Home Page, <https://www.uniba.it/it/ricerca/dipartimenti/dirium>, (last consulted: 16/12/2022).

¹¹ D.A.BI.MUS. s.r.l., Home Page, <https://www.dabimus.com>, (last consulted: 16/12/2022).

¹² University of Bari Aldo Moro, Home Page, <https://www.uniba.it/it>, (last consulted: 16/12/2022).

¹³ CKAN, The world's leading open source data management system, <https://ckan.org>, (last consulted: 16/12/2022).

¹⁴ Open Memory Apulia, SAB di Puglia e Basilicata, D.A.BI.MUS. s.r.l. <http://www.openmemoryapulia.it/it/organization/sab-di-puglia-e-basilicata>, (last consulted: 16/12/2022).

¹⁵ Open Memory Apulia, Fondazione Giuseppe e Salvatore Tatarella, D.A.BI.MUS. s.r.l., <http://www.openmemoryapulia.it/it/organization/fondazione-tatarella>, (last consulted: 16/12/2022).

¹⁶ Open Memory Apulia, Collezione Digitale Archivio Storico Parrocchia Santa Maria della Porta Palo del Colle, D.A.BI.MUS. s.r.l., <http://www.openmemoryapulia.it/it/organization/archivio-parrocchia-santa-maria>, (last consulted: 16/12/2022).

¹⁷ Creative Commons, Attribuzione 4.0 Internazionale (CC BY 4.0), <https://creativecommons.org/licenses/by/4.0/deed.it>, (last consulted, 16/02/2022).

Other ID, Themes, Editor, Release Date, Modification Date, Geographical Name, GeoNames URI, Language, Temporal Coverage, Rights Holder, Frequency, Version of, Creator (Owner), and can add metadata about Field, Author, Maintainer, Last Updated, Creation Date (Figure 1).

Fondo Attività di partito - Archivio Storico Fondazione G. e S. Tatarella

Serie attività di partito
Data e Risorse

Attività di partito
File in formato csv

Attività di partito
File in formato XLSX

ARCHIVIO CARTEGGIO DIGITALIZZAZIONE FONDO

Metadati del Dataset

Identificativo del dataset	07246730720:attivit�-di-partito-fondazione-tatarella
Altro identificativo	N/A
Temi del dataset	Istruzione, cultura e sport 3221 documentazione
Editore del Dataset	Nome: D.A.BI.MUS. srl Codice IPA/IVA: 07078270720
Data di rilascio	17-11-2021
Data di modifica	17-11-2021
Copertura Geografica	Area di competenza dell'unit� organizzativa preposta
URI di GeoNames	https://www.geonames.org/3169778/puglia.html
Lingue del dataset	italiano
Estensione temporale	N/A
Titolare	Nome: Fondazione Giuseppe e Salvatore Tatarella Codice IPA/IVA: 07246730720
Frequenza di aggiornamento	irregolare
Versione di	N/A
Autore	N/A

Informazioni supplementari

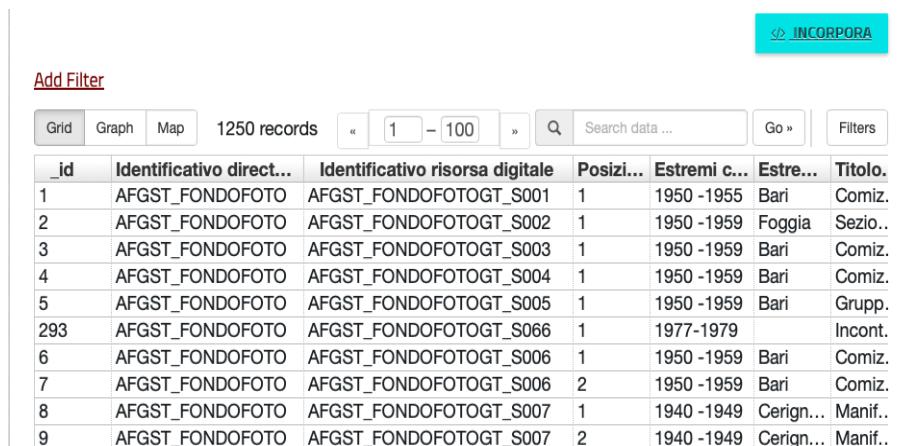
Nome campo	Valore
Autore	Nicola Barbuti
Mantenitore	D.A.BI.MUS. srl
Ultimo aggiornamento	8 dicembre 2022, 12:35 (UTC+01:00)
Creato	17 novembre 2021, 10:59 (UTC+01:00)

Figure 1: Dataset interface with related metadata

The dataset path is structured in an open XLSX form that is stored in a highly responsive cloud system and it is linked to data fruition interface by API. It can be constantly modified because of its *flexibility* requirement, adapting number of metadata and the descriptions to the different types of digitized analogic heritage, adding further information or vary the extent and updating in real-time the corresponding datasets exposed. By this way, the DL ever can be dynamically enriched with new elements and attributes over the time, which can be instantly usable online addressing the user needs and improving their interaction with the datasets.

Another added value of this approach is that it is possible to extract by the XLSX form the metadata for creating path in METS, MODS, EAD or other international standards, mapping the collections with other digital libraries managed by current DLMS systems.

Accessing a dataset, the interface shows the searchable path with its 74 metadata and associated tags that record information related both to analogic cultural artifacts and to digital objects, including metadata describing provenance and life cycle of data, among them: content, users, tools, quality, rules of use and reuse, and architecture (Figure 2)



_id	Identificativo direct...	Identificativo risorsa digitale	Posizi...	Estremi c...	Estre...	Titolo.
1	AFGST_FONDOFOTO	AFGST_FONDOFOTO_S001	1	1950 -1955	Bari	Comiz.
2	AFGST_FONDOFOTO	AFGST_FONDOFOTO_S002	1	1950 -1959	Foggia	Sezio..
3	AFGST_FONDOFOTO	AFGST_FONDOFOTO_S003	1	1950 -1959	Bari	Comiz.
4	AFGST_FONDOFOTO	AFGST_FONDOFOTO_S004	1	1950 -1959	Bari	Comiz.
5	AFGST_FONDOFOTO	AFGST_FONDOFOTO_S005	1	1950 -1959	Bari	Grupp.
293	AFGST_FONDOFOTO	AFGST_FONDOFOTO_S066	1	1977-1979		Incont.
6	AFGST_FONDOFOTO	AFGST_FONDOFOTO_S006	1	1950 -1959	Bari	Comiz.
7	AFGST_FONDOFOTO	AFGST_FONDOFOTO_S006	2	1950 -1959	Bari	Comiz.
8	AFGST_FONDOFOTO	AFGST_FONDOFOTO_S007	1	1940 -1949	Cerign...	Manif..
9	AFGST_FONDOFOTO	AFGST_FONDOFOTO_S007	2	1940 -1949	Cerign...	Manif..

Figure 2: Metadata strings of the dataset in the open DL

Users can search the dataset by several different and customizable queries, actively interacting with the collections. They can freely *find, access, download, use, reuse, modify, share* and *redistribute* digital object and related metadata for any purpose. Due to this interactive and free approach of users, the open DL addresses the *FAIRification Process* applied to digitized GLAM heritage fostering *Findability, Accessibility* and *Reusability* of metadata. *Interoperability* is improved by relation metadata such as context.

Each dataset is associated with an *Activity Flows* interface, that give the users the possibility to explore the provenance and the lifecycle of the resources, because it integrates metadata that record and store all the information related to the creation, updating and modification of digital objects. This is a first-level asset for preserving readable digital records, giving them a cultural requirement. There are also information and links to the owners, social media channels and the type of open (data) license. By recording this kind of information, the metadata evolve to *digital heritage*, addressing the Art. 2 of the *UE Council conclusions of 21 May 2014 on cultural heritage as a strategic resource for a sustainable Europe* (2014/C 183/08) [24].

Users can interact with digital records by previewing and/or downloading the files together with descriptions. The Preview function shows the strings containing the valued metadata of each cultural entity of the collections and allows access to the resources thanks to query tools. These, through filters corresponding to the labels of the metadata path, are carried out both in terms of content and from a perspective of research of the digital object (Figure 3). In addition, the users can download the dataset in CSV and XLS, as required by the Open Data paradigm.

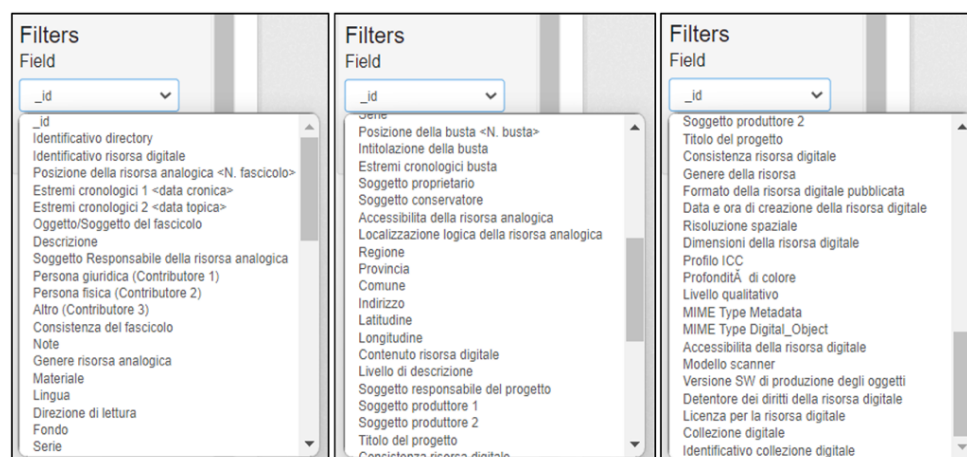


Figure 3: Detail on valued metadata.

The Institutions section contains information about all the institutions that have played a role in creating both analogic archives and digital collections; even this information are access points for

research. This section aims at giving voice to several heterogeneous news, from organized events to the information on the background image of the homepage.

4. Perspectives

The DL Open Memory is ongoing to be implemented more actively for users. The new implementation is creating an intuitive and interactive query interface allowing an increasingly exhaustive search mode that leads the user to land directly on the single digital record from which, through a series of metadata that describes the content, contexts and relationships, it is possible to reach other digital records, rework them and thus create new knowledge and culture.

Firstly, to achieve this goal, the interface has been made responsive, i.e. the graphic design responds differently, and it adapts to the device of the user making the implementation more sustainable by being unique for the various devices and systems (there is no specific implementation for web, for mobile, or mobile operating systems such as Android, Apple, etc.).

Moreover, the approach for the new front-end is based on Material Design guidelines adopting tools from the field of print design, like baseline grids and structural templates, to have consistency across environments by repeating visual elements, structural grids, and spacing across platforms and screens sizes. These layouts scale to fit any screen size, which simplifies the process of creating scalable apps.

A further step will connect datasets with images digitalized coming from each project. The idea is to create sustainable digital records that respond to FAIR criteria that could be easily understandable by users.

Therefore, the Apulian project Open Memory Apulia, carried out with an open approach and to tell stories of interest, is dedicated to historical digital resources allowing access, reuse and redistributing information and promoting new forms of social participation active interaction of anthropic communities with a new Digital Heritage. In particular, it is evident that the enhancement of metadata of the digital asset (metadata of content, context, relationships, provenance and life cycle of digital records), according to a dynamic path but compliant with quality and certification requirements, generates an indeterminate range of search keys and an improvement in the methods of access to digital cultural entities and their use.

In conclusion, the Open Memory Apulia is proposed as the product of good practices in the use of digital technologies for cultural heritage, pursuing objectives heavily suggested by the European Union, such as the design of digital libraries [25] and the production of Open Data, contributing to the economic and social development policies of the member countries.

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