PHOTOCONSORTIUM: opening up the riches of Europe's Photographic Heritage

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Abstract. Digitization and crowdsourcing actions are fostered by the European Union for enhancing access and citizens' participation in culture and research. Several experiences are demonstrating how tangible and intangible heritage is moving nowadays from the concept of representing objects to that of safeguarding memories and stories related to those objects. This process means to have richer, more complex and heterogeneous metadata associated to digital objects. To leverage on such richness of information, new approaches for improving searchability/retrievability of digital resources, storytelling and reuse are developing. Also, dealing with crowdsourced contributions of various types poses new challenges for curation and preservation methods in heritage institutions and across separated repositories, where linked objects and resources lie. PHOTOCONSORTIUM, the international consortium for photographic heritage, is exploring the potential of technologies, which can make possible to enrich metadata and utilize photographic heritage at best for different purposes in education, creative industry, and research.

Keywords: metadata, digitized photography, linked thesauri, multilingualism, digital collections management

1 Introduction

1.1 About PHOTOCONSORTIUM and digital photographic heritage

PHOTOCONSORTIUM [1] association was established in 2014 with the aim of expanding and enlarging the results of EuropeanaPhotography [2], a project funded by the European Union (EU) in the frame of the Competitiveness and Innovation Programme (CIP) [3]. The wide digitization and aggregation campaign carried out by the project resulted in nearly 500,000 early photography items digitized and made available online. The original partners of that project founded the association to provide a sus-

tainability model, ensuring the long-term maintenance of the project results, and to continue to cope with its initial aims. Since then, the association has grown much, welcoming new members from cultural heritage institutions, archives, professionals and amateurs of vintage photography. PHOTOCONSORTIUM represents a centre of expertise and knowledge on digitization, aggregation of content to Europeana [4], the European digital library, and other digital cultural heritage portals, metadata standards, indexing, cataloguing, controlled vocabularies, and in general best practices for the management of digital archives. The Association is currently acknowledged as the expert hub for photography, also acting as domain aggregator for Europeana. This expertise and knowledge is the core to generate activities, provide services, organise training programs and seminars and participate in new research. The main areas of research for PHOTOCONSORTIUM are, in particular, in the ambit of the role of storytelling and curation to enhance the use and re-use of digital cultural heritage, and the role of rich and dereferenced metadata to improve searchability and interlinking of the digital resources. PHOTOCONSORTIUM is also committed towards smaller and micro institutions and even private collectors and citizens, to support them in sharing their own (private or family) heritage and to contribute to the growth of knowledge that is connected to photographic heritage. By enabling such forms of crowdsourcing, PHOTOCONSORTIUM participates in the process of democratization of culture [5] and explores novel ways to build a gratifying pan-European identity.

Figure 1: Band of the battalion, between the two wars, contributor Antonio Ricci, digitized at All Our Yesterdays exhibition and collection days in Pisa in 2014, Promoter digital gallery CC BY NC 4.0

1.2   Europeana and the aggregation landscape

Europeana, the European digital library, gives access to ca. 50 million digital objects from cultural institutions all over Europe. In 2008, at the launch of Europeana, the rush to digitization of cultural heritage was just open, and no fully developed national platforms were available allowing cultural institutions to expose their data and metadata to the newly created portal. At the time, two domain platforms, The European Library (TEL) and Video Active (now named EUscreen) were operating, and that was the base Europeana grew on, sourcing metadata from there. In the following years, this original aggregation was supplemented with a number of EU funded aggregation projects. These networks focused on domain/thematic aggregation, with a primary role to help memory institutions in various sectors to digitize and prepare their data for the online presence, for participation to Europeana and, later, for reuse of such digital resources. Among these aggregation projects, some became then independent entities and kept living and operating beyond the end of the EU funding period. The scenario nowadays is rather complex, including national aggregators (platforms with a generalist cultural approach, which allow national cultural institutions to dialogue with Europeana ingestion process), and domain/thematic aggregators for archives, films, photography, audiovisual and sound, together with specific operational fields such as fashion, archaeology and natural history. All these actors talk to cultural heritage institutions (largely museums and archives, but also private collectors and small institutions, and even citizens via collection days), allowing them to prepare their data, both basing on Europeana models and requirements, and taking into account the domain-specific metadata needs.

Although such project-based approach was successful in enlarging the participation in Europeana of cultural institutions of any kind (over 3,700 institutions delivering data to Europeana from all the European countries), unfortunately the result nowadays is far from the optimal. Each project had separate goals, often with different aggregation systems and independent websites/repositories. Data quality often was not appropriately taken into account, nor monitored, as the primary target was on achieving large numbers. In addition, sustainability was not always a priority, and a number of the earliest projects ended without providing solutions for continuity of their services or supporting the preservation or enrichment of the metadata delivered to Europeana. An example of this is a project about photography digitization, the EUROPhoto, which delivered c.1,5 million photographs to Europeana in 2013 and nowadays is no more active, thus resulting in a huge batch of records with broken links in Europeana. Next to the issue of broken links, due to resources that are no more available on the web, Europeana faces the challenge of reviewing the millions metadata currently published on the portal, to upgrade them in a way that the resources are retrievable, searchable, and meaningful for the various categories of users.

A first huge effort was done for the rights/copyright information associated to each resource, which is the top requirement in order to make resources reusable. A long campaign took place for rights labelling, and the result is that today each and every record in Europeana bears a rights indication, so that the user is able to understand what he/she is lawfully allowed to do with the resource found on Europeana. Next step, cur-

rently ongoing, relates to the quality of metadata (richness, completeness, multilingualism) and to the quality of the visual representation of the objects (the preview and the thumbnail that are visible in Europeana).

The number and heterogeneity of the aggregators, resulting in non-standardized outcomes, which created some downsides, is now holding a huge potential for supporting Europeana in this crucial task for improving data quality. With the help of the aggregators, particularly the domain and thematic aggregators who have a deep knowledge of both the content providers and the metadata peculiarities in their specialist field, it is possible to analyse the metadata in Europeana and to define appropriate strategies for metadata improvement. This is the ambit of work where PHOTOCONSORTIUM is active together with the other domain and thematic aggregators.

2   State of the art

Many initiatives and papers have addressed the theme of access to digital cultural heritage, for its use and re-use. This subject has been studied from different angles of research and experimental pilots and it would be out of the scope of this paper to provide a comprehensive discussion of the wide and multidisciplinary range of investigations involved.

However, a few examples of research are listed below as they are considered as the reference framework, where the topics addressed in this paper are positioned. They are: innovative approaches to the issues of right protection [6], reflecting on the role of cultural heritage in a changing world [7], roadmapping citizen science in the cultural sector [8]. Furthermore, the Social Platform named REACH - RE-designing Access to Cultural Heritage for a wider participation in preservation, (re-)use and management of European culture [9] is currently animating the debate about the various declinations that apply to participatory approaches in culture and social innovation.

These areas of research and their results represent the necessary background for PHOTOCONSORTIUM, which participated and is still involved in several linked projects focused on these subjects.

On this basis and in the framework of the above-mentioned state of the art, the following topics are of major importance for the activities of PHOTOCONSORTIUM and its members and are addressed more in detail in the next sections: Storytelling, Metadata curation, Data quality and Multilingualism. These areas are inter-linked and they all refer to the key question of the accessibility to and use/re-use of digital cultural heritage.

Storytelling is considered here as the social and cultural activity of sharing stories. This is a major factor that contributes to the promotion of photographic heritage and to the widest participation of its users, namely photographers, photography enthusiasts, from amateurs to professional curators. Metadata curation, data quality and multilingual search are necessary features to enable storytelling and users' engagement.

2.1 Storytelling and metadata curation

There is a deep liaison between storytelling and metadata curation. From one side, metadata curation allows to retrieve more efficiently content of interest for storytelling. From the other side, browsing records in seek for content of interest for storytelling allows to stumble upon problematic records that would need metadata correction or improvement (e.g. typos), or could be easily enriched because missing evident information (e.g. a photo clearly taken in Paris but not tagged as "Paris"). Much of this work has been so far a time-consuming and often tedious manual work: a person sits in front of the screen and looks at thousands of records in the institution's repository. When possible, he/she integrates the metadata with complete, correct or additional information. Now it is evident that cultural heritage institutions, aggregators and other content holders (e.g. stock image libraries) will have high benefits from services and tools that generate/complete metadata in a cost-effective way.

A technology that is rapidly developing is known as 'visual matching annotation'. This is based on algorithms that are able to recognize places, time periods, subjects, and even other specific features as commanded by the user (e.g. "find all the photos that are taken in backlit"). Then, such information is automatically added to the metadata where missing, and/or resources with common metadata are linked, within the same repository as well as across separated repositories. This does not mean that all annotation and curation must be fully automatic from now onwards, as this would deprive the outcomes (both the database of information and the storytelling outputs) of the crucial "human factor". However, once tested and assessed that they comply with a certain level of confidence, the results generated by such automatic services will provide a cost effective way to improve metadata. This will result eventually in a facilitated and often more targeted search, and the linking and contextualization of cultural heritage resources will facilitate the discovery of content, which matches different narrative paths in the storytelling.

2.2 Data quality and thesauri

Another effective way of improving searchability of information and metadata consistency is by the use of controlled lists of terms. A photographer's name, if manually added in the metadata, could be mistyped, or could be formatted in different ways - e.g. Holger Damgaard, or Damgaard Holger, or H. Damgaard, or Holber Damgaard - with any other possible combination of typos, and so on. Of course, if the name is mistyped in the metadata, the record will never be retrieved when the search is done with correct spelling.

Although systems and tools to improve consistency and correct typos in a database do exist, as well as search tools that automatically include and search for mistyped terms, it is more efficient to link one's metadata to authority lists, or thesauri, that grant correct and consistent spelling of the term/name, and often provide additional information and a multilingual translation. A number of such specialist thesauri is already available for any sector, and the growing resource of Wikidata is also becoming more

and more used, because it allows a certain freedom of adding terms and references when they are missing from other lists.

Furthermore, the controlled list of terms can be provided in multilingual versions, coping with the different national spellings of names, which can be another source of difficulty in the searching activity.

3   Data quality for data reuse

3.1   Europeana DSI – Digital Service Infrastructure

The Trans-European Telecommunications Network part of the Connecting Europe Facility (CEF) Programme aims at delivering interoperability, connectivity and coordination for telecommunication services at European level. A specific area of the work programme is dedicated to supporting projects, which provide efficient solutions for access and distribution of multilingual and multi-domain resources in digital European cultural heritage. Under such framework, since 2014 the projects called Digital Service Infrastructure (DSI) [10] are funded to support Europeana and its aggregation partners, with the objective to improve the Europeana infrastructure. This means to create access, interoperability, visibility and use of European cultural heritage, by the European citizens, cultural institutions and creative enterprises, through the Europeana platform. Now approaching its fourth round of projects, the DSI involved a very wide number of partners and institutions, from all over the EU, all collaborating to improve Europeana as the flagship digital resource in Europe.

PHOTOCONSORTIUM has been a key partner of DSI with a number of good achievements so far and ambitious new objectives for the near future. The major work done relates to metadata and records quality improvements, as illustrated below. However, a huge contribution was delivered to other Europeana initiatives such as the review of terms of the Data Exchange Agreement (DEA) [11], and the realization of a "training playbook" to support aggregators in providing content holders with appropriate information and metadata training for aggregation of content to Europeana portal and collections.

3.2   Europeana Photography thesaurus

For the EuropeanaPhotography project, a 16-language thesaurus was developed to support metadata encoding for the collections. It covered a series of subject terms and some specific vocabulary to describe photographic technical terms, such as different kinds of print formats, and negative processes. The thesaurus is published as linked data in a SKOS [12] file format. However, a review of this approach is currently ongoing in order to dereference directly more of the subject terms using existing, widely accepted vocabularies like AAT. In a first step the metadata of the Photography collections is updated at the aggregator's side (the MINT tool [13] used by PHOTOCONSORTIUM) to replace the original thesaurus terms by these linked data pointers. This allows focusing the vocabulary work on the more specific photographic properties. Here we are

aiming at two important domains. First, since we uncovered many important yet lesser-known photographers while digitizing early photography throughout Europe, we are building a Photographer's index, which we aim to publish on a public resource such as WikiData or contribute to Getty ULAN. This would enable to support Europeana's efforts to offer entity pages, which will facilitate users to browse through the data. Second, we want to work on true photographic properties of the image, such as balance, fill the frame, lead room, rule of thirds, motion blur, simple, color harmony, framed, leading lines, … which would allow photo enthusiasts to more effectively explore Europeana's contents on early photography. We also are revising the current photographic technique metadata, as statistics show they were implemented somewhat inconsistently – e.g. a partner might have preferred to describe the photographic process, eg. 'wet collodion', while another mentions the result, e.g. a 'tintype'. In addition, it would be very helpful to offer a search facet to end-users of Europeana that provides useful periodization of early photography. All these efforts aim to strengthen the usability of Europeana as a portal to explore photographic heritage in its full richness.

3.3   Metadata enrichment and metadata task force

As mentioned above, PHOTOCONSORTIUM was invited by Europeana Foundation to take part in the DSI-2 project in 2016. The most visible outcome by PHOTOCONSORTIUM in DSI-2 was the development and curation of the Europeana Photography thematic collection, a sub-website in Europeana portal aiming at highlighting examples and stories related to vintage photography (cfr. 2.4 below). Having in mind the scope of the Europeana Photography thematic collection, the focus of the action in the DSI-2 project was on checking the quality of the legacy datasets originated in the EuropeanaPhotography project (last ingestion in Europeana dating back to 2014, as part of the project funded by the EU). Assessment and improvement of data quality insisted mostly on metadata, and collaboration agreements were established by PHOTOCONSORTIUM with selected content holders from the network of the association (among which Parisienne de Photographie, Topfoto, United Archives, CRDI/Ajuntament de Girona, KU Leuven, Generalitat de Catalunia, Nalis Foundation). They participated in the project improving the metadata of existing datasets, providing new datasets/items, and participating in the creation of virtual exhibitions, digital galleries and blogs.

In terms of metadata improvements, each content provider was able to perform different actions according to the desiderata for the realization of the Europeana Photography thematic collection. In first place, they provided images and records matching specific requirements for data quality as established in the Europeana Publishing Framework [14]. In particular, a minimum of 800x pixels preview was required for each image, with direct links to the image at the provider's website. Moreover, improvement in accuracy of titles was requested to the content providers, including descriptions and authors/creator information on the legacy data. Finally, licensing was requested to be as open as possible, with non-obtrusive watermarks of even better no watermarks at all. The DSI-2 project continued in the new edition of the DSI-3, ongoing until 31 August 2018, and will continue in the DSI-4 until 2020. As part the action for

improving metadata quality, PHOTOCONSORTIUM is committed to raise awareness of the Europeana Publishing Framework, and to promote the upgrade of digitized collection according to different 'tiers'.

Table 1. 'Tiers' in the Europeana Publishing Framework

TIER	Technical requirements	Rights specifications
TIER 1	Direct link to object, minimum 0.1 megapixel in size	Any rights statement of Europeana licensing framework
TIER 2	Direct link to object, minimum 800+ pixels wide	Any rights statement of Europeana licensing framework
TIER 3	Direct link to object, minimum 1.200+ pixels wide recommended	Any rights statement of Europeana licensing framework that allow for some reuse
TIER 4	Direct link to object, minimum 1.200+ pixels wide recommended	Any rights statement of Europeana licensing framework that allow for free reuse

PHOTOCONSORTIUM supports and encourages alignment to tier 2, 3 and 4, because of the advantages in terms of visibility of the collections and their accessibility by the targeted users; less invasive forms of image protection like the invisible watermarking technologies or, at least, adoption of non-obtrusive watermarks, to improve usability of the content; and non-restrictive licenses for the digitized images, particularly because this is extremely useful for the creative reuse of digitized content, e.g. in applications for education.

Table 2. Sum up of DSI-2 metadata actions

Area of improvement for PHOTOCONSORTIUM partners	Number of records
Larger previews and direct URLs (upgrade to Tier 2-4)	123,846
Metadata improvement, particularly in accuracy of titles, descriptions and authors/creators	11,949
Smaller watermarks than before	35,434
Provision of new content	35,230

The achievement got by PHOTOCONSORTIUM in DSI-2 was relevant, particularly because two important providers – namely, Parisienne de Photographie and TopFoto - accepted to change their original positions about previews and watermarks taken in 2012-2014 during the EuropeanaPhotography project. The changes were with higher resolution previews in the case of Parisienne de Photographie and with the use of a less invasive watermark in the case of TopFoto (as illustrated in the figure below). This result is a direct consequence of the launch of the Europeana Photography thematic collection, that showcases the pictures in a more attractive way compared to the general purpose interface of the Europeana portal. It also confirms that the approach 'the more you give the more you get' of the Europeana publishing strategy is effective.

Figure 2: example of TopFoto record, one item as published in 2014-2015 and the same item updated in 2017 via PHOTOCONSORTIUM.

The DSI project represents a win-win opportunity for both Europeana and the content providers - particularly because of the possibility of the datasets being included in the Europeana Photography thematic collection generating a wider visibility for the content and its provider, all over the EU and internationally. Furthermore, PHOTOCONSORTIUM includes a mix of different partners, both public and private organisations, contributing to the project with different opinions and strategies towards the open approach as advocated in the Europeana Publishing Framework. The experience of metadata and workflow improvement established within the DSI project was reviewed by PHOTOCONSORTIUM content providers, and the impact of this action was discussed by the members of the association. It became immediately evident how the metadata improvement in Europeana was beneficial for the content providers.

To capitalize the experience gained in collaboration with Europeana, a dedicated Metadata Task Force was officially created within PHOTOCONSORTIUM and a front-officer was appointed to coordinate the relationships between content providers and the Europeana ingestion team.

3.4   Thematic Collections

As mentioned above, PHOTOCONSORTIUM operates as a thematic aggregator for Europeana: Europe's most trusted portal to Cultural Heritage. Europeana.eu currently holds over 51 million objects provided by thousands of institutions. Unlike Google, Europeana's data and metadata are contributed by professionals and come with a quality and safety guarantee. To make this monumental database more accessible and encourage reuse of its content, Thematic Collections have been established, offering access to well-defined, manually curated, top-quality subsets. These collections are either created in the framework of DSI project and in other CEF Generic Services project PHOTOCONSORTIUM coordinates the efforts toward content selection and curation for two of those Collections: the already mentioned Europeana Photography and another one with a focus on migration.

Europeana Photography: photography.europeana.eu
The thematic platform on photography contains over 1 million high-quality images, and invites visitors to explore its treasures by using the search bar or browsing options.

Furthermore, users are guided through the content more intently via a plethora of curated features, from predefined queries and blog posts, to picture galleries and large-scale exhibitions – all handpicked and narrated by PHOTOCONSORTIUM curators. Masters of early photographers like John Topham, Gaston Paris, Josep Maria Lladó Bausili or Karl Heinrich Lämmel are exhibited at their best in a magnificent digital showcase.

Europeana Migration: migration.europeana.eu

At a time when the word 'migrant' is often accompanied by the word 'crisis', PHOTOCONSORTIUM is joining Europeana in its efforts to show Europe's history of migration in a different light. Through a thematic collection containing a varied range of objects from all over the continent, stories great and small tell the tale of Europe's past and present as a product of many cultural influences. Our heritage shows that Europe is the result of a flow of people and ideas, and that migration is woven through people's everyday lives - from our choice of cuisine to the way we dress. Focusing on the effects of migration on the arts and the sciences in particular, Europeana Migration promises to enlighten and enrich, to surprise and to inspire those who are curious about Europe's shared and multifaceted identity.

4   Future work

The future work of PHOTOCONSORTIUM will focus on two complementary directions. The former is to develop the concept of accredited aggregator of Europeana, taking the ownership of part of the Europeana mission for the domain of photographic heritage. The latter is the development and testing of novel technological approach to the automatization of metadata generation.

Eventually, both the participation in the Europeana aggregation and the improvement of metadata will contribute to a more efficient and successful curation and storytelling, which represent the ultimate goals for user engagement and exploitation of the results of the work performed by the Association. In this light, PHOTOCONSORTIUM is committed to continue to widen its communication, using its online website, its channels on the social media, maintaining its collaboration with the *digitalmeetsculture* magazine [15] and through the organisation of workshops, seminars and physical photographic exhibitions.

4.1   Aggregator for Europeana

Beside own association's activities, PHOTOCONSORTIUM intends to maintain its role of photography aggregator and expert hub at service of Europeana, because this opens possibilities for the content providers that belong to the association network. Such possibilities include a bigger visibility and participation in the digitized cultural heritage European landscape, and new technological opportunities for research and improvement of the impact of digitized collections.

4.2   New projects

"Fifties in Europe Kaleidoscope" is a new project, recently awarded by EC in the 2017 CEF call for Europeana Generic Services, starting in fall in 2018. It is coordinated by KU Leuven, with the participation of PHOTOCONSORTIUM together with several other partners from all over Europe. It has high- technological ambitions and a strong focus on the educational target. Among other outcomes, a MOOC is planned to be released in 2019 and provided online by the participating Universities as part of their educational offer. The scope of the technological research is to develop an intelligent visual similarity search to complement the Europeana core service functionality, applying state-of-the-art deep learning techniques on training photo datasets under the overarching theme of the 1950s in Europe.

The effort to research advanced solutions and technologies for metadata improvement, including automatic identification of information/properties from digital objects, and addition to technical and descriptive metadata, will continue within other projects and proposals to the EU.

A particular interest exists to apply artificial intelligence and visual feature extraction and classification, with expected impact on cultural heritage institutions' workflow, collections visibility and usability, Europeana advances and new possibility of applications in various sectors including education, mental therapy, serious games and others.

4.3   IIIF standard and PHOTOCONSORTIUM

The International Image Interoperability Framework (IIIF) defines a standardised method of describing and delivering images over the web [16], enabling interoperability across digital repositories.

A Task Force of Europeana worked "to identify the current trends and tendencies towards the handling of the emerging IIIF technology on the part of the Europeana content providers" [17]. It produced a final report [18] providing on the use of IIIF technologies within the Europeana ecosystem. Europeana adopted IIIF into its technical infrastructure, extending "the Europeana Data Model (EDM) to accommodate links to IIIF end-points and manifests. To that end the Europeana service acts as a IIIF reference node serving up IIIF imagery to its interfaces". The challenge is now to make content providers more aware of how to use IIIF to support distribution and use of their digital contents.

PHOTOCONSORTIUM is engaged in the further development of high-end image capturing procedures (via members KU Leuven [19] and CRDI [20]), and image storage and dissemination standards. To this end, it has a liaison with the JPEG standard committees through its member imec/ETRO [21]. PHOTOCONSORTIUM follows in particular the development of multispectrum and reflectance imaging standards which are essential for the capture of early photographic techniques to their full potential. It also follows the JPEG PLENO developments [22] and, on behalf of its members, has liaisons with image rights advocacy groups such as IPTC [23] and CEPIC [24], and is looking in this context into better protection of image integrity and embedded image

metadata. For its public oriented activities, in particular its work with cultural heritage institutions, PHOTOCONSORTIUM aims to facilitate among its members the adoption of the IIIF standards and IIIF compliant visualisation solutions. For that matter, encouraging institutions to deliver high resolution images is part of its mission, which is important in light of digital showcases such as Europeana, that support an IIIF viewer for high end images. Providers such as KU Leuven already support IIIF on their own infrastructure [25].

Figure 3: Medamud. Elouet El Ghir Archeologists and guides are on their way to a prehistoric site, collection glass slides KU Leuven, Public Domain Marked.

5   Lessons learnt, impact and added value

Digital technologies are offering a terrific opportunity to cultural heritage to renew its role in the society. Younger generations, elderly people, researchers, scholars and citizens in general can find a new way to re-appropriating of the heritage belonging to their territories and passed generations. This is particularly true in the case of the photographic heritage, which represents the testimony of the life in the generations that just left, which is a tangible witness of the life of our direct ancestors, and which can provide a concrete contribution to understand our past and the challenges of our present. PHOTOCONSORTIUM has a clear mission that is to improve the discoverability of the heritage of photography in Europe. Improving metadata, content quality, multilingual access and storytelling is part of this mission, looking toward the future steps of moving into a new context where digital cultural content is more accessible and re-usable.

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All the referred web addresses have been accessed on 14 August 2018.