The IIIF-based Digital Library of the Veneranda Biblioteca Ambrosiana

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Abstract

This paper aims to present the freely-accessible, IIIF-based digital library of the Veneranda Biblioteca Ambrosiana in Milan: the Veneranda Biblioteca Ambrosiana joined the international IIIF community for providing high-quality digital content on the Internet. Each of us knows how important is to spread knowledge: today we can improve upon methods of the past decades, thanks to new Web-based technologies. Thanks to IIIF, to the image viewer Mirador and to the image server Cantaloupe, the Veneranda Biblioteca Ambrosiana makes its precious manuscript collections freely available online to users from all over the world.

Questo articolo si propone di presentare la biblioteca digitale liberamente accessibile e basata su IIIF della Veneranda Biblioteca Ambrosiana di Milano: la Veneranda Biblioteca Ambrosiana è entrata a far parte della comunità internazionale IIIF per la fornitura di contenuti digitali di alta qualità su Internet. Ognuno di noi sa quanto sia importante diffondere conoscenza: oggi possiamo migliorare i metodi dei decenni passati, grazie alle nuove tecnologie Web-based. Grazie a IIIF, al visualizzatore di immagini Mirador e al server di immagini Cantaloupe, la Veneranda Biblioteca Ambrosiana rende disponibili gratuitamente online le sue preziose raccolte di manoscritti agli utenti di tutto il mondo.

Introduction

On November 7th, 2019, the date of the official launch of its new Digital Library (Figure 1 and Figure 2), the Veneranda Biblioteca Ambrosiana joined the IIIF-International Image Interoperability Framework community ([1]). The Veneranda Biblioteca Ambrosiana was the first library in Italy to adopt IIIF, making a significant step toward free access to high-resolution digital copies of its digitized manuscripts ([17];[4];[16];[10]).

Figure 1: A selection of tweets published in November 2019 by the Veneranda Biblioteca Ambrosiana, the Hesburgh Libraries – University of Notre Dame, the Medieval Institute – University of Notre Dame and the Italian Association of Digital Humanities (AIUCD) about the launch of the Library's IIIF-compliant digital platform.

Figure 2: A selection of tweets published in November 2019 by Greta Franzini and Ben Albritton about the launch of the Library's IIIF-compliant digital platform.

Since that date 18 months ago, we have continued to provide free access to more than 290,000 images in IIIF, and this number increases daily.

We also attracted more than 26,000 users from all over the world[1] (Figure 3): in light of these statistics, we are happy to state that our efforts to offer a more efficient way of using digitized content have been recognized and appreciated by scholars. Especially during the COVID-19 pandemic, scholars from around the world were able to continue their study and research activities with digitized Ambrosian manuscripts.

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1   As the Digital Library is accessible for free and no preliminary registration is needed by users, the Veneranda Biblioteca Ambrosiana does not collect data about individual users. We can analyze data about devices and operating systems used, and this is very interesting, because we discovered a high percentage of mobile devices usage (more than 20%).

1.	🇮🇹 Italy	**13.922**	(53,65%)
2.	🇺🇸 United States	**2.230**	(8,59%)
3.	🇩🇪 Germany	**1.119**	(4,31%)
4.	🇬🇧 United Kingdom	**999**	(3,85%)
5.	🇫🇷 France	**906**	(3,49%)
6.	🇪🇸 Spain	**582**	(2,24%)
7.	🇬🇷 Greece	**482**	(1,86%)
8.	🇨🇭 Switzerland	**449**	(1,73%)
9.	🇹🇷 Turkey	**350**	(1,35%)
10.	🇷🇺 Russia	**333**	(1,28%)

Figure 3: The users of the Digital Library from all over the world.

The Catalog: an evergreen compass, especially in the Digital Age

Each of us knows how important it is to spread knowledge: today we can improve upon methods of the past decades thanks to state of the art web-based technologies. Thanks to IIIF and the related, comprehensive digital infrastructure (the web-based technologies: the image viewer Mirador,[2] the image server Cantaloupe;[3] in conjunction with the digital production infrastructure: the 'Digitization Lab'[4] and the 'Photo Lab'[5]), the Veneranda Biblioteca Ambrosiana makes its unique manuscript collections (selected shelf marks: Inf.; Sup.; S.P. and Trotti) freely available online through its O.P.A.C. The digital library is interconnected with the current O.P.A.C. in order to guarantee a direct link between the bibliographic record and the digital resource: from the bibliographic description present within the O.P.A.C. a special link

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2 Our system integrates the version 2.7.0 of the image viewer Mirador (the last version of the 2.x family); currently we are testing the latest version (v. 3.0.0), equipped with a renewed interface. About the Mirador Web Viewer project, please see <https://projectmirador.org>.

3 About the dynamic image server in Java Cantaloupe, please see <https://cantaloupe-project.github.io/>

4 The 'Digitization Lab' is now equipped with two Zeutschel 'OS 14000 A1' overhead scanners (with an optical resolution of 600 dpi) and a new lighting system for the rooms by installing 'UV free' LED lamps with cold light (5000 K°). We recently updated the technical equipment of our 'Digitization Lab' thanks to the precious cooperation with the Università Cattolica del Sacro Cuore di Milano and its service provider, Microdisegno.

5 The 'Photo Lab' is equipped with a medium format CMOS camera Hasselblad 'H5D-50c MS' 50 Mpixel (equal to 300 dpi optical); relative optics in the range of 50 mm, 80 mm and 120 mm; lighting kit with 'UV free' adjustable LED lamps (also adjustable in the brightness intensity).

activates (in a way completely transparent for the user) the Mirador image viewer, which allows the online user an unprecedented viewing experience across platforms. This approach – that we can define as 'O.P.A.C. centered' – brings some advantages: firstly, it is well known that the cataloging and description of manuscripts are activities in continuous development, a work in progress with necessarily slow times (especially when compared to the pressing ones to which today the rapid and whirling evolution of the Internet has accustomed us). The choice we did of not duplicating, for each digitized manuscript, the descriptive information within the Digital Library, but to entrust its use exclusively to the O.P.A.C. only, makes the functions of descriptive/cataloging analysis independent from that of viewing digital images, guaranteeing an optimal possibility of intervention and updating on both fronts; secondly, all descriptive information and bibliographic details related to each manuscript, its constituent elements (previous owners, etc.), as well as the necessary links between the bibliographic information itself and different types of authority records are all details subject to change, updating and integration over time, and inserting such information also into the Digital Library would have caused an unnecessary duplication of information and, consequently, a double work with enormous complications in the management and updating of such data; thirdly, having chosen to keep the information related to the description of each manuscript within the O.P.A.C. only – which is a characterizing function of the catalog itself – and having also chosen to recall the images of each digitized manuscript only as a resource linked to the catalog record, the IT structure of the catalog itself was not burdened by digital images.

Ultimately, to summarize the meaning of this approach, we can affirm that the O.P.A.C. of the Library continues to manage and convey the identifying/descriptive information relating to the manuscripts, allowing access to the digital copies of the manuscripts intended as external resources to the catalog itself; the management of the viewing of each digital copy, as an external resource connected to the O.P.A.C., is instead the exclusive task of the Digital Library and the D.L.M.S.-Digital Library Management System which guarantees its operation, availability, and online usability.

We are facing the new digital dimension of the Veneranda Biblioteca Ambrosiana: from the beginning of the history of the *eroica et immortal biblioteca*,[6] this prestigious research library has

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6 Pier Francesco Fumagalli states: «A worthy successor of St. Charles, his cousin the Archbishop of Milan and Cardinal Federico Borromeo [...] in 1595 he planned to found in Milan a multi-cultural institute that could vie with the most famous universities and academies in Europe. As a young man, Federico had received his education in Rome [...] inspired by a humanistic tradition open to ideas of spiritual reformation and scientific research. He found inspiration in the most advanced artistic and academic novelties existing at the time in Europe, in France, England, Spain and Italy: in 1560, a library was opened to the public in Venice, in a new seat built by Sansovino hosting the collection bequeathed by Cardinal Bessarion; in 1563 in Spain, Philip II began the construction of El Escorial, where for decades Italian and Spanish artists would work together to create a splendid library. Federico also looked upon the example set by Sir Thomas Bodley in England who, in 1602, bought books from all over the world for his library, which he then donated to Oxford University at his death in 1613. In Milan, a College of higher studies endowed with a rich library had just been opened in Brera in 1572 upon the initiative of the Jesuits. From that city, Archbishop Federico Borromeo

managed and curated a special and unique and multilingual collection of significant manuscripts, and – now as it was then – makes those masterpieces freely available for users from all over the world, both within its reading room and – today – through its new digital initiative.

The main mission of any library is to collect, organize, expand and disseminate knowledge through access to resources stored therein. Every library, albeit in the theoretical alternation of its functions between the horizontal activity oriented to the use of books by our contemporaries and the vertical one oriented to their conservation for posterity, is *ipso facto* an organized collection of books; very often, however, this intrinsic function that has always characterized the ideal library is not enough to be able to affirm that every library really acts as a living place of culture.

Although every age has witnessed key moments of evolution and progress across fields of knowledge and technology – often unnoticed by contemporaries – our society has seen many potentially useful technology tools to spread knowledge and culture that one naturally wonders how it is possible that this did not implicitly involve the world of libraries!

How come, then, nowadays we still find ourselves reflecting on what seems to have become a true *cliché*, or the antithetical relationship between library and technology? Each of us could bring his own experience, useful to provide a *quid* related to the perception that users have of the library itself; and precisely this perception would seem to be the key to reading the previous question. In such a context, therefore, the conservation library is often perceived as the refractory place *par excellence* of technology and innovation, destined by definition only to the storing of its precious heritage.

De Bibliothecario et Bibliotheca: managing digital collections at the Veneranda Biblioteca Ambrosiana

The approach we used to develop the comprehensive digital infrastructure of the Biblioteca Ambrosiana should not be understood as something extraneous to the prestigious history of the

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cultivated friendships with Roman scientists, intellectuals and academics including Angelo Rocca, who at the time was opening his Angelica Library, and members of the Accademia dei Lincei, founded by Federico Cesi in 1603. Pope Clement VIII, finally granting the Archbishop's request, on 6th September 1604 ordered that 6,000 scudi from the Almo Collegio in Pavia should be used for the Ambrosiana Library and its Collegio dei Dottori. The construction of the splendid building took place between 30 June 1603 and August 1607 under the direction of Fabio Mangoni and Francesco Maria Richino. On 7th September 1607, the Collegio dei Dottori and the Library were formally established in order to provide a "universal service". With its opening to the public, on 8th December 1609, the "Immortal Library", as defined by Galileo Galilei in 1623, was born»: see [8]. The Veneranda Biblioteca Ambrosiana is traditionally considered among the first examples of public library in the sense of an institution created with the clear intention of providing access to books to a community of readers as broadly as possible. See [14];[12];[13].

Library itself, but as a further step towards its development, especially in the context of the services offered to users. All this, however, always in the shadow of historical tradition.

And from the historical point of view, there is a work that is appropriate for us in thinking about the context of this digital work: Francesco Bentivoglio's work *Constitutiones Collegii ac Bibliothecae Ambrosianae* ([3];[11];[2]. It devotes an entire chapter to the position of the librarian: the *Caput X, De Bibliothecario et Bibliotheca*, in which, through twenty-eight paragraphs, the author describes the role of the Librarian, his duties (as well as those of the personnel reporting to him) and the need to prepare at least two types of catalogs are described ([3]). Another figure who, traditionally, joined the *Bibliothecarius* at the Veneranda Biblioteca Ambrosiana is that of the *Custos catalogi*, the individual with oversight of the catalog ([15]). This expression turns out to be etymologically very interesting and, as we will see, plays an important role in opening up to functions and activities characteristic of the digital age, such as the Data Curator and the derivative data curation field.

It is precisely on the merits of the Data Curator that the etymological link to the *Custos catalogi* emerges: the etymology of the English word *curator* is, in fact, directly derived from the Latin, respectively from the verb *curo, as, avi, atum, are* and from the noun *curator*, and it is precisely for this logic that it is possible to relate the two figures to each other. The Data Curator (as well as the Digital Librarian), in fact, is inspired by the same principles that guided (and still guide) the *Custos catalogi*: he works to take care of the catalogs (now predominantly the O.P.A.C.), of the catalog information (today mainly codified in formats standards such as ISO2709), of the metadata (descriptive, administrative, technical, all united by the <tag> and the metalanguages adopted for their compilation, such as, for example, Dublin Core and XML), of the digital objects (as well as of their different formats, especially for digital images) and of the various technical procedures to be utilized from time to time to start the production of new digital objects through the use of different equipment (digital cameras, scanners, etc.), and to ensure their storage and, together, the persistence of digital information. Another fundamental aspect is that of the global design of digitization and the development of the necessary workflows connected to them.

Taking into account a necessary multidisciplinary approach, we can say that the Data Curator is called upon to act on different and complementary plans: there cannot be digitization planning without the necessary attention dedicated to the reuse of data inherited from previous digitization projects, to the data quality and to the preparation of a scalable plan for the future reuse of the new data produced today:

> «At present, there are a number of competing terms used to describe the activity of managing digital materials for research: digital curation, digital stewardship, data curation, digital archiving. There is overlap among these definitions or visions. The variation that does exist is due to more than confusion or carelessness. Each of these terms has significant connotations and attempts to align the relatively new activity of caring for digital materials with an older tradition, discipline, or profession» ([7]).

Through the approach adopted at the Veneranda Biblioteca Ambrosiana, we have tried to take all of these aspects into due consideration, carefully evaluating what has already been tested in other international institutions,[7] and trying to lay the foundations for the creation of a project that is by necessity scalable, open to productive collaborations, and shares both technical and scientific aims.

The concept of 'reuse of data' at the Veneranda Biblioteca Ambrosiana has been tested in a very concrete way: some previous digitization projects have produced, in fact, a very large amount of data (more than 1,800,000 high resolution images in uncompressed .tif format, colors, 24 bits, corresponding to approximately 31 terabytes of disk space), which represent a precious cache composed of more than 2,700 fully digitized manuscripts. It is from this project that we have based our new phase of digitization. But how do we manage all of this data? How, and where, are the files to be stored? And how to make all of this data (and the related metadata) perpetually available? As Fenlon, Jett and Palmer suggest:

> «[…] curated collections will become increasingly important as organizational units for the scattered and diverse mass of available digital information and for providing coherent contexts for meaningful engagement with that information. Aggregations, or collections of collections, are essential backbone resources in the evolving e-research platform that also need to be curated if they are to truly support and enhance discovery and innovation across the disciplines. Curatorial activities, such as archiving, preservation, and maintenance, are also important for managing the entire lifecycle of collections, but collection development and collection description are formative curation activities that add value for scholarly inquiry at both the collection and aggregation levels» ([6]).

The current result, therefore, combines data reuse activities, production of new digital copies, local data storage[8] and cloud data storage.[9] All of this is necessary in order to manage a consistent

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7   International institutions as, for example: the Bayerische Staatsbibliothek (BSB) <https://opacplus.bsb-muenchen.de/metaopac/search.do;jsessionid=5B3B2E2526ABF66F21568DA1EB28C844.touch03?methodToCall=selectLanguage&Language=en&SearchType=2&SearchType=2> and its Münchener DigitalisierungsZentrum (MDZ) <https://www.digitale-sammlungen.de/en/>; the University of Notre Dame (USA) <https://cds.library.nd.edu/expertise/digitization/; https://innovation.library.nd.edu/marble/>; the Eidgenössische Technische Hochschule Zürich Library (ETH Zürich) <https://library.ethz.ch/en/> and the related projects e-codices - Virtual Manuscript Library of Switzerland <http://www.e-codices.unifr.ch/it>; e-rara <https://www.e-rara.ch/> and e-manuscripta <https://www.e-manuscripta.ch/>.

8   The local backup strategy is actually based on a NAS (Network Attached Storage) to be used as a medium-term local storage space, equipped with 8 hard drives of 6 terabytes each one, for a total amount of 48 terabytes, formatted in RAID 6 (Redundant Array of Inexpensive Disks), to privilege data security and redundancy (the useful storage space has therefore been reduced to about 32 terabytes).

9   The cloud storage strategy is actually based on the AWS (Amazon Web Services) 'S3' cloud storage service: the cloud storage (scalable) solution for all the data and metadata.

base for the new digital library of the Veneranda Biblioteca Ambrosiana, with the aim of making the digital reproductions of part of the Ambrosian manuscript collections freely available online, free of charge and available to worldwide audiences.[10]

In order to use the digital library of the Ambrosiana, no preliminary registration, subscriptions or software installation is required (regardless of the type of device used) in addition to the browser that is normally used to surf the Internet; and not even the variety of browsers available today is a limit since the entire Digital Library system is natively multiplatform.

Looking to the near future…

Before the Digital Library was born and was available to the public, we took care to design a technical infrastructure that would guarantee a good development pathway for the future ([5]): joining the IIIF community was undoubtedly a decisive choice in this sense, because it guarantees maximum interoperability as possible at present, together with the possibility of using the Digital Library in multi-platform mode.

As already mentioned above, after 18 months of an online presence we have confirmation of the success of our choices, also confirmed by users satisfaction; now, thanks to the close and effective collaboration with our partners, we are working to gradually increase productivity in terms of new digital copies produced, without losing sight of the due attention to be paid to the precious codices.

Acknowledgements

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10 The huge conceptual and methodological effort applied to the creation and development of the new Digital Library of the Ambrosiana is fully rooted in the concrete implementation of a particular point of view relating to the concept of digitization and the consequent Workflow applied to it: as Klaus Kempf states, indeed, the digitization concept «è da intendere nella sua accezione più ampia. Esso non si riferisce solo alla produzione di una copia digitale, ma comprende anche tutte le fasi e gli aspetti associati a questo processo: la preparazione dei materiali, l'esecuzione della ripresa fotografica, l'archiviazione e l'uso della versione digitale». See [9].

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