

# Top-Down and Bottom-up Approaches to Identify the Users, the Services and the Interface of a 2.0 Digital Library

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**Abstract.** In spite of the existence of theoretical models for digital libraries (DL), studies and guidelines about the identification of the DL users, the users and their needs in terms of interface and services are still not well known, especially in the context of a 2.0 DL. Yet, this type of DL has become crucial for the projects that want to be more anchored in the Web environment and want to better fulfil the expectations of their potential users. Our work “Enriched digital libraries: users and their interfaces” aims to better understand the needs of the users in terms of interaction and participation in a DL called *Fonte Gaia Bib*, through the development of an enriched and participative DL. This paper will first present the challenges of the elaboration of this type of interface, from both the DL and user points of view. Then, it will focus on the method chosen to achieve it, which is a combination of a top-down approach (state of the art of the DLs’ services) and a bottom-up one (identification of users profiles and requirements through user studies). This method has already produced good results and has highlighted common practices, services and roles, that can constitute the basis for the development of an interactive and participative DL.

**Keywords:** Digital library · User studies · Interfaces · Bottom-up and top-down approaches · Services · Collaboration

## 1 The User, the Great Unknown of the Digital Libraries?

Digital Libraries’ (DL) theoretical models, such as the Digital Library Reference Model (DLRM) or the Interaction Triptych Framework (ITF), make the user one of the pillars of this type of resources. They insist on the need to take the user into account during the development of a DL, to achieve well-balanced interfaces [15, 32]. However, DL interfaces are often based on a set of presuppositions and false beliefs, and are ultimately the reflection of the needs of the creators of DLs themselves [12, 13]. Instead of being a bridge between the users and the digital contents, interfaces appear as a place of conflict between the users as they are imagined by the creators, and the *real* users.

To balance this situation and to better know these specific users and their practices, studies have been carried out since the late 1990s [4, 5, 7, 18, 19, 29–31, 33]. Some DLs,

such as *Gallica*<sup>1</sup> or *Europeana*<sup>2</sup>, have also launched extensive user studies to adapt their interfaces to the evolution of their users. The success of those studies has led to the publication of guidelines that help and encourage similar projects to do the same [2, 3, 6, 8, 11, 14, 25]. However, despite these recommendations and studies, DLs' users are still not well known. On one hand, the studies focus on one facet of users' practices (usually the search and reading practices). On the other hand, they are linked to a specific project and were launched several years after the release of the first interface. Therefore, they only provide a biased view of the DLs public, i.e. the behaviours of a public for one specific DL, and general studies are still too few.

Moreover, the DLs are currently at a turning point. They gradually move towards so-called 2.0 interfaces, where the users become actors, instead of being passive readers. These new-generation libraries are no longer mere data silos, where the data are static and only available for viewing, but spaces for sharing and collaborating, where the data are renewed, enriched and dynamic, mainly through users' activities such as the addition of annotations or links. If many studies on user participation have been done for other humanities projects [1, 9, 16, 17, 26–28], they are still rare for DLs. The needs of the users in terms of interaction with DLs contents and collaboration are not clearly identified.

## 2 Who Are the Real Users of Digital Libraries? Objectives and Methods

On the basis of these studies and through the development of a specific DL called *Fonte Gaia Bib*<sup>3</sup>, a 2.0 DL for the Italian studies, the project “Enriched Digital Libraries: Users and their Interfaces” aims to lay the foundations of the needs of users in the context of an enriched and participative DL. Several research questions are at the base of this work: Who are the intended and the real end-users of 2.0 scientific DLs: is it us (i.e. academics folk with a high digital literacy), someone like us, or someone else? What does it mean in terms of self-perception and of expectations to be a user of a 2.0 DL? What kind of interface do we have to build in order to match those expectations and to shape implicit needs? Can we imagine a personalized and user-adjustable interface that remains intuitive and effective? By extension, this work focuses on the formation of a mixed community, made of academics and members of the larger public, both groups being the intended public of the library we are building. It also investigates which factors are likely to encourage users to be engaged with a DL: is it the content, the interface, the infrastructure or the community gathered around a DL, that lead them to use a resource rather than another?

This work aims to propose a method that goes beyond the principle of “If we build, they will come”, which is particularly persistent in digital humanities projects [12, 13,

<sup>1</sup> <http://gallica.bnf.fr/accueil> [Accessed 28/05/2017].

<sup>2</sup> <http://www.europeana.eu/portal/fr> [Accessed 28/05/2017].

<sup>3</sup> Presentation of the digital library's project: <http://fontegaia.hypotheses.org> [Accessed 28-05-2017]. *Fonte Gaia Bib*: <http://www.fontegaia.eu> [Accessed 28-05-2017].

22, 34]. This latter principle seems to be based on a top-down approach pushed to its extreme, i.e. the creators develop an interface only from their own perspective. This hegemony of the top may lead to unsuitable interfaces, as we mentioned earlier. This is why we have chosen to adopt a twofold approach: a bottom-up approach, based on the needs of the potential users, *and* a top-down approach, based not only on the objectives of the creators but also on projects that already exist. In merging these two approaches, the goal is to produce a user-centred interface, made up of innovative functionalities identified with the top-down approach, while remaining consistent with what users do and want via the bottom-up approach. This twofold approach corresponds to the first step of this work. The results obtained will be a base for the development of prototypes, which will then be tested with a panel of users to analyse their activities and to identify new needs.

The *Fonte Gaia Bib* case will help us to offer a set of recommendations for the elaboration of a 2.0 DL and to contribute to the definition of 2.0 DLs users. These reflections about users and their interfaces will also bring knowledge about the engagement of the public with digital written heritage and about the factors that lead to the constitution of mixed communities of users<sup>4</sup>.

### 3 Preliminary Results: Users and Services

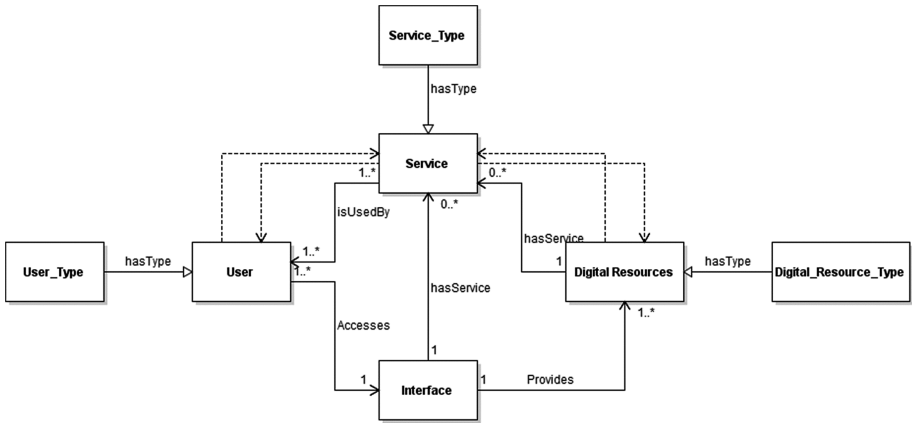
#### 3.1 From a Digital Library Point of View: The Top-Down Approach

The top-down approach was based on a state of the art of DLs and digital humanities projects, which have some similarities with *Fonte Gaia Bib*. After the analysis of these projects, it appears that the interfaces of DLs take the form of a mosaic of services. These services act like the key components of the relationship between users and digitized contents. This relationship can be defined as interdependent. Indeed, when users access a digitized content, the interface provides one or several services that the users then use. The nature of a service is dependent both on the type of the content chosen and on the profile of the users. However, the features of a particular content can be influenced by the service used to interact with it. Finally, if the profile of the users does not change, their methods of work can be modified by the services offered (Fig. 1).

Let us take the example of the downloading service. This service is based on proposing different formats of export. However, these formats depend on the nature of the resource: if a text offers many formats such as .pdf, .epub, .jpeg, .tiff or .xml, an image has limited possibilities, mostly .tiff and .jpeg. The form of the service itself is then influenced by a particular resource. But, the aspect of a resource can also be modified by the export format chosen by users. A resource in PDF or in XML will not have the same form and the same features. In return, the users have new possibilities to see and analyse the resource. For example, they can annotate a resource with the PDF format, but a XML format is rather for automatic processing of texts, data extraction etc. Thus, the downloading service can enrich the experience of users by providing different ways to apprehend a resource.

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<sup>4</sup> Presentation of the thesis: <http://fontegaia.hypotheses.org/1050> [Accessed 23-06-2017].



**Fig. 1.** UML representation of the User-Resource-Service relationship

This model leads to the categorisation of the services already present in DLs, and their modelling in a UML ontology. This categorisation underlines that DLs waver between fidelity to the traditional missions of libraries by offering services that copy the one of the latter (consulting of documents, advice services, communication services), and innovation, under the influence of Web 2.0 technologies (user-generated-content services). These different types of services tend to change the relationships between DLs and their users. From a unilateral relationship, where DLs provide tools and their expertise to their users, DLs move little by little towards a multilateral relationship, where users collaborate with DLs and other users. This ontology gives us then an insight into the internal functions of a DL and helps to envisage potential services for *Fonte Gaia Bib*.

### 3.2 From a User Point of View: The Bottom-up Approach

The needs of users have been identified using a bottom-up approach, via dissemination of a questionnaire (67 answers, May 2016) [21] and conducting interviews (8 participants, February–April 2017). The objective of this first user study was (1) to better know the profiles, the practices and the needs of users of DLs; (2) to identify their high-priority services; (3) to measure their degree of engagement with interfaces by presenting interactive and participative services. Compared to other similar endeavours, such as the ones of *Gallica* and *Europeana*, this study had the distinctive characteristic to precede the public release of *Fonte Gaia Bib* and then to attempt to define a general profile for the users of specialised DLs<sup>5</sup>. Moreover, it gave an important insight into the notions of interaction and collaboration.

The questionnaire allowed us to identify the core stakeholders of DLs, i.e. a public made of researchers, PhD students and GLAMs’ professionals. It appears that these

<sup>5</sup> “Specialised DLs” are projects that focus on one discipline, type of contents, period or author, by opposition to “generalist DLs”, that aggregate large types of contents and do not make any distinction between them [10, 24].

different groups have similar needs and practices, namely the way they read a digital document (scanning, use of the table of contents and of the full-text search to select interesting parts), the way they search (dominance of the simple search) or the way they want to contribute (addition of tags, comments and bibliographical references) [20]. These results have been confirmed by interviews with eight representatives of the core stakeholders of the DLs (2 academics, 2 PhD students, 2 students and 2 librarians).

However, this study has also highlighted several users' patterns that are independent from the professional backgrounds, and that represent distinctive roles within a DL:

- The passer-by reader: These “ephemeral” users favour the reading locally on their own machine to reading on the Web. They glean contents from library to library and have a superficial knowledge of the functionalities provided by DLs. They do not have a preferred DL, but rather a preferred portal or search engine that helps them to find contents of interest. They put the emphasis on the contents rather than on the interface or on the services of DLs.
- The active reader: These users are engaged in DLs and favour online reading. They have a good knowledge of the services offered, but focus their attention on select functionalities, such as zoom, full-text search and interactive table of contents. For them, a DL is a reading space, where they can manage their selections, their searches and their downloaded material.
- The expert reader: These users have a high degree of engagement with DLs. They explore all services for the purpose of analysis and reuse of content. They consider DLs as workspaces, where they can compare several documents, make critical annotations or work in group.

These roles underline that DLs have a utilitarian function: they fulfil research objectives that have been carefully thought through by the users. These latter do not come to a DL for their own enjoyment, but with a specific purpose in mind [14, 23]. The services expected by the participants of the study are thus essentially linked to search, export and analysis activities, which are oriented towards the use and reuse of content.

The same assessment can be made for collaboration. While all the participants declare a willingness to collaborate with other users, the way they see this collaboration depends on their profession: researchers and PhD students are oriented towards scientific collaboration; students towards a pedagogical collaboration; librarians towards a professional collaboration, where the contributors become citizen librarians. The volunteers are thus interested by participative working tools, that allow them to share their knowledge and skills and that can help the progress of their research, their studies or their professional tasks.

## 4 When the Two Approaches Meet: Conclusions and Perspectives

After comparing the results of the top-down and bottom-up phases, it was possible to define a set of services that have the specificity to engage users in each step of a digital

document's lifecycle. From the suggestions of which work to digitize, to the dissemination of contents (social networks, Web 2.0 tools), to the involvement in the pre-processing of documents (transcription, OCR correction) and their analysis (annotations, easy-reading tools, personal workspace), users can contribute to the improvement and the renew of the digitized documents of DLs.

A second categorisation can be overlaid on the first one: users' roles in DLs that have been modelled during the user studies. The first categorisation corresponds to the DL point of view; the second, to the users' point of view. In this second classification, each service that has been identified previously corresponds to a role within a DL and to the needs and expectations of the users that follow this role. Services connected with reading, search and export correspond to the passer-by reader role. Services for the description and the improvement of the content, as well as connected with the management of reading (history, personal annotations) are typical to the active reader role. Services related to advanced reading (comparison, text and image manipulation) and to critical annotations are in the realm of expert reader role.

The definition of these roles helps the on-going modelling of the DL's interface, via the realisation of mock-ups and prototypes. The challenge will be to be able to standardize these roles and relevant services into one interface, and to allow users to move easily from one role to the next in a flexible way. The objective is to avoid the forms of role segregation between users, and to consider the potential evolutions of their practices.

In the meantime, the bottom-up phase enters a new stage: the identification of the potential users coming from a larger public, who remained in the shade during the first study. After this new study (May–June 2017), the aim will be to compare the practices of the academics and of the amateurs, in order to identify common patterns or differences that will help to understand how we can create a diversified and welcoming community of users. These results will be also taken into account during the development of an enriched and participative DL.

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