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USER-CENTRIC EVALUATION OF DIGITAL LIBRARIES: THREE CASE STUDIES

Abstract. Cultural heritage digital libraries have a range of users including professionals; "digital natives" as well as general users. Their motivation and needs differ and one of the challenges in evaluating how digital libraries are perceived is to understand the specific points of view of various communities. The identification of stumbling blocks and features which are not satisfying users' expectations is aimed not only to develop a clearer understanding of users and to serve them better but also to sustain a steady user community. The paper addresses how user evaluations could help to adapt the digital libraries to the users. Three case studies will illustrate how a range of user communities within the art and cultural heritage domain were studied. The first one treats the user survey initiative held for the Italian Association of Librarians AIB portal, launched in the phase of its re-styling through a web questionnaire that collected more than 600 answers. The second, within the project DiSCmap, studied the needs in digitized materials within the Higher Education institutions in the UK. The third one assessed the European digital library Europeana through a combination of focus groups and media labs held in four countries. This study was qualitative but gathered a range of quantitative data providing evidence of user behaviour (queries used; eye tracking data and data on the users' performance on a standard set of tasks). All those studies synthesized recommendations on the preferred characteristics and features of the digital libraries from the point of view of specific user communities. The paper will provide practical examples which illustrate how quantitative and qualitative elements in a user study help to build a better picture of the users' needs.

1. Introduction

The increased interest to user studies in the digital library (DL) domain is noticeable in the recent years. The number of publications reporting on such a work is growing; and user modelling and evaluation are standard tasks within most project developing or enhancing DLs. However, research on the users, their expectations, needs and perception has not yet crystallised sufficiently to offer consistent models and recommendations. As Michael Khoo et al. noted, [KBC09]

> *"In the case of digital library researchers, the focus of research is often on technical issues (e.g., information retrieval methods, software architecture, etc.) rather than on user-centered issues."*

Since DLs are a broad domain, one could expect that smaller more specialised areas provide coherent studies on their users. However, this is hardly the case and publications addressing different professional communities warn that the knowledge about users is still limited. Within the context of digital resources for archives, A. Sundqvist noted that "the general knowledge of user behaviour is a mixture of common sense, presumptions and prejudices" [Sun07, p. 624]. The Institute of Museum and Library Services (IMLS) reported that "The most frequently-used needs assessment methods do not directly involve the users" [IML03, p. 2]. In some domains more profound user studies had been conducted; e.g. Leo Konstantelos studied in his doctoral dissertation the needs for scholarly information retrieval within the context of Digital Art in Digital Libraries [Kon09]. While this study addresses one specific

aspect, it is a good example of a research which helps understand better the user needs within a specific DL use.

If we can not find user-related guidance in the studies of DL for specific user communities, we could consult the areas of *information behaviour* [Wil99] and *user experience* studies [HT06], [MT07] which do not address specifically DLs but might be a helpful starting point for work in this area too. These areas currently do not offer definitive guidance and the needs for more empirical research is recognised. As Hassenzahl and Tractinsky suggest,

"But even now, while UX (user experience) is well discussed on conferences and symposia, it only rarely enters the relevant academic journals. We believe that the lack of empirical research is one of the reasons for this. The absence of empirical research – whether qualitative or quantitative – impedes theoretical advancement and restricts our understanding of UX as concept and its further development."[HT06]

What types of research are helping understand the user point of view in the DL domain? Most frequently, it addresses *evaluation of existing DLs*, i.e. it studies how users react to an existing service with a strong emphasis on usability, see e.g. [BSB01], [Yan01], [CD02], [XW06], [KTA07], [Xie08].

The studies done *before a DL. was developed* or while it is in development are less common but had been made for the European Digital Library Europeana [Eur09], [DMCB*10], [SDB*10] and Bibliotheca Alexandrina.

There are also publications which introduce user study methods, .e.g. [BB00] provide a review of methods; [KB08] presents an evaluation of DL with webmetrics; [MW10] introduces some specific issues in the evaluation in the context of long-term preservation systems and presents the experience of the SHAMAN project (http://shaman-ip.eu/shaman/). The Minerva *Handbook on Cultural Web User Interaction* [FN08] intended to be an additional guidance resource for cultural institutions and companies focusing on user interaction and satisfaction. In particular, the second part of the Handbook aims to synthesize the complex panorama involved by such issues with the principal goal to guide readers to put into practice what was discussed so far. In particular, it offers a simplified taxonomy of uses measuring methods, dividing them into census data measurements: web analytics, sample or user centred measurements, the meter (client-side software installed to monitor single-client preferences, an effectively user-centric measurement), standardized interviews (static textual questionnaire), audience metrics (qualitative and quantitative indicators for the analysis of web application effectiveness), log file analysis (carried out by specific software called log analysers). The handbook also offers two practical tools for cultural subjects who want to evaluate the users' point of view whose second is a model for websites and portals feedback form: a standardized interview model to be distributed to users of web sites and cultural portals.

There are several specific characteristics of DL user studies:

– *In most cases the studies are evaluating existing DLs; DLs in development are addressed less frequently.* But at the same time knowing more about the users before a DL is developed is essential for delivery of content and services which would match better those for whom the DLs are created.

– *Many studies are "stand-alone"*; they address a specific DL or a small group of DLs; it is much rarer to find studies which contextualise the specific DL within the larger picture of the DL domain. An example of a study which looks at the larger picture are [CD02] and [PL10] but there is definitely need for more studies looking at the evaluation from a broader perspective.

– *The studies focus mostly on specific aspects such as usability;* more work needs to be done to contextualise better specific DL user studies and information behaviour as well as user experience studies.
– *In many cases the studies address a limited set of user communities.* This is acceptable in the case of a single DL although the digital world does not put barriers to any type of user entering the DL. But now we work in the time of federated resources, aggregation, building very large DLs. In this domain so far the main questions addressed are how to store and retrieve in big volumes of materials; the question how the aggregation of resources is changing the user base is not studied in detail.

In this paper we take as a starting point that from the delivery of information about cultural object, the cultural industries will move towards facilitation of cultural experiences. This requires a new level of integration of scattered digital collections and digital objects of various types, including the virtual models of cultural heritage objects. In the next subsections we look at the central research questions of user studies in DLs and at the link between virtual models and DLs. Then we outline how existing models for DLs address users. To contextualise better how user studies are being currently made we provide some examples and synthesize what other areas of research could contribute to the domain but are still underused. Finally, we provide some conclusions and recommendations.

If we face the Key Research Questions on User Studies in DL, we have to start from the complex concept of a DL: for sure, this entity has not to be considered merely as an accessible collection of digital resources but, for example "a (potentially virtual) organization that comprehensively collects, manages, and preserves for the long term rich digital content and offers to its user communities specialized functionality on that content, of measurable quality, and according to prescribed policies" [CCF*08].

Some others were even more radical in this defining DLs: for example the first principle of the Digital Libraries Manifesto published by the Study Group on digital libraries of the Italian Association of Librarians states that "Digital libraries are conversations", not "a single system or grand systematic narrative" [AIB05]. The interactions (between resources and users and between users) are thus affirmed as crucial point for DL quality.

Then, a DL is a software product, so it could be included in the range of the definition provided by [ISO01], according to which Quality is "the capability of the software product to enable specified users to achieve specified goals with effectiveness, productivity, safety and satisfaction in specified contexts of use." This definition highlights the fact that the quality of a software product lies not in the absence of faults, richness of functions, or technical innovation, but merely in the extent of which products are usable and accessible according to the needs of the users in the context of use.

Our aim in this paper is to address user studies and not the concept of DL per se; we take as a rule of thumb that whatever views we have on what a DL is, it always exists to meet the needs of users.

There are three core elements in a DL: the content it makes available, the services it provides, and the users. Understanding the needs of the users, whenever these needs are explicit or not, is core to the delivery of a service.

In many cases DLs are addressing specific types of content; but one major current tendency is the aggregation of content from various sources as it is done in Europeana or the World Digital Library. This allows bringing together different types of content prepared in different conditions and creates new problems of providing reliable services in conditions where homogeneity is impossible per se. But regardless of the size and the profile of a DL, it always helps to understand better users and their needs. Even in the case of DLs addressing

specific content where the user community might seem clearly defined and its needs and preferences – obvious, the very nature of the digital world means unexpected users and surprising uses. As Paul Miller wrote:

"For the users, a portal is surely only useful if it meets a real need that users have, and in a way with which they are comfortable. As such, the portal needs to do more than any of the current offers being presented. To facilitate this, there is need for continued work on ensuring interoperability of systems" [Mil01].

What are the central research questions in this domain?

- The *continuum of user needs – user expectations – user perceptions* had not been studied systematically yet. Knowing more about the connection between the user satisfaction and the consciously expressed needs combined with expectations is essential to develop resources which sustain a stable user community. The understanding
- of this continuum also would help to design DLs which succeed to attract the user attention in the very first seconds when a novice user decides whether this resource is useful or not.
- The *modes of interaction (searching, browsing)* can be further studied. Knoweing more about their characteristics can help to provide the best possible support according to the mode followed by the user.
- *Methods for user studies*. There is a wide range of users, some involving directly users (e.g. focus groups, media labs, questionnaires), as well as methods based on the use of data gathered in the process of DL use, e.g. user logs. The selection of the most suitable method according to the question addressed is not a trivial task and the provision of more guidance is essential.
- *Measures (objective and subjective)*. There are different ways to measure user performance. There is still no consensus on measures which can be used for DL user studies. Having an agreed set could facilitate future comparative studies and benchmarking.

2. Examples of User Studies

Here we will present three examples which allow to see how a range of different user study/modelling methods have been applied in practice. To highlight the different study goals, approaches and outcomes, we will address in the following subsections:

- What is the method in general?
- What were the aims of the particular study?
- How were the methods applied?
- What were the difficulties/lessons learnt?
- What were the outcomes?

The most extensively used method of investigation of media audiences, including websites and portals, is the *standardised questionnaire*. It is done by asking preliminary structured questions to all users or to a group of selected individuals. This method entails the direct involvement of the subjects to be analysed. The aim is to investigate their preferences, habits and behaviour, in order to verify effectiveness in terms of user satisfaction with choices made and to study behaviour during network navigation – in other words, to build a "profile".

The choice of those to be interviewed can be casual or not casual, according to whether or not the choice of those to be interviewed should be probabilistic or not.

What is really critical for remote questionnaires is the truthfulness of the statements provided by the interview regarding his user type, complicated on the Web by the increase of

"virtual beings" (role games, chat, avatar, nicknames, etc), although studies in this sector have not been yet consolidated.

To illustrate this method, we will present a recent study of AIB-Associazione Italiana Biblioteche aiming to gather feedback which would be used in the process of the redesign of a professional community portal, and DiSCmap which analysed user priorities in digitisation in the Higher Education Institutions in the UK. Both projects used web questionnaires; in the case of DiSCmap the web questionnaires helped to inform later stages of the study.

Focus groups are a typical example of study which involves directly users and tries to gather rich qualitative feedback involving the participants in a joint discussion. In the digital library domain such studies normally involve either a demonstration made to the group, or personal hand-on experience. This method was recently applied for the Europeana user functionality testing, our third case study in this paper.

2.1 AIB WEB study. The AIB-Associazione Italiana Biblioteche is the professional association of Italian librarians and libraries. Founded in 1930, AIB is the unique library association in Italy, the only National Association Member of IFLA (and by far the oldest and largest association from this field in Italy). The members, some 4,500+, are mostly librarians, but membership is open to other persons or bodies interested in the field. Corporate bodies account presently for some 15% of the total membership.

AIB-WEB, AIB web site (http://www.aib.it), born on 1995 (but on 1997 under this domain) has actually 15.000+ pages, created and maintained by a distributed editorial staff (120+ people). It promotes the principles of the widest access to web contents in general and to libraries' contents in particular. Over the years, it has always been focused on the content, in the name of accessibility and simplicity, sacrificing some elements such as graphics, presentation, and inclusion of multimedia content. An admirable severity in the definition and management of a universal access policy was not accompanied by a gradual adjustment of the rich and complex web site to the obvious web environment changes (both technical and in users interaction). After the decision of AIB executive board to proceed with the redesign and restructuring of AIB-WEB from a static model of implementation of the pages to the use of a CMS, the editorial board has decided to launch a user's satisfaction survey, to gather a base for the remodelling of the site and its future enrichment.

The user study was conducted by Pierluigi Feliciati and Maria Teresa Natale (OTEBAC - Italy), both AIB associated, in accordance with AIB-WEB coordination board. The method chosen was the web questionnaire: a reporting system with the direct involvement of subjects to be analyzed, proposing to all users via the Web a series of structured questions. For this survey the method of *unrestricted self-selected survey* was chosen: the sample is open and the survey is publicized through calls via Web portals, popular websites, discussion lists, etc. The questionnaire was administered via the Web platform SurveyMonkey (http://www.survey-monkey.com), an on line service for creating instant polls. The questionnaire, based mostly on the MINERVA model we quoted before, consisted of 37 questions, organized in 6 sections and including a mixture of open/closed questions; questions with predefined answers; questions with free text answers; multiple choice answers and/or votes. A high number of users (645) answered, and 74,7% filled in the entire questionnaire.

This excellent response, both in quality and quantity showed that the target community of the DL appreciated and needed to be involved in its life, providing a huge number of personal opinions and suggestions choosing often to make the most of the "free text" option. This tendency meant substantial extra time for the analysis of free text answers and to disentangle some contradictions between closed-choice and free answers. The quantity of qualitative data provided the evidence for some common needs and opinions, even if it was

not easy to extract clear recommendations. Most of users felt the need for an AIB-WEB update, being also fully aware of what "content quality" means and many among them expressed clearly the necessity of a more easy interaction.

The low cost of the survey, limited to the use of SurveyMonkey pro platform, must be underlined, jointly with the possibility to reach people distributed throughout the target area (and even more: 4 users were not from Italy). The research had been followed by the AIB-WEB board since its beginning and the final results were sent to the staff immediately after the closure of the survey, while the full report in Italian is in print in the AIB Bulletin Journal [FN10].

2.2 DiSCmap study. The DiSCmap project (Digitisation of Special Collections: mapping, assessment, prioritisation) was commissioned by JISC (Joint Information Systems Committee (JISC), http://www.jisc.ac.uk/) in 2008 to the Centre for Digital Library Research (CDLR) of the University of Strathclyde. The work on the project was completed between September 2008 and May 2009 by CDLR and CERLIM (The Centre for Research in Library and Information Management) at the Manchester Metropolitan University. The project had as its primary goal to study the user needs in digitised special collections in the higher education institutions in the UK.

Traditionally, digitisation of cultural and scientific heritage material for use by the scholarly community has been led by supply rather than demand. JISC's recent Digitisation Strategy [J08], however, makes clear their commitment to re-focussing digitisation efforts to make them most valuable to direct users of digitised materials, including researchers, teachers and students.

The project was constructed as a set of inter-connected tasks aimed at assessing the current landscape of digitisation of special collections from the point of view of the needs of the researcher and teachers within UK higher education institutions. It included several components:

- compiling a long list of collections nominated for digitisation by users (it includes 945 nomination).
- constructing a framework of criteria for user-driven prioritisation of digitisation.
- illustrating how the framework can be used in prioritising collections from digitisation (applying different combination of criteria from the framework produces short lists which address different user needs)

The project used a combination of methods to gather data: web questionnaires, focus groups, interviews as well as social networking.

The web questionnaire was used in the context of this project for two basic purposes:

  1. As a means to gather data on nominated collections for digitisation – the nomination of collections which includes collection descriptions and reasons for the nomination is a time-consuming task.

  2. As a tool for compiling data analysis of which would be useful for the further work on the project, namely constructing the framework of criteria for user-driven digitisation.

The web questionnaire aided collecting evidence on the reasons for nomination of the various collections and this helped understand better how intermediary users (collection curators) perceive the impact of digitised collections on research and teaching. In parallel, the project studied the direct users' views on anticipated impact of digitised special collections through a combination of web survey, focus groups and in-depth interviews. The interviews with end users showed a different set of criteria for advancing special collections for digitisation. The nominated criteria by both groups of users were cross-mapped and compared with other existing frameworks.

This study aimed to understand better the user priorities for digitisation and its outcomes combine very specific product (the long list of collections) with a toll which allows to flexibly apply a combination of criteria and to construct a short prioritised list of collections. To populate the list, it used web questionnaires which allowed gathering response from multiple community members. The questionnaires included free text explanation why a certain collection is nominated for digitisation; this set of explanations was used to produce an initial set of user-driven criteria which had been later refined through focus groups and interviews and contextualised with existing prioritisation studies and frameworks. Social networking (through a blog and a group in Facebook) did not prove especially helpful in this study.

In the case of DiSCmap the web questionnaire was developed specifically for the project not using a ready-made platform. To test it, the team initiated a pilot study requesting feedback from 10% of the higher education institutions in the UK, and then after some minor refinements announced the survey.

Similarly to the AIB study, a serious challenge for data processing were the free text questions where content analysis techniques had been applied. Since the data in this case covered nominations of collections, the data had to be revised (deduplicated and checked for misspellings or alternative collection titles).

2.3. Europeana User Testing. As regards focus group method for user studies, here we will use as an example a recent User and Functionality Testing which was made for Europeana. [DmCB*10]

Europeana (http://www.europeana.eu/portal/) is a single access point for digitised cultural heritage materials provided by various European libraries, museums, archives, galleries, audiovisual collections and other memory institutions. This specialised digital library was launched by the President of the European Commission (EC) in November 2008. Currently it provides access to over 4.6 million objects with the aim of reaching a target of 10 million objects in 2010; more than 1000 institutions are providers of the cultural content in Europeana and their number and geographic coverage are steadily growing.

Europeana is more than an aggregator, however, since it also seeks to provide innovative ways of searching and visualising the rich cultural contents. This is being achieved through the gradual development of new versions of the interface with improved data organisation, search and browsing functionalities (the next one will be Europeana Rhine which will be released later in 2010). Stakeholders developing Europeana are in regular discussion regarding how best to approach and serve its users. In fact, the concept itself of a "portal" includes the mission of "service provider", an added value with respect to single sites. This extra sets aside the identity of the individual cultural subjects providing their data and deals directly with customer satisfaction. User studies for Europeana involve a combination of methods including gathering expert opinion, organising focus groups, carrying out observations of users and conducting a web survey. In the future Europeana will enrich knowledge of its users through log analysis; it also plans to work on the development of formal models of users (personae).

This paper presents some of the outcomes from a Europeana User and Functionality Study, which was coordinated by the Centre for Digital Library Research at the University of Strathclyde in Glasgow and implemented jointly with the University of Macerata, Italy, and the Emotion Lab of Glasgow Caledonian University.

This study aimed to address two specific user communities (young people and members of the general public) across four countries through a series of focus groups and

media labs. Its purpose was to establish a better understanding of users' expectations as well as the difficulties and stumbling blocks encountered while using the Europeana prototype.

The choice of countries in which focus groups and media labs were organised was announced by the outcomes of the preceding web survey of Europeana (Europeana – Online Visitor Survey 2009). The Netherlands, the UK, Italy and Bulgaria were selected because they had differing response rates to the web survey (low, medium and high) and also different levels of contribution to Europeana in terms of resource provision. Being geographically distinct and having different educational systems, especially in the area of information and computer literacy, also serves to create diverse conditions for the study.

The study involved approximately the same number of participants in each of the different countries. Groups with secondary school children were held in Sofia, Bulgaria and in Amsterdam, The Netherlands. University students were targeted in Fermo, Italy and members of the general public were recruited for the groups in Glasgow, Scotland. All group sessions were held between October 2009 and 15 December 2009.

The involvement of two types of user in the study aimed to provide a basis for analysing whether there are substantial differences within, and between, the user types. Unlike other Europeana studies, this study:

– addressed participants' responses combined with analysis of the evidence of user actions during the completion of a standardised task in all the groups;
– included homogenous groups and an equal distribution of the number of participants in each of the four countries.

The number of participants (total 89) is not sufficient to make any statistically significant conclusions but the opinions and observations gathered are of interest and can be compared with the outcomes of other current user studies.

Having in mind the international setting, one key feature of the study was the careful design of a protocol which had been applied consistently throughout the focus groups. The protocol included a brief introduction to the study and Europeana, filling in questionnaires, and individual work on an assignment combining 8 search scenarios which were comparable for the various groups. The assignment was to prepare a virtual portrait of the participant's city with predefined slides which had to be filled in; the scenarios were selected so that participants would make a variety of searches – for texts, images, audio/video, looking for a very specific piece of information. The difference in the groups held in different countries was in the number of objects on the local cities which varied from several hundreds to 80 000. The analysis of the feedback which was provided by the participants did not seem to be influenced by the number of available resources; the study made 24 suggestions for changes in Europeana in 3 groups – Content, Functionality/Usability and Navigation.

Below we present some of these visualisation from the study of Europeana [DMCB*10].

Fig. 1. Heat-map visualisation in B/W of user fixation data
for Europeana Home Screen [DMCB*10].

The heat maps present clearly the areas which attract most of the fixation of the study subjects' gaze. In the case of the Europeana home screen, the area attracting most interest is the search bar (see Fig. 1).

The graphics presenting areas of interest for the different screen allow comparing the size of the area to the attraction it receives (in terms of eye fixation). For example in the Europeana home screen (see Fig. 2) most attractive is the search bar which takes a little space on the screen. The set of randomly selected images below the search bar, which are supposed to attract attention, are fixated only 4% of the total fixation time. This analysis helps designers to decide how to change the composition of the screen and make users feel more comfortable. The search results screen (fig. 3) attracts a compound highest interest in the three areas where a search can be changed or refined.
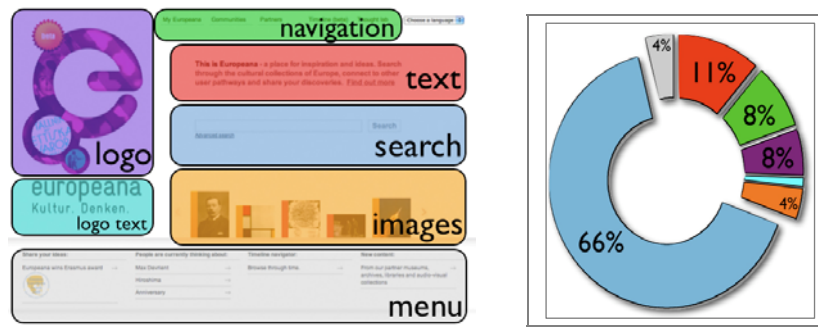

Fig. 2. The Home Screen of Europeana decomposed to areas of interest
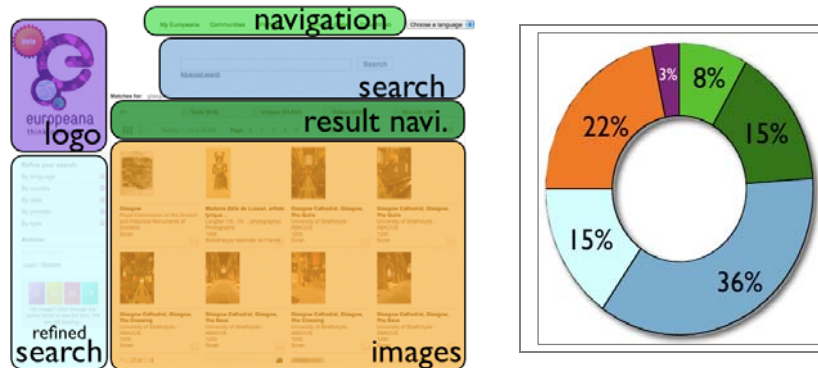and a graph showing percentage of fixation [DMCB*10].

Fig. 3. The Search results screen of Europeana decomposed to areas of interest
and a graph showing percentage of fixation [DMCB*10].

Fig. 4. Example gaze plot, Europeana home screen [DMCB*10].

Gaze plots illustrate trajectories of exploring a page. They are helpful when decision for rearranging the elements on the page need to be made. Fig. 4 shows a typical trajectory for exploring the Europeana home screen by a novice user (unfamiliar with the DL).

Eye tracking is especially helpful for research aiming to improve the navigation in a DL interface and since many DL interface components are comparable, could help to understand better how users e.g., use textual and pictorial representations of video objects, use search facilities, evaluate results lists produced after a query, evaluate different results screen interfaces (tabular and list), and how task and gender influence search and evaluation behaviour.

2.4. Three case studies results and issues. Fig. 5 summarizes methods, results and issues characterizing the three case studies examined. Synthetically, we have to put in evidence the centrality of the definition the study goals and the user group to be involved from the starting phase of the research, to obtain clearer recommendations. As regards the choice of methods, they impact strongly on the effectiveness of results: as we underlined we have a range of methods which can be used but they are not systematized in a common research framework. Then, the methods have to be applied with sharp attention to the research goals and target, i.e. choosing the web based questionnaire implies the wise sub-choice of the number and type of questions. Both AIB-WEB and DISCmap studies revealed, for example, the difficulties of systematic analysis of free-text answers, that on the other hand may bring interesting information on users availability to spend their time to support the DL.

As regards the concrete use of user studies outcomes, a need is emerging to look into areas such as personalisation and recommender systems and to better harmonize the research with the DL life cycle.
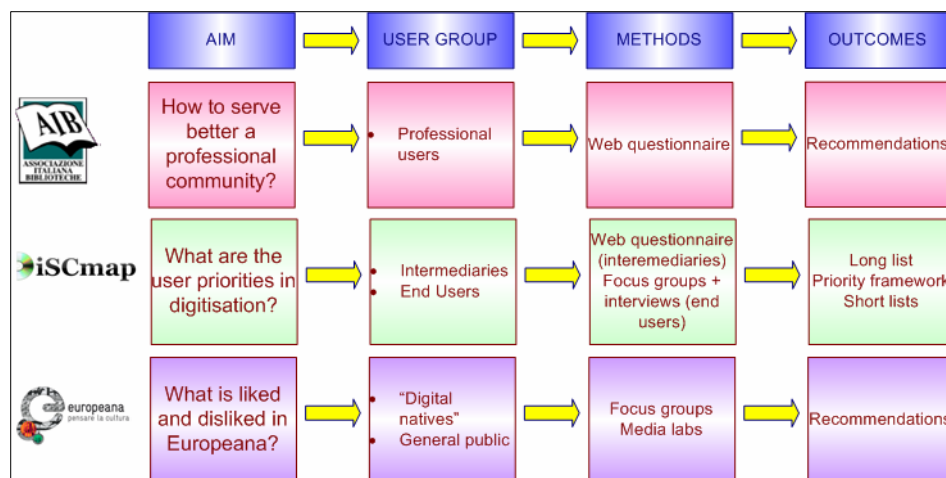

Fig. 5. The three case studies at a glance

3. How to Combine Methods Work Together?

The methods described above are quite diverse in terms of time investment, number of experts needed, and methods for users' engagement. It might seem quite difficult to select the method which would be beneficial in a specific situation and will best answer the particular goals of the study.

In reality many studies use a combination of methods. For example Europeana used a web survey, focus groups, expert evaluation and is currently using personae and logs analysis. All these studies help build a more solid knowledge about the user expectations, needs and behaviour. The different methods contribute in a different way to creating a more holistic

picture of the user. For example the web survey of Europeana [Eur09] provided an insight on the demographic characteristics of current users of Europeana and also gathered some ideas for improvement. The focus group study [DMCB*10] gathered a high number of insights from users from different countries about the features of Europeana they like and dislike. The user log analysis allows to see what are the most popular search terms; how detailed searches the users make; and adds more knowledge on the geographic and some demographic characteristics of Europeana use. The use of personae allows fine-tuning the features of the DL to the most typical users.

But when a DL wants to make a user study which method would be most suitable? Tab. 1 summarizes some typical questions and recommended methods.

Tab. 1. User-related questions and methods

Question	Method
How to find out more about the users of a DL which is currently planned?	A web questionnaire can be used to address potentially large community of future users. Their responses could be helpful to define personae.
How to evaluate the usability of an existing DL?	This could be achieved through an expert group study. Direct user involvement could be accomplisehed through focus groups.
How to conduct a study which will help to identify measures for extending the user community?	Web questionnaire and user logs could help to build a picture of the current user community. For fine-tuning what measures could be used to expand the user base, expert evaluation could be helpful. This might be connected to finding possible reuse scenarios.
How to understand better what are the stumbling blocks for the users of an existing DL?	Bet suited are methods with direct user involvement (focus groups or media labs); the logs analysis could also be useful.
How to compare my DL with others?	Comparison in this domain is still difficult; expert evaluation seems the best option here.
How to make the navigation on the web site easier?	Use media labs to see what individual users are doing and how they use logs to define typical patterns of actions within the DL.

4. Discussion and Recommendations

Recently Z. Manžuch made a survey on monitoring digitisation which summarises 11 user-related studies; this study shows that the most popular method deployed was the analysis of usage statistics while direct user involvement is not so popular [Man09]. What explains such a preference? Are DLs trying to avoid the direct contact with their users? What place in the evaluation of DLs should be taken by direct involvement of users? How the diverting perspectives on DLs can best present the users?

We presented in this review some models and frameworks in the DL domain and looked at the way they integrate the users. We also presented a series of recent studies which employed different user study methods.

Most popular types of user studies are currently related to evaluation of DLs and most frequently focus on usability; it is important to conduct more studies on needs/expectations on

the stage of planning of DLs and to expand the coverage of the studies into more general information behaviour and user experiences issues.

User studies in DLs are not an easy area to address. On the one hand, the advancements of technologies creates rich and diverse unstable expectations and when a DL is being studied, there should be a visible borderline between the expectations this DL creates and the technological expectations coming from previous user experiences. These expectations are constantly changing with the rapid technological change and in fact mean that a DL should be constantly redesigned to meet the new trends. In addition, all research involving human subjects is difficult; at the same time the studies of the machine users are to some extent neglected but these users "spread the word" about the DL and it is necessary to know how they function and what they miss.

The importance of addressing better the users is voiced at a high political level. In a recent recommendation of the European parliament [EP09] several recommendations raise user-centred concerns and identify areas which need to be addressed in the future Digital Agenda of the EU (the numbers from the original document are used below, bold), some of them being:

"12. Underlines the need for further assessment and research into potential interference between existing and future users of the spectrum so as to mitigate potential negative consequences for consumers;

13. Considers that, as Internet access rates are increasing, Member States should strive to achieve the connection of 50% of EU households to very high-speed networks by 2015and 100% by 2020 enabling a reliable and improved end-user experience in line with consumer expectations and needs; recalls that for achieving these objectives an appropriate policy framework is vital to enable private investment, while safeguarding competition and boosting consumer choice;

20. Calls for respect for transparency, accessibility and equality of opportunity in the use of ICT systems, with a view to improving their user-friendliness for the largest possible number of European citizens;

23. Recommends introducing the notion of digital literacy into education systems, starting as early as the pre-primary level, in parallel with foreign languages, with the aim of producing skilled users as early as possible". [EP09]

These recommendation addresses a range of issues: from the technological infrastructure role in user satisfaction to the need to educate skilled users.

This range is applicable also in the DL domain. User studies need to be made regularly at different stages of the DL lifecycle and while nowadays this is rather an exception than a practice, we hope that the situation will gradually change.

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