

Constituencies of use: Representative usage scenarios in international digital library user studies, a case study on Europeana

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Abstract

Digital libraries are still being developed independently of the extensive involvement of end users, those who form their *constituencies of use*. The traditional approach to digital library development is to consult with experts or *communities of practice* in a particular field and attempt to incorporate recommendations into the interface functionality and service models, whilst user needs are often not comprehensively scoped in advance, at the development stage, or regularly consulted for the purposes of formative and summative evaluation. Recent developments in digital library design concentrate effort on the use of innovative search and browse tools, streamlined techniques for navigation and display, and the provision of personalised areas for search management and information sharing; such developments, however, remain unaligned to any thorough understanding of exactly *how* user behaviour alters depending on scenario of use, and the problems encountered by end users in task completion within different contexts. This paper reports on the deployment of usage scenarios to evaluate the Europeana digital library v1.0 prototype.

Keywords: digital libraries, user studies, tasks

1. Introduction

Digital libraries are only as good as the uses to which we can put them. Whilst user needs are signalled as a priority in the multitude of policy documents which shape online cultural heritage services, user needs are often not comprehensively scoped in advance at the development stage, or regularly consulted for the purposes of formative and summative evaluation. The traditional approach to digital library development is to consult with experts or *communities of practice* in a particular field, and incorporate advice and recommendations into the service models. In a review of the use of digitised archival collections, for example, A. Sundqvist [1] noted that “the general knowledge of user behaviour is a mixture of common sense, presumptions and prejudices” (p. 624), whilst the Institute of Museum and Library Services (IMLS) reported that “The most frequently-used needs assessment methods do not directly involve the users” (p. 2) [2]. Z. Manžuch [3] in her survey on monitoring digitisation (which summarises 11 user-related studies), showed that the most popular method deployed was the analysis of usage statistics. Digital libraries are, therefore, still being developed independently of the extensive involvement of their *constituencies of use*.

An evidence-based approach to the information behaviour of users will have tangible impact on the development of interface functionality, digital library policy, data quality and potentially on the architecture of digital libraries.¹ Such studies need to address different user groups. For example, the younger users, often referred to as “digital natives”,² are expected to prefer enhanced *functionality* which reflects the customisable, interactive, information experience found on popular search and social networking sites; whilst, by comparison, professional users seek authoritative and trusted information *quality*.

Recent developments in digital library design have concentrated effort on the use of innovative search and browse tools, streamlined techniques for navigation and display, and the provision of personalised areas for search management and information sharing. Hence, studying the use of such digital libraries requires selecting suitable scenarios which will allow the users not only to navigate and search for data, but also deploy a range of

¹ Domains used as defined in the DELOS Digital Library Reference Model) [4]

² A term applied to the new generation of users who have grown up with ICT and whose patterns of knowledge creation and information sharing are largely defined by web based tools, virtual worlds and social media.

functionalities. This paper presents the experience of devising user-orientated assignments for a study of Europeana³ undertaken in October-December 2009 by the Centre for Digital Library Research (CDLR) at the University of Strathclyde with the participation of the University of Macerata and Glasgow Caledonian University. The study aimed to gather feedback from members of the general public and younger users, since a previous web survey of Europeana users conducted in May 2009 identified these to be relatively low use consumers compared to professional in their 30s and early 40s [5].

2. Methodology and composition of the groups

Previous research on users of digital libraries has incorporated a range of methodologies including: interviews, focus groups, observations, usability testing, transaction logging, user surveys, web-based questionnaires, think aloud protocols and video data [6, 7, 8, 9, 10]. Alongside usage scenarios, the study also utilised psychological testing techniques such as eye-tracking, which had been deployed in previous studies of information behaviour (cf. [11, 12,13]), but have not, before now, been applied to assess digital libraries.

The study needed to gather demographic data which would help to analyse the profile of the participants and gather data on the tasks performed. Table 1 summarizes demographic data on the participants in the study.

The problem presented to the CDLR-led study was how to devise a cohesive methodology for the user testing of a multilingual digital library, where focus group demonstration would take place across 4 European countries with the resource being evaluated by a number of different *constituencies of use* i.e. groups composed of different cultures, linguistic communities, professions and ages. For example, 76% of study participants were between the ages of 15 (or under) to 24 years and could be categorised as belonging to the growing constituency of “digital natives”.

³ <http://www.europeana.eu/portal/>. A single access point for digitised cultural heritage materials provided by various European libraries, museums, archives, galleries, and audiovisual collections. At the time of the study it was offering access to 6 million digital objects. The interface is available in 26 languages and supports both simple and advanced search, and offers additional functionalities such as a timeline and date clouds.

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Table 1: Demographic characteristics of the participants in the study

	Country									
	Bulgaria		Italy		The Netherlands		UK		Total	
	N	%	N	%	N	%	N	%	N	%
Country	22	25	20	23	23	26	24	27	89	100
Gender										
Male	11	50	6	30	12	52	10	42	39	44
Female	11	50	14	70	11	48	14	58	50	56
Age										
Under 15	2	9	-	-	-	-	-	-	2	2
15-18	20	91	-	-	21	91	-	-	41	46
19-24	-	-	17	85	2	9	6	25	25	28
25-34	-	-	-	-	-	-	7	29	7	8
35-44	-	-	-	-	-	-	3	13	3	3
45-54	-	-	2	10	-	-	5	21	7	8
55-64	-	-	1	5	-	-	3	13	4	5
Profession										
At school	22	100			23	100	-	-	45	51
At College / University	-	-	20	100	-	-	5	21	25	28
Researcher	-	-	-	-	-	-	4	17	4	5
Information specialist	-	-	-	-	-	-	4	17	4	5
Manager / Administrator	-	-	-	-	-	-	3	13	3	3
Lecturer	-	-	-	-	-	-	1	4	1	1
Writer	-	-	-	-	-	-	1	4	1	1
Other	-	-	-	-	-	-	6	25	6	7

A key issue in the design of user studies is the ‘hands-on’ experience of users physically interacting with the interface and the selection of tasks for the purposes of testing and evaluation. During a study of information behaviour, users will normally have to answer specific questions, usually belonging to two categories: *navigational* and *informational* [11, 13, 14]. The selection of tasks has a central role in the user studies as they constitute the very fabric of user experience. In order to keep users engaged during the study, it is important that tasks should adequately address their likely interests. The selection of tasks is even more difficult when the study is international, addresses divergent constituencies, and must produce comparable outputs from the various groups involved for the purposes of systematic evaluation. The

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innovative solution for the CDLR was to devise an extended and iterative assignment which could accommodate the interests and abilities of different user groups without compromising the basic thematic structure or upsetting the essential navigational and informational elements of the tasks.

Our testing of Europeana, therefore, necessarily applied a uniform methodology to all focus groups and media labs. A standard protocol was established for the study including three questionnaires (demographic data; first impressions (since the participants were not familiar with Europeana before the study) and deeper/lasting impressions), as well as a series of key discussion points and an assignment. The thematic bond of the assignment was the creation of *a virtual portrait of the city* where each focus group was held (with the exception of the group in Fermo where the assignment was to make a virtual portrait of the city of Rome). This allowed the tasks to be both locally specific and easily translated across cultures and age groups.

The assignment requested participants to collate a PowerPoint presentation, from materials retrieved on Europeana, using a predefined set of slides which guided them to produce a virtual tour of their local city, and which also aimed to encourage use of Europeana's innovative functionality. The assignment was designed to incorporate 8 different usage scenarios: 1) finding texts on a predefined topic; 2) finding images on a predefined topic; 3) finding audio and video materials on a predefined topic; 4) finding materials presenting the same, predefined, object in different times (eg. how their city had changed over time); 5) finding materials on a specific predefined subject (like a landmark or an event or a person); 6) finding materials on a specific historical event; 7) a topic of the participants' own choice within the context of the general theme; and finally, 8) identifying the providers of digital objects who contributed the highest number of objects on a particular topic as a means of encouraging consideration of the provenance of objects; this last also asked users to identify what they found to be most useful about Europeana and to suggest areas where material may be lacking.

Deploying such scenarios requires users to formulate searches that target a range of metadata fields to retrieve a variety of material types. The approach made it possible to assess which scenarios of use are easiest to satisfy and to identify the stumbling blocks that users of the Europeana prototype might be encountering. The tasks were selected on an extended and iterative model representative of the key processes in the searching of digital libraries such as 'undirected searches' and 'monitoring a topic over time' reported in Bryan-Kinns and Blandford [15] and noted the findings of Furnas and Rauch [16]

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that 'one-shot query' of digital libraries, as with conventional ones, is relatively rare.

The approach is also compatible with the TIME framework for evaluating digital libraries developed by Andrew Dillon [17]. The TIME framework focuses on four elements: Task – what users want to do; Information model – what structures aid use; Manipulation of materials – how users access the components of the document; and Ergonomics of visual displays – how they affect human perception of information. The 8 scenarios of the assignment represent the Task; Europeana provides an environment in which the users can try various searches, which maps to the TIME Information model.

Triangulation of the information gathered on search strategies, the data recorded during eye-tracking sessions, and the combined responses to discussion and questionnaires, enabled researchers to analyse: 1) the user searches which show the queries used to search for objects; 2) the most extensively and frequently used (and unused) components of the interface (based on the eye tracking data); and 3) users' actual performance in relation to the specific scenarios (based on the content of presentations completed by participants).

3. Results

Table 2 below shows the results sets (at the time of the study) for Text, Image, Video and Sound materials for a simple search using the name of each city selected in the assignment (participants in Fermo chose to present a virtual portrait of Rome).

Table 2: Europeana "simple search" results for assignment cities

	Text	Images	Audio/Video
Sofia	35	668	34
Amsterdam	3,653	69,440	381
Glasgow	678	33,842	1,541
Rome/Roma	1,509/1,604	27,007/ 13,853	534/213

An inevitable consequence of adopting such a thematic approach was a marked difference in levels of digital representation (the number of digital objects available in Europeana for each location) for different geographic regions; however, the repetition of a single generic and fixed assignment

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throughout would have resulted in more problems, for example, with regards to the language of retrieved objects in different cultural locations.

Table 3 gives the total number of presentations prepared by the various groups and the range of material types retrieved by participants in response to the task. In some instances (as in the school groups), two participants worked jointly on a single presentation, therefore, the number of completed presentations is lower than the overall number of participants in these cases. The number of slides populated with text, image or audio/visual materials is also lowest for Sofia which also reflects the relatively low ranking of Bulgarian institutions in the provision of digital collections to Europeana.

Table 3: Number of digital objects' types retrieved during task by participants

	Completed presentations	Textual resources	Image files	Audio/Video files
Sofia	15	0	0	3
Amsterdam	19	6	10	7
Glasgow	24	10	15	5
Fermo	10	5	8	0

The 8 separate tasks of the assignment required users to formulate searches that addressed differing levels of generality/specificity. From the point of view of the digital object model used in Europeana, the various tasks addressed a range of metadata fields to retrieve a variety of material types; and also involved the necessary use of various functional components. As a key aim of the study was to discover areas of difficulty for current users of the Europeana prototype, deploying a range of tasks which addressed matters of both content and functionality was deemed to be the most efficient approach.

The sample slide in Figure 1 illustrates the materials retrieved from Europeana by one Glasgow-based participant for *Scenario 5: finding materials on a specific predefined subject*, in this case the Mackintosh School of Art. The slide is representative of the difficulties encountered by a number of participants in completing the task for 3 reasons: 1) the low quality resolution of the thumbnail demonstrates the difficulty of participants in retrieving presentation quality images; 2) the insert of the Quicktime icon highlights the lack of direct access to (often subscription based) audio/visual resources experienced by the groups, and 3) users commented on a lack of textual material available to support findings.

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Figure 1. Sample slide showing materials retrieved from Europeana by a Focus Group participant relating to the Glasgow School of Art designed by Charles Rennie Mackintosh

Table 4 below outlines the levels of performance and problems encountered across the focus groups for all 8 usage scenarios deployed.

Table 4: The 8 Usage Scenarios used for the assignment

Scenario 1	Finding texts on a predefined topic
Slide title	What do people <i>write</i> about the city of... Sofia, Amsterdam, Rome, Glasgow
General description	Participants working on assignments were tasked to identify and use reliable text resources, copy them and supply a reference to sources.
What problems were experienced?	<ul style="list-style-type: none"> • It was impossible to understand materials in foreign languages (experienced in Sofia, Fermo). • Maps were received as text objects (Glasgow). • In many cases texts were retrieved as digitised images and could not be used or copied easily. • Few participants added references to indicate the sources of documents.
Scenario 2	Finding images on a predefined topic
Slide titles	How do people <i>see</i> ...Sofia, Amsterdam, Rome, Glasgow?
General description	Participants were tasked to identify and use relevant images, to copy the image files to their presentations and supply a reference to their

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	source.
What problems were experienced?	<ul style="list-style-type: none"> • Images were most easy to find. • Concerns over image quality were raised, regarding the size and resolution of image files.
Scenario 3	Finding audio and/or video materials on a predefined topic
Slide title	What are the <i>sounds</i> of the city?
General description	Participants working on the assignment were asked to identify sounds which might be either typical of or unique to their city. They were expected to be able to access audio/video files and insert the resource within their presentations whilst supplying a reference to the source.
What problems were experienced?	<ul style="list-style-type: none"> • Big challenge to access video materials. • Audio materials easier to find and use • Generally difficult to copy such objects into presentations. • It would be helpful to have previews of material available through subscription.
Scenario 4	Finding materials presenting the same object in different times
Slide title	How has the city <i>changed</i> over time?
General description	Participants were asked to identify materials, images of landmarks etc. which could be said to represent their city in different historical periods. They were expected to be able to access and use the resource within their presentations and supply a reference to the source.
What problems were experienced?	<ul style="list-style-type: none"> • Users experienced difficulty in having to “guess” what digital objects were available on Europeana relating to their cultural heritage at different times – this would be made easier for users if the range of resources related to the same object were linked.
Scenario 5	Finding materials on a specific subject (like a building, place or person)
Slide titles	<i>Sofia as saint, princess & city; The Royal Palace on Dam Square; The Fontana dei Quattro Fiumi in Piazza Navona; The Glasgow School of Art.</i>
General description	Participants were asked to identify materials related to a building or landmark of popular/ iconic status within their respective cities. They could focus on its appearance or use in an historical period alongside the contemporary one. They were expected to be able to access and use the materials in presentations whilst supplying references to sources.
What problems were experienced?	<ul style="list-style-type: none"> • Student in Bulgaria experienced problems with polysemy of the word “Sofia”. • Although this appeared an easy task with specific objects to search for, it seems participants had difficulty in locating digital objects which matched their knowledge and expectations.

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Scenario 6	Finding materials on a significant historical event
Slide titles	What happened in 1853?; Roma during the Ventennio (1924-1945); What happened in Glasgow's George Square in 1919?
General description	Participants were asked to retrieve materials relevant to a specific historic date or event. They were not restricted to what material they selected to represent the event and were encouraged to seek primary as well as secondary sources. They were expected to be able to access the materials for use in presentations and supply references.
What problems were experienced?	A general observation is that participants did not use the timeline to search for answers of these questions but rather performed general searches combining the name of their city and the year in question.
Scenario 7	Finding materials on a topic of the participants' choice within the context of the general theme
Slide title	Use this slide for your own material...
General description	Participants were invited to present materials on a subject of their own choosing. They were not restricted to what materials they could select (as long as the subject was in keeping with the thematic context of the task) as long as reference to sources on Europeana were used.
What problems were experienced?	This task redirected participants to browse mode; a low number populated the slides due mainly to lack of time for completion.
Scenario 8	Identifying the providers of digital objects who contributed the highest number of objects on a particular topic
Slide title	Europeana and... Sofia, Amsterdam, Rome, Glasgow
General description	Participants were requested to provide feedback on the institutions and partners who had supplied the most materials on their city in Europeana. Feedback was also gathered on what they considered to be the most useful aspects of the site and their recommendations for its further development.
What problems were experienced?	Generally participants did not look at the drill-down options of the search to provide the information but responses were based on their impressions of what types of materials they had retrieved during the assignment.

4. Discussion

The selection of tasks allowed for consideration of what specific difficulties were experienced in various usage scenarios. Older (more professional users), for example, complained of not being able to complete tasks due to a lack of granularity encountered in the recording of some objects in Europeana (e.g. maps being classified as texts), and cases where textual materials could only

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be retrieved as digitised images; whilst younger users, (who found images most easy to find) complained of not being able to freely access audio/video content in order to complete tasks, or find contemporary materials to reflect changes in their city over time. Generally, both constituencies of users expressed concerns over image quality, regarding the size and resolution of image files, stating also that it would be helpful to have previews of the materials currently available only through subscription.

The tasks of the assignment were not purely navigational but included a number of necessary navigational elements, such as use of the Europeana advanced search, time-line, results tabs and date-filters. Eye-tracking data revealed, however, that participants did not fully investigate the various drill-down options available on the search interface, and analysis of search data revealed that participants rarely used advanced search options or additional functionality but rather performed variations upon general search themes.

5. Conclusion

The CDLR-led User and Functional Testing study demonstrates that it is possible to develop large scale digital libraries, such as Europeana, with the extensive involvement of end users. In order to track the evolving requirements of both “digital natives” and other users, it is hoped that such innovative studies of digital libraries in the cultural heritage domain will continue to be conducted; a domain which is multi-cultural and multi-lingual, and whose constituencies of use seek better and more efficient forms of digital representation from their online cultural heritage institutions.

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