

The 7 Basic Functions of a Digital Library - Analysis of Focus Groups about the Usefulness of a Thematic Digital Library on the History of European Integration

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Abstract. This paper presents the main results of a study involving an original user-centred design approach to modify and improve a specific digital library (DL) related to the history of European integration. The ultimate goal of the project is twofold: (1) to find ways to improve end-users' use of this thematic DL; (2) to develop an original method to measure real users' needs and mental representation. This user-centred approach is based on focus groups, this technique being a powerful means to evaluate services or test new ideas. In our study, more precisely, focus groups were set up by conducting interviews with 58 users (researchers, professionals in documentation, journalists, historians, teachers, students, ergonomists, politicians, computer engineers, etc.), but including four to five people at the same time in the same group. Each of these 14 focus groups was videotaped for a 3-hour period and all verbalisations (needs, viewpoints, etc.) were transcribed. Our analysis showed that the users' needs can be expressed through seven basic functions which match the users' expectations. This paper brings together the process by which these functions were identified and also discusses the interests, limitations and possible generalisations of these functions in the context of all digital libraries.

Keywords: digital library, functions, function analysis, user-centred design, user requirements, user needs, ENA, European integration.

1 Introduction

Although there has been considerable investment by organisations, academics and researchers targeting online resources [11], little attention has been paid to the effective use and usability of these digital systems [17]. Moreover, in updating and introducing a new version of digital library (DL) services, end-users should be comfortable with the new version and should not struggle to complete their tasks and to be able to “find what they need, when they need it and in a form they want it” [2]. Even if some specific problems have been identified in prior empirical studies, e.g. the quality of

sources [3], diversity of the users' knowledge [13], users' perceptions [12] and usability [17], work remains to be done by designers [9]. In this paper, we intend to analyse the real and effective needs of users of a specific DL [16] and to deal with the problem of what is a "good" DL [10]. In the next section, we will introduce the social construction of needs in the field of digital libraries. In section 3, we will describe the problem and related method to solve the key issues. Section 4 will discuss the results.

2 Social Construction of Needs of Digital Libraries

From a general end-user point of view, technological environments are the product of their activities. Nevertheless, if we tend to perceive these environments as an "external" world of obvious things, this can be an error of assessment. Technology does not exist by itself; technology is primarily a social construct, even if many designers reject and/or deny this social constructivism.

2.1 Limits of Prior Studies

Design approaches are often deterministic. These approaches support the idea that an artefact is designed in an autonomous or independent way. In this case, technological progress is seen as imperative, determining many dimensions of the user's needs and a large number of the social dimensions involved in the use of the technologies. In other words, this progress is perceived as the result of scientific discovery applied to technology and social change.

However, sciences do not generate technological innovation; in our view, specific groups of individuals (i.e. end-users) build a social representation of what they desire to use. These individuals have complex and interdependent relationships, and take part in innovation by building interactions between society and technology.

2.2 Principles for an Innovative Approach Based on the Social Construction of Users' Needs

Our approach is both based on the theory of the social construction of technology (SCOT [2]) and on methods to produce the social construction of the user's needs [6].

According to the model elaborated by Pinch & Bijker, the social construction of technology is a theory within the field of sociology of technology and society. The SCOT theory argues that technology does not determine human action but rather that human action shapes technology. The way to understand and design technology is first to refer to the social context of the technological use. This approach highlights the importance of three social constructivist concepts:

- Interpretative flexibility: each technological artefact has different meanings and interpretations for various groups. Every social group has different priorities and regards the artefact's features in different ways. These distinct interpretations create different problems to be solved. For example, what should be prioritised: performance, aesthetics, convenience, usability or robustness?
- Relevant social groups: end-users and producers of the technological artefact are the most suitable groups to address the issue of understanding its features. Many

subgroups can be often delineated. But sometimes there are relevant groups who are neither users nor producers of the technology, such as journalists, students, multicultural specialists, politicians and teachers. Distinctions may be made between the various groups based on their shared or diverging use and assessment of the technology in question.

- Design flexibility: there are many ways of designing technologies. A design is the result of a decision process, this process trying to construct technical possibilities to reflect the different points of views of relevant social groups.

So a new technology cannot begin to be designed without understanding how that technology is embedded in its social situation. Comprehension of the social context depends on methods used to establish the user's needs and to analyse them.

From a methodological point of view, previous studies [5, 6, 8, 9] insisted on the fact that need cannot exist as such outside humankind, outside history and outside the society that generates it. The user's need is a social construction. Need does not build itself in an isolated manner. Need is the result of complex transactions between a user, a designer and an environment where imitation, learning, co-construction of knowledge and sharing of representations play an essential role; it involves reciprocal process validations. Needs emerge in and through social interactions and through the mediation of language. When designing an interface, if the user and the designer are not able to solve their own problems, they will have more chance of achieving their objectives by means of cooperation and social interactions. Therefore, needs emerge from collaborative efforts where users and designers mutually enrich their knowledge by being confronted with the knowledge of others. This knowledge, which ultimately shapes the representation of needs, can be obtained by using participatory and creative methodologies. The target of these methods is to explore the intellectual creative works generated by relevant social groups. Within the scope of participatory methods, verbalisations are produced concerning new forms of ideations which might be useful for users. In short, the benefits anticipated by implementing participatory and creative methods are the development of technologies which are useful, usable, acceptable and adaptable for communities of users.

2.3 Implications for the Design of a Digital Library

The approach centred on the social construction of users' needs involves taking different dimensions into account in order to understand users' requirements. This approach draws on the following ideas, which it seeks to develop.

We consider that a DL is a social reality before becoming a technological reality. This reality is not a fixed construct. It is built on the basis of social interactions and sharing (or not) inside social groups. This reality is essentially built from conversations (face-to-face or technologically mediated) between individuals who co-produce representations about the use of a DL. They share and disseminate these representations. Each social group will develop a flexible interpretation of the DL, its functionality, its aesthetics and its overall usage. We must therefore look at the most relevant communities of users to promote flexible interpretations and understand the degree of familiarity of each group with the future of the DL. The design of an artefact, such as a DL, must be viewed from the "perspective" of each relevant group, even if, and because, these perspectives are different. But the views of the social groups are ultimately processed in the same way by the designer.

The design has to take into account variation in the flexibility of interpretation, which converges into a common representation of the DL. When there is convergence of views, this leads to a socially constructed innovation. Thus, the contribution of a group to a specific technology (and vice versa) is strongly related to the degree of familiarity of its members and their shared knowledge.

Because language is the primary way to construct, share and disseminate representations about the future DL's functions and attributes, analysis of verbalisations produced by relevant social groups must be central.

3 Problem and Method

The challenge of the ENA (European Navigator, www.ena.lu) project is to preserve digital content on the history of European integration [1, 7]. For this project, our main problems and issues were the following: How can we generate a situation that provides conditions favourable to the social construction of users' needs with regard to the DL? How can it be monitored? Does this situation provide a relevant expression of users' requirements? Does this situation accelerate the ideation of usable features for the DL? As we have already pointed out [6], users' needs are social constructions: the aim is not exactly to analyse these needs, but to create a social situation in which they may become apparent. To do this, we establish a method of user comprehension based on the principles of (1) social construction of users' needs and (2) participatory and creative design.

Because experimental studies, laboratory testing or job analysis are not relevant for obtaining real needs, producing in-depth exchanges between end-users or obtaining qualitative information such as emotions [8], it was decided to use focus groups for our study. These focus groups were used in order to extract qualitative information from the end-users taking part and to investigate whether participants felt that they shared similar problems and experiences. It was felt that this technique would be an effective way to probe the problems they were facing, in particular identifying barriers to their use of the DL, their perceived benefits and their needs. Table 1 presents the steps related to our focus groups.

Table 1. General organisation of the process for collecting users' needs with a socio-constructivist approach.

<ul style="list-style-type: none"> • Definition of communities of practice: What communities are involved in the project? The proposed solution is to map communities in order to identify those directly or indirectly involved in the use of the DL. <ul style="list-style-type: none"> — Principles: The purpose of defining communities of practice is to choose relevant social groups to express needs regarding the evolution of the DL. The aim is to gather as much information as possible on people who may be affected by the project and to determine a profile of users of the DL. — Results: 14 communities of practice involved in the use of a digital library on European integration were defined and approved by the head of the DL (researchers/historians, lawyers, professionals in documentation, journalists, teachers, cross-cultural teachers, students, PhD students, software ergonomists, politicians, computer engineers, experts in intercultural studies, experts in new digital leisure, members of historical associations).
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Table 1. (Continued)

<ul style="list-style-type: none"> • Identification of communities' experts: Who are the experts in this community? Who can speak for this community? Who are the legitimate representatives for this community? The proposed solution is to contact institutions to produce a panel of experts. <ul style="list-style-type: none"> — Principles: A laboratory engineer contacts a number of individuals to find community experts and uses social networks to identify the experts' communities. They are invited to participate in a filmed focus group for 3.5 hours. An expert of a community of practice is an individual who can speak for his/her community. He/she is a legitimate representative for this community. — Results: 58 experts (from France, Germany, Luxembourg and Belgium) agreed to participate. The list of experts was validated by the initiator of the study. • Organisation of 14 video-recorded focus groups: What do they think? Who are they? What do they do? How do they see the future? The proposed solution is to organise a group working session using expert "focus groups". The working session will be video-recorded and conducted with the aid of various tools. The leader of the focus group will target expertise and the community. <ul style="list-style-type: none"> — Principles: 14 focus groups were organised in three phases: (1) participants were asked to speak freely about subjects relating to European integration; (2) participants were asked to discuss some sections of the existing DL; (3) participants were asked to organise knowledge about Europe by carrying out a short card exercise. Each session should last 3 to 3.5 hours. Because focus groups are basically multiple interviews, many of the guidelines for conducting focus groups are similar to those for conducting interviews. Focus groups were conducted with four to five communities of experts who were given equal status in the programme. — Results: 50 hours of video records; representation of ideas of each relevant social group; ideas for improving the functionality and usability of the DL; better representations of users (direct, indirect, primary, secondary, etc.); considerations on the future of the DL (content, status, organisation of information). • Results analysis: What knowledge is useful for designing the DL? The proposed solution is to summarise the results of each focus group, to define all ideations discussed in each social group, and briefly to explain the main function of the DL. <ul style="list-style-type: none"> — Principles: A content analysis was carried out on the 14 focus groups. The verbalisations of each focus group were summarised and a list of major improvements was drawn up. — Results: 53 new ideations were listed and the descriptions of the 7 basic functions of the DL were described. • Consensus workshop: How should the knowledge produced by the different groups be put to use? How should the different results be prioritised? The proposed solution is to hold discussions with the initiator of the study and try to reach a consensus. <ul style="list-style-type: none"> — Principles: A "consensus workshop" is a standard method to conduct a process of collective reflection to discuss controversial issues and reach agreement on joint recommendations. The main objective of consensus methods is to develop recommendations modelling the opinion of experts to strengthen the objectivity of the requirements produced. It is particularly relevant in cases where the subject matter is controversial. — Results: share and validate the seven basic functions.

4 Results and Discussions: "The Seven 'A' Functions"

The focus groups highlight expectations, needs, gaps and desires. Corpus analyses stress different types of features that people find useful as a whole. We will show that

a DL is not only a system archiving relevant information, but that users want to enjoy a total of seven useful functions, as we explain below:

1. **Function: To Archive resources:** “to give efficient access to relevant data”.
 - a. **Definition:** To sort rational, reliable and organised resources and to make them easily accessible and usable for users by specifying their usage rights.
 - b. **One example of archive needs constructed by focus groups**

User expressions	“We need disasters, errors, things that have gone wrong.” “What didn’t work is also interesting for the historian.” “We should not be limited to the official version.” “There should be horizontal links for more in-depth information.”
Ideas & solutions	Archive documents as widely as possible, including those which may be controversial. Include links to “less official” websites and comment on the links. Explain to the user what might be found on other sites.
Focus group	Researchers, historians, multicultural experts, teachers

2. **Function: To Accredite the information:** “to improve the credibility of the DL”
 - a. **Definition:** To officially recognise the DL as a credible institution with credible expertise. The DL must be an authoritative source of knowledge.
 - b. **One example of accreditation needs constructed by focus groups**

User expressions	“Have comments made by credible historians.” “To be accompanied by criticisms on other aspects.” “We cannot be limited to facts.”
Ideas & solutions	Involve facts and documents with contextualised explanations written by European historians. Comments by expert historians are important. The authors of academic papers must be cited.
Focus group	Teachers

3. **Function: To Actualise knowledge:** “to update the knowledge”
 - a. **Definition:** To update the information and provide up-to-date knowledge is an ongoing user need.
 - b. **One example of actualisation needs constructed by focus groups**

User expressions	“Have home pages linked to the news.” “Europe is not over but under construction.” “We need information on Europe relating to the news.” “There should be a link with the news of Europe.” “Reflect the fact that the story does not end every day.”
Ideas & solutions	Making homepage more attractive. Zoom on a point of relevance of a European country. Give news on the various European countries.
Focus group	All.

4. **Function: To Analyse the data:** “to help the user to interpret the archives”
 - a. **Definition:** To help the user to analyse data. Users express the need to have usable systems to analyse the archives. The DL should promote

understanding of facts, comparing the resources, giving its cultural referents or contextualising ideas. The DL has to offer evidence of analysis to identify the constituent historical, geographical, cultural, artistic, social, psychological and political facts and archived events.

b. One example of analysis needs constructed by focus groups

User expressions	“Have modes of entry other than chronology, institutions and data formats or search engine information.” “The history is seen as too monolithic and official.”
Ideas & solutions	Give other modes of entry (geography, countries, capitals, maps, articles of law, treaties, values, identity, etc.). Link the archives to software data analysis.
Focus group	All groups.

5. Function: To Affirm an identity: “to express a good, positive and relevant image”

a. **Definition:** To assert, point out or affirm the corporate identity behind the DL; this is an important background for interpreting the archives based on the nature of the DL. The objective is to affirm the DL’s identity and therefore to seek to differentiate it and put forward a specific identity.

b. One example of identity affirmation needs constructed by focus groups

User expressions	“A digital library on the history of Europe should be a place of cultural democracy.” “Must express European values.”
Ideas & solutions	User interface and interaction design in line with European values.
Focus group	Experts in new cultural practices, multicultural experts.

6. Function: To Associate: “to help users to connect with specialised social networks”

a. **Definition:** Involving various forums (individual or collective, private or public) in developing common knowledge.

b. One example of association needs constructed by focus groups

User expressions	“Have a discussion forum under the supervision of a moderator.” “Create a network of exchanges between citizens or between businesses on specific European topics.”
Ideas & solutions	Have an access code and identifier to monitor users’ credibility. Build European forums. Boost friendship groups.
Focus group	Multicultural experts, politicians, ergonomists, legal experts, experts in new cultural practices,

7. Function: To Animate: “to increase user interest by developing digital events”

a. **Definition:** To stimulate the users of the DL by encouraging them to produce and exchange knowledge.

b. One example of animation needs constructed by focus groups

User expressions	“Relationships between researchers are important but not sufficient.” “It is necessary to facilitate the relationships between research scientists to solicit papers, publications, memoranda, etc.” “Much work is performed in history research centres but this is not properly valued.”
Ideas & solutions	Developing the relationships between research centres in European history. DLs might help identify historical research, i.e. lists of theses written on the history of Europe, dissertations, etc.
Focus group	Experts in new cultural practices, historians.

Technology has often overshadowed social practice in DL design. DLs are complex, heterogeneous social entities that are difficult to understand without considering their social implications. Our rule of the seven basic functions underlines the fact that users would like to have large patterns of activity which are almost socially oriented.

Generally, a DL offers only the first three functions: (1) Archiving knowledge in different forms and formats; (2) Ensuring the credibility of its information; (3) Actualising knowledge by keeping it up to date. However, DLs have not yet focused their efforts on new features that facilitate analysis of records by increased visualisation, intelligent sorting or statistics analysis. DLs don't make much effort to assert the consistent identity of their contents and thus to enhance their external image. DLs generally do not look to engage users and develop social networks of users. Finally, DLs do not desire to stimulate users willing to contribute to their development by promoting the exchange of information, or by directing users to participate in one-off virtual events. There really are new needs to explore!

5 Conclusion and Prospects

The design of a digital library requires the identification of the needs of users who interact with this system. Need is often the starting point for technology projects. Understanding it is complex and delicate, particularly when this determines the success or failure of the digital library. Far from a linear design point of view where the need is seen as a finished object, this paper shows that users' needs are social constructions which can be extracted from relevant conversations with users. As a result, the understanding, development and formalisation of users' needs involves establishing a user-centred design process to produce new knowledge built in conjunction with experts from relevant user communities. Placed in a focus group, communities of experts have specific needs, requirements, expectations and desires – all statements that we classified into seven categories, “the seven A functions” (to **Archive**, to **Accredit**, to **Actualise**, to **Analyse**, to **Affirm**, to **Associate**, and to **Animate**).

Even if this research highlights new functions for digital libraries, as explained by Wilson [17], the discussion on the enormous problems of defining “information need” and how “information” can satisfy the end-user is still open [8]. These seven rules

have to be operational and efficient in order to turn them into features for designing human-computer interactions. But that is the subject of another publication!

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