Workshop report: Usability of Digital Libraries @ JCDL'02

Ann Blandford
UCL Interaction Centre
University College London
London WC1H 0AB, U.K.
A.Blandford@ucl.ac.uk

&

George Buchanan
Interaction Design Centre
Middlesex University
London N14 4YZ, U.K.
G.Buchanan@mdx.ac.uk

The motivation for organizing a workshop on "Usability of Digital Libraries" at JCDL'02 was the recognition that digital libraries will only realise their potential when they are usable, useful and used by a broad cross-section of users. An interviewee in one of our earlier studies on experiences of working with digital libraries commented that "It's like being given a Rolls Royce and only being able to sound the horn"; in other words, digital libraries are potentially powerful tools, but only if users are able to harness that power and take it in fruitful directions. As with all new technologies, there will be early adopters who will persevere with using systems almost regardless of the costs and benefits; however, to have the impact commensurate with current investment, it is essential that there be take-up by a much broader community of potential users. As one participant in the workshop observed, the notion that "'build it and they'll come' is a lie".

The workshop took place on Thursday 18th July, with 32 participants. Participants represented a variety of backgrounds and perspectives on usability, from practitioners with responsibility for introducing digital resources within their own libraries, whose experience was well grounded in the demands of delivering effective services here and now, to researchers from various disciplines (human–computer interaction, information science, social science, computer science), who took more theoretical approaches to issues of usability.

Ten papers were presented at the workshop. These covered both practical and theoretical aspects of the topic. Practical presentations described both empirical and analytical approaches to evaluating the usability of particular digital libraries.

Matt Stoeffler described a "User study of multi-collection text retrieval", in which they tested users' ability to complete pre-set tasks within a library comprising multiple collections. One of their important findings was that, while the concept of a 'collection' within a library is often helpful to librarians and curators, it causes great confusion for most end-users, who have difficulty anticipating which collections desired information might be found in. In a similar vein, Jessica Hovater presented the results of "Usability testing of the virtual data center", through which users can both access data and perform a range of analyses on that data (e.g. statistical tests). One of the striking features of this system is the approach to integrating information seeking and information use within one streamlined system. Taking a more strategic approach, Casey Jones and Tamara Sumner presented a discussion paper on issues surrounding "Evaluation of the National Science Digital Library". Here, the question is not how to evaluate a particular system, but how to evaluate and improve an organisational structure and development process – a much less well defined problem.

Cédric Dumas entertained everyone with a demonstration of three contrasting visualisation systems that are supporting a formal usability evaluation of various representations of the same library system. This was accompanied by a presentation of a paper, "Libraries: comparisons between the real and the virtual in 3D, 2D zoomable and 2D arborescent". This provoked substantial discussion on the relationship between users' experience of physical and virtual libraries, and how these experiences might reinforce or disrupt each other. In a presentation entitled "An investigation into the application of Claims Analysis to evaluate usability of a digital library interface", Suzette Keith addressed a different kind of gulf – that between usability specialists and developers. In particular, she highlighted the difficulty for developers of recognising potential user difficulties when working with a new system because they have (typically) built "the best possible system". Whereas the approaches presented in the first few talks were essentially controlled empirical studies or analytical, the following two talks took a more explicitly qualitative approach to evaluation and design.

Julie Parker discussed a user study based on in-depth interviews with specialist end-users on "Searching digital image libraries". This talk raised issues such as how the activities of direct searching compare with using an expert intermediary (a librarian who is familiar with the image library), of how the activity of searching for images fitted in with other aspects of a user's work, and of how images with particular, impossible to articulate, features could be located or eliminated from the search.

After lunch, the focus shifted somewhat from evaluation to design. Bob Sandusky presented a paper on behalf of Ann Bishop and Chip Bruce on "Usability research as participative inquiry". This work again raised issues about how to engender effective interactions between different stakeholder groups – in this case between (often disadvantaged) user groups, system developers and information providers. The importance of valuing users' prior experience as contributing to design was emphasised in this work. The following two papers both sought to develop a better abstract understanding of the information search process, independent of users working with a particular system or in a particular context. Hanna Stelmaszewska presented work on "Patterns of interactions: user behaviour in response to search results", in which she focused on the difficulties users experience when search results fail to match user expectations, particularly in number: different user strategies for narrowing results sets (when too large) and for expanding sets (when too small – typically 'no matches') were presented; in particular, users' tendency to give up searches if they fail to get good results within two or three attempts was highlighted. Kyunghye Kim presented "A model-based approach to usability evaluation for digital libraries", in which she proposed a process model for understanding the search process, and illustrated how the process model can be used to support usability evaluation and re-design.

Finally, Bob Sandusky presented preliminary work on "Digital Library Attributes: Framing usability research". In this he proposed a classification scheme for categorising various aspects of digital libraries, including system designs, contexts of use and design processes. This framework was welcomed by many practitioners in the audience as providing a good 'checklist' for aspects to consider when designing and deploying new digital library services.

One of the great strengths of the workshop format is that it provides plenty of opportunity for discussion, and this workshop was no exception. Inevitably, discussion revolved more around unresolved issues than (for instance) past achievements, although the importance of these should not be underestimated. Various themes emerged through the presentations and discussions, as follows.

On evaluation:

- One question that arose several times was: "what *is* usability?" There was broad agreement that the term includes many aspects: as well as performance measures such as efficiency of interactions, avoidance of user errors and basic ability of users to achieve their goals with a system, 'usability' should account for affective aspects of interaction – e.g. 'frustration'. In addition, it is important to recognise that usability includes the larger context within which the search is taking place.

- In the course of the workshop, as illustrated above, a variety of methods of usability evaluation – qualitative, quantitative, model-based, participatory – were presented. At present, we have a relatively immature understanding of what techniques are appropriate for addressing particular aspects of design and evaluation. This is definitely an area for further work: while usability specialists may have the skills to define suitable methods depending on the context in which they are working, the constraints they are operating under and the particular questions a study is aimed at addressing, this understanding needs to be codified so as to be accessible to non-specialists such as librarians. A particular question concerned sample sizes: many of the studies reported were based on small numbers of subjects (e.g. 6 - 10); in some cases the small sample size may represent a 'short cut', or lack of rigour in the study; in other cases, notably where the analysis of each user is in great depth, such apparently small numbers may be appropriate. In summary, there is a need for further work on methods – including an understanding of how to balance rigour, appropriateness of techniques and practical limitations – for analysing usability.

- One of the particular difficulties faced by many developers of digital libraries is that of knowing who the users are. This presents a challenge in selecting representative samples for (empirical) user testing, for creating scenarios of use to guide design and evaluation, and for identifying user groups for participatory design. An associated challenge is that of devising appropriate incentives for study participants: *why* should particular users invest time in helping evaluate novel digital library systems? This, of course, recognises the need to study representative user groups, as other studies are liable to result in designers / evaluators making inappropriate inferences.

- Associated with the difficulty of accurately identifying user groups is that of accurately identifying core classes of user tasks that the system is expected to support. There was general agreement that user goals and design solutions need to 'fit' … but there is a cycle of interactive development, whereby systems are (in principle) designed to address recognised user goals, but users may then recognise new possibilities which leads to the definition of new goals, which the system is not (yet) designed to support effectively. Particularly in the context of empirical evaluation, therefore, one of the outstanding challenges is to identify reliable means of defining appropriate user tasks for testing.

- It was recognised that – probably more so for digital libraries than most other kinds of computer systems – there are different types of users. One obvious dimension is that of novice / expert (or 'power') user; the process whereby general information users gain expertise in information seeking is as yet poorly understood. Another dimension is that of end-users and librarian, where the main differentiating feature between these groups is the way in which information retrieved is subsequently used; as one librarian put it (with a smile on her face): "we're not normal people working on reference desks".

- It was recognised that there is little understanding about what user assumptions are about what constitutes a library. In one of the presentations, the library was described as a 'buffer' between user and data, which is rather different from a user's experience of a physical library. The 'library metaphor' that is intended to support users and developers in thinking about what is possible within, and gain appropriate understanding of, a digital library may at times help and at other times hinder the user's developing understanding and ability to work effectively with a particular digital resource.

- There is a general problem of user familiarisation – with process, content, and other features of any particular library. Pierre Cubaud presented a graph giving one measure of user competence with a particular library that indicated – though further research would need to be done to validate the assumption – that general user competence is not perceptibly changing over time (meaning, here, two years, rather than hours or days), although it is likely that that of individuals is improving. One of the tensions in library development is that between rapid evolution, as new problems are recognised and new design solutions become possible, and maintaining consistency of interaction so that users' familiarity with a particular system – and hence users' competence in using it – can be retained.

- One particular consensus that emerged was the inappropriateness of the 'collection' as a user concept. While this concept has a place within many physical libraries (especially where users can easily ask a librarian where particular resources can be found), and is perceived as significant by many information professionals, it has been found to create a barrier for end users, for whom the focus is generally on the information rather than the route to finding it.

- Similar problems were observed with the use of metadata fields for search – many users simply not comprehending the role and purpose of different fields. However, for some specialist user groups, that very facility was very important where the role of words (e.g. in either author or title field) had a significant impact on meaning. Again the target user group would have a significant impact – general access libraries tending to rely less on metadata for access. Problems with cross-collection searching, where metadata formats varied, and metadata quality could vary, were also identified as related problems.

- One theme that emerged in discussing the relationship between physical and digital libraries was that of understanding the roles of information intermediaries as experts mediating search. The conditions under which expert intermediaries contribute

positively to the user's interaction with information, and when users are better off searching for themselves, are not yet at all well understood.

- We were, rightly, reminded that even though digital library use can be difficult for anyone, the needs of less able users present additional challenges for design.

Users and uses:

The requirements on design and evaluation are strongly informed by an understanding of how systems are used, and here the experiences of professional librarians were particularly informative.

- It was observed more than once that, for most users under most circumstances, use of digital libraries is discretionary. While use is made attractive by the ease of accessing the desktop (you don't even need to leave your office!), there are generally other possible sources of information, such as the physical library or asking a friend. Indeed, with the proliferation of digital resources, users now have wider access to information and may use libraries other than the ones designed specifically for them. As one participant observed, "what they need is information, not to use this library". However, it has also been observed that digital library access can sometimes increase access to the physical library resources too, as users gain awareness of the information resources that are available.

- There is a widespread need for integrating physical and digital resources and understanding who has access to one, the other or both, and hence how the different resources may complement each other effectively. The value of instant gratification – e.g. for physical users who can quickly be shown to the right place by a knowledgeable librarian – cannot be underestimated.

- Users don't use systems as expected! For example, users have often been found using internet chat to communicate with librarians from within the library, when the librarians are in the same physical space. The impact of available techniques for accessing information and support in different contexts need to be better understood in order to design better information use environments.

- A need to log in has been found to be a deterrence for many users (yet another user name and password); there is a need to work towards integrated information services for each user that address security, privacy and related issues effectively.

- Students have poor information handling skills. This deficit needs to be addressed – whether by improved training in information sciences or by devising design solutions that enable users to better develop skills through the activity of information search.

Design:

While many of the presentations focused primarily on evaluation of systems, it was agreed that the main need is for solutions, not just problem identification (though the one rarely happens without the other). There is usually a need for making trade-offs in design, and one of the key design challenges is knowing how these trade-offs are best made for particular design contexts.

- Effective design demands effective communication between different stakeholder groups (librarians, users, developers, HCI specialists …). The roles of users as designers and of design as a social process were discussed.
- Some practitioners applauded the idea of producing checklists of design issues to be considered. More generally, there was a recognised need for tools and techniques to support designing for usability.
- There is a need to consider potential users as well as existing ones – e.g. as social groups. This links back to an earlier observation made: that it is difficult but necessary to know (as well as possible) who the intended users of a system are. It is important to recognise the essential difference between publicly accessible and 'closed' libraries, and the different possibilities in the different situations – e.g. publicly accessible libraries cannot make assumptions about what technical infrastructure is available to users. At times, it may be necessary to choose the focus of users, accepting that other people may access the system even though they are not necessarily well catered for by it.
- The issue of interface design and exploiting users' existing knowledge and capability was discussed. For example, the question was raised as to whether being 'amazon-like' or 'google-like' was an appropriate target for design. However, no conclusion was reached, so this has to remain an outstanding research question.
- Issues of tailoring interfaces to different user groups – e.g. students, academics, others (maybe even other librarians as a particular expert group) were discussed. The relative merits of adaptive, tailored and customisable interfaces were discussed, without reaching any strong conclusions. It was, however, observed that users have a tendency to believe that other user groups may be 'getting a better deal' if they are aware that there are multiple interfaces, which may lead to resentment.
- It was observed – somewhat forcibly – that core services are not 'usability neutral'. That is: technical specialists cannot design and implement fundamental structures and algorithms (e.g. protocols) on which libraries are built, serenely assuming that their work is "neutral" with respect to the way in which the libraries are subsequently used. Every important design decision has an impact on what is subsequently possible, and usability cannot be 'added on' at the end. User needs have to be taken into account from the earliest stages and the deepest levels of design.
- Of course, one of the challenges for all who are concerned with the users' views in design is communicating those views effectively to others involved in the process of design and deployment of digital information resources. We need to learn to 'market' the need for usability, and to know the audience for 'marketing'. Maybe this remains as one of the biggest challenges for us, because usability is a privative – you don't notice when it all works well, you may not even notice if it doesn't work well (after all, fewer people will use it, and very few will complain or suggest that things might have been done better). And making systems truly usable and rewarding to use is difficult – probably as difficult as getting a novel piece of system infrastructure to perform well, but difficult in a different, 'softer', kind of way.

To close on a more optimistic note: one attendee reported that a library he is involved in saw 1.5m copies of articles downloaded in the past year. This is a finding that will be reflected in many places, representing a real increase in the accessibility of information. Digital libraries are providing a new kind of service that is increasing the use of pertinent information. They are not impossible to use, but there is scope for improvement, and many exciting challenges lie ahead in this regard. This workshop represents a step forward in the slow march towards useful, usable and used digital resources.

The papers from the workshop are all available from http://www.uclic.ucl.ac.uk/annb/DLUsability/JCDL02.html .

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Ann Blandford & George Buchanan

Workshop chairs