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Anne Christensen

Introduction

In the wake of the digital revolution, libraries have started rethinking their catalogues and reshaping them along the lines that have been set by popular search engines and online retailers. Yet it has also become a hallmark of next-generation catalogues to reflect the results of studies concerning user behaviour and user needs and to rely on the participation of users in the development and testing of the new tools. A wide array of methods for user-driven design and development are being employed, which ideally leverage discovery platforms that reflect the specifics of library metadata and materials as well as the need for attractive design and useful new functionalities.

After looking back at the history of user studies on online catalogues, we will briefly investigate methods to involve users actively in the design and development processes for new catalogues before describing and examining the outcomes of studies of users' perceptions.

Catalogues: where are we coming from?

The catalogue is the core product of any library. The accessibility of the catalogue via Telnet or later the web was considered a huge achievement because – to quote from one of Ranganathan's famous *Five Laws of Library Science* (Ranganathan, 1931), it 'saved the time of the reader' in terms of

saving them the trip to the library. But the first generation of online catalogues has to be considered as a by-product of the automation of circulation processes or metadata exchange between libraries. The early online catalogues served internal purposes in the first place, rather than being meant as a service for users.

It is therefore not surprising that there is little to no evidence about the consideration of user needs and perspectives in the literature about the development of the early Online Public Access Catalogues (OPACs). They were, however, the subject of quite extensive research after they had been introduced. Early user studies identified significant problems with subject searching (Cochrane and Markey, 1983). There is plenty of literature from the 1980s about preventing users from failing with searches other than 'known-item' searches. In response to the results from these studies, a lot of research has been conducted about supporting users with subject searching, for instance by helping them to match their terms with those used in the catalogue or by offering linguistically enhanced retrieval functionality such as stemming or spelling correction (Walker, 1987).

Frameworks for next-generation user studies: anthropological and ethnographic approaches

Sadly, the features proposed after the early user studies of online catalogues have not been extensively implemented in the standard first-generation catalogues. It is therefore not surprising that with the rise of the world wide web and its powerful search engines, library users have quickly switched to websites other than library catalogues to conduct their research. Within ten years, academic libraries lost what used to be a monopoly position for the provision of scientific information. The changes in the behaviour of users, from all types of library, have been documented in a large study by the Online Computer Library Center in 2005 (OCLC, 2005). Around the same time, two highly significant studies were published that provided valuable insights into the information-seeking behaviour of students. Both these studies employed anthropological and ethnographic approaches that had not been used before in a library context, and, interestingly, resulted in the development of new, home-grown catalogues at the respective institutions. At the University of Rochester, anthropologist Nancy Fried Foster and her team published a comprehensive report not only on searching habits of undergraduates, but on their academic work in general (Foster and Gibbons, 2007). In parallel, the

library started to develop its own next-generation discovery solution with a strong emphasis on user-centred design.[1]

Denmark's State and University Library in Aarhus examined the information-seeking behaviour of their users by encouraging them to write journals and then analysing these 'cultural probes'. This resulted in the definition of three different behavioural patterns (drive-in users, worker bees and library enthusiasts), which serve as personas for whom appropriate services can be developed (Akselbo et al., 2006). Since the improvement of the current catalogue aroused the most interest in their users, the library decided to embark on their own catalogue project, the development of 'Summa'.[2]

Similar research has been conducted elsewhere (Hennig, 2006; Rowlands et al., 2008). The findings regarding the further development of catalogues recommend seemingly straightforward user requirements: make catalogues more convenient (Calhoun et al., 2009). But how does convenience translate into features? A concern that is expressed both often and urgently is the availability of delivery options; limiting searches to available items, both print and electronic, seems to be more important to users than the actual discovery of relevant material. On the other hand, the user studies that concentrate on catalogues specifically indicate a great necessity for support in the discovery process, as well as help with the evaluation of search results. But this support would need to be very unobtrusive, since users generally feel confident about their abilities regarding the research process.

Another outcome of the user behaviour studies, which is important for catalogue design, is the time factor; users will visit the catalogue site only very briefly and a vast majority of users only conduct simple searches and look at no more than a few items from the top of the results list. A possible solution to this could be the work on new relevance ranking algorithms.

Great expectations: the next-generation catalogue

Research from the 1980s proves that librarians have been aware of their users' problems with OPACs for a long time, and they have developed what from today's perspective looks like an impressively wide range of ideas for improvement (Hildreth, 1982). Michael E. Koenig proposed the idea of enriching the catalogue with what he called 'user-supplied metadata' as early as 1990 (Koenig, 1990). Koenig was concerned about the large increase in scientific information and claimed that user-supplied metadata would help

librarians and users with the evaluation of authoritativeness, etc. The idea must have been completely forgotten, because the use of folksonomies in library information systems seemed very new when, around 2005, the University of Pennsylvania introduced *PennTags*.[3]

However, innovative ideas for catalogues date back even further. In 1964, Don R. Swanson published an article called 'Dialogues with a catalogue' (Swanson, 1964). The features listed by Swanson read like requirements for a next-generation catalogue; enrichment of bibliographic metadata with tables of contents, browsing functionality, combination of discovery and delivery services, search for similar titles and exploiting circulation data for recommendation services.

Why haven't libraries been able to implement features they knew would help users better? It is not the purpose of this chapter to answer this question. However, a look at the history of library automation indicates that vendors for library management system (LMS) software (and thus also OPACs) have been busy developing a market for themselves.[4] Only after the introduction of open-source indexing solutions like Solr[5] have libraries started developing their own search tools and, knowingly or not, have come back to ideas for catalogue functionality which are sometimes more than 45 years old.

The other reason for libraries to engage in rebuilding the catalogue has been mentioned before. With the advent of the web, users started doing their research anywhere but in the library, because catalogues (as well as other bibliographic research tools) were simply too hard to use in comparison with other platforms. This motivated libraries not only to finally start rebuilding catalogues, but also to involve users in the process. There is scarcely any implementation of a new discovery solution that has not been usability-tested or released as a beta version for discussion within the user community prior to launch.

Methods of user-centred design

The methods employed for the development, implementation and testing of next-generation catalogues are mainly usability studies and focus groups. Both these methods require only a reasonable amount of effort, at least compared to the large anthropological and ethnographic studies. Henrik Lindström and Martin Malmsten describe what a user-centred design process could look like (Lindström and Malmsten, 2008). Features are developed, preferably in short cycles, which always involve user collaboration and

feedback. In the Beluga project at the State and University Library in Hamburg,[6] new or planned features were presented to focus groups where users could discuss and comment on the features. The features were then implemented and subsequently usability tests were conducted in order to assess whether users understood and used the offered functionality as intended (Christensen, 2009).

Other implementation projects follow the same or similar routes. Results of focus groups and usability tests are mainly published informally; Yale University Library put its reports on usability tests of their VuFind installation (as well as other tools) on a specific website,[7] created by a group around Director of Usability and Assessment Kathleen Bauer. Users' reactions to Bibliocommons, a next-generation catalogue implemented at the Canadian Queen's University, have been researched by Martha Toub and Steve Whitehead and presented at the Access conference in Hamilton 2008 (Whitehead and Toub, 2008). Graham Stone published about the experiences with the VuFind installation at the University of Huddersfield, UK (Stone, 2010).

Alongside such studies, there are two other significant publications on new catalogues that examine the users' perspective on a larger scale. The OCLC report *Online Catalogs: what users and librarians want* was published in 2009 (Calhoun et al., 2009). It is, among other methods, based on a survey with more than 11,000 participants. In 2011, a German consortium conducted a web-based study and recruited nearly 24,000 respondents (Nienerza, Sunckel and Maier, 2011). With numbers of respondents this large, these studies complement the data from usability tests and focus groups (which typically have no more than 6–12 participants).

A distinctive feature of the OCLC report is the investigation of librarians' attitudes towards next-generation catalogues. The findings of this report, and the experience of libraries that have introduced their next-generation catalogues, would make for a chapter of its own. Librarians seem to be most concerned about data quality in next-generation catalogues. These new architectures require bibliographic metadata from (mostly) proprietary LMS systems to be mapped into other formats. Librarians are worried about resulting inaccuracies and the lack of possibility of exploiting authority files, thesauri and classification systems. These concerns are important, but are not really in the focus of what users expect from new catalogues. Still, with librarians as a main constituency for catalogues, these concerns must be taken into account by development and implementation teams.

User study findings

Catalogue enrichment

The enrichment of bibliographic metadata with additional information has been a requirement for several years, both by librarians and by users. An undoubted outcome of these user studies is the need for tables of contents as well as other evaluative content, such as summaries, abstracts or excerpts.

Findings concerning other enrichments, especially user-generated metadata, are much more inconsistent. There seems to be some interest in contributing ratings, reviews and tags to the catalogue, but users are also harbouring numerous concerns. In the focus groups for Beluga, both students and faculty members made a strong case for the neutrality of the catalogue, accepting only descriptive and non-judgemental information like tables of contents and rejecting the inclusion of reviews and ratings from non-academic users. Also, the motivation of users to contribute to the catalogue – either with ratings, reviews or tags – is low. In the unlikely event of them adding any significant content, they would feel uncomfortable sharing this with strangers. These results are backed up by the German study (Nienerza, Sunckel and Maier, 2011) where only 24% of the respondents stated interest in adding their own content to the catalogue.

A study from the UK's Research Information Network published in 2010 defined *trust* and *quality* as the main barriers for researchers contributing content to information systems (Procter and Williams, 2010). Students seem to be reluctant to contribute because it does not seem beneficial to them to invest time in sharing information. While *openness* and *sharing* are two core concepts of the 2.0-generation of web services, there seems to be little acceptance of this in the context of library services. It is therefore unlikely that a critical mass of user-generated metadata will be created any time soon. A possible direction for the further development of next-generation catalogues is the aggregation of this content. In order to eventually exchange social metadata between different catalogues, a standardized format would need to be developed as well as corresponding policies for terms of use.

The search process

As we know from the studies about information-seeking behaviour, users want the catalogue to be a convenient and efficient tool. Ease of use is the most important paradigm for next-generation catalogues. They typically offer a number of features to meet these needs: autocompletion, spell checking and

did you mean? functionality, faceted browsing or limiting searches to electronic and currently available items.

The feature that has been examined most extensively is faceted browsing. The Endeca-based catalogue at North Carolina State University (NSCU) was the one of the first catalogues to employ this functionality (Antelman, Lynema and Pace, 2006). There is quite a lot of research, both qualitative and quantitative studies, on the use of faceted browsing (Fagan, 2010). When asked, users sometimes seem to prefer text searching to more structured searching through facets. At the same time, results of the studies cited by Jody Condit Fagan consistently show a high level of satisfaction with faceted browsing options in general, as well as good outcomes of the conducted searches. Both labelling and order of the facets play an important role regarding the usability, but in general, users seem to understand intuitively their purpose and how to make best use of them. There is even a debate about forgoing the advanced search interface in favour of faceted navigation (Morville and Callender, 2010).

Quite surprisingly, users in the usability tests for Beluga complained about the simplicity of the user interface, specifically the lack of an advanced search interface. This seemed very odd to the development team, given how seldom the advanced search is used in the current catalogue. It seems to be very surprising for users to see such a simple interface in a library catalogue. However, when people started using the simple search, they quickly forgot about Boolean searching and advanced searching options. A recent study that compares the searching behaviour of users in classic and next-generation catalogues shows that users are 15 times more likely to refine their searches when facets are available (Ballard and Blaine, 2011).

Facets obviously seem to help users with the translation of their information needs into searchable queries. Another way to accomplish this is by using authority files and controlled vocabularies. Libraries worldwide have spent decades compiling this data, but large parts of it cannot be exploited for next-generation catalogues because it is locked away in proprietary LMS systems. To be able to use this data in next-generation catalogue environments, it is crucial that the data is made available in appropriate formats and through open interfaces. Users could be offered recommendations for search terms or expand searches on the basis of this data. This is important because evidently not only students but also scholars have huge difficulties establishing appropriate search terms (Siegfried, 2011).

Evaluating search results

Meeting the demand for convenient and efficient searching also includes working on the presentation of search results. With many of the next-generation catalogues it is easy to find at least something on any given subject. But are users able to make sense of a typical results list? As mentioned before, facets help users to refine result sets subsequent to searching. However, there is plenty of evidence that users expect the library catalogue to work like Google in the way the results are ranked. They want to see the most relevant results at the top of their lists, and don't realize that this is not the case in most classic catalogues (Schneider, 2006).

Even though more advanced library catalogues and discovery interfaces typically offer a ranking based on term statistics, this method has certain limitations and will not always produce sufficiently convincing results (see Chapter 2 for more information). The architecture of next-generation catalogues, however, allow for new and entirely different algorithms to be implemented. Dirk Lewandowski suggests a set of factors that go far beyond the standard text matching – for instance, the inclusion of popularity information (Lewandowski, 2009). The idea of mining circulation data to establish popularity factors might indeed be viable, especially if this data is aggregated from a large number of libraries, as preliminary results from the JISC-funded Library Impact Data Project indicate (Stone, Ramsden and Pattern, 2011).

Other than circulation data, libraries have even more information available that can be useful to establish relevance. The relevance of a title could be boosted in accordance with the number of items held by the library. Bibliographic metadata may also contain useful information to assist relevance ranking. For instance, ranking could be provided for a certain target audience, based on whether an item is classified as an introduction to a subject.

Testing the results of relevance-ranking algorithms is undoubtedly difficult, and even more so with several different factors in action. Additionally, there is enough evidence that just one algorithm might not be sufficient. For example, Ken Varnum developed Project Lefty the prototype of a system that takes a user's expertise level into account to establish an appropriate ranking algorithm (Varnum, 2010). Working on ranking algorithms is most certainly a very challenging task, but its complexity may not keep information professionals and librarians from trying to make the search experience more satisfying for their users.

Discovery

Next-generation catalogues are sometimes also referred to as discovery tools. Consequently, most solutions claim to be particularly helpful when it comes to subject searching. Aside from faceted browsing, there are other features in next-generation catalogues to look at as far as discovery is concerned. All studies indicate that keyword searching is the predominant way used to access a catalogue initially, but the qualitative research, especially, shows that users like the idea of being given starting points for their research. Virtual shelf browsing is one solution to that, a feature which has been brought to perfection by the Harvard Library Innovation Lab under the auspices of David Weinberger. The application ShelfLife[8] not only lets users explore the library collections but colour-codes the works according to their 'community relevance'. This is a measure which takes into account not only the circulation data, but also the usage in courses.

Collecting reading lists for courses in order to determine the local relevance is something that was discussed extensively in the context of the Beluga project. One aim of the project was to integrate the catalogue seamlessly with the learning management systems used by the universities in Hamburg. However, both students and academic staff were reluctant to share their lists. Faculty members felt that their lists were often very personal and would need revision and continued updating before being made public. Students said that they would not want others to profit from lists that had been a lot of work to compile in the first place.

It is apparent that libraries have to explain the value of openness better. We know that one quality users appreciate most in libraries is their trustworthiness (OCLC, 2005). As a result of – and not in spite of – this trustworthiness, libraries must engage in leveraging the principles of openness. The functionalities that at least students wish for can only be implemented if the necessary data, reading lists for courses or papers, are made publicly available.

Meanwhile, the users' keenness for discovery can be met otherwise. There is an obvious potential for both faculty and subject specialists in working together on providing selected, preferably annotated bibliographies for certain topics. The requirement for the transformation of the next-generation catalogue into a knowledge hub with reader advisory functions could be met (Tarulli, 2010).

Delivery

The reason why library catalogues are perceived as inadequate in comparison to Google seems to have much to do with delivery. Google provides users not only with search results, but also with full text. This paradigm shapes our users' expectations and explains why the improvement of delivery rates scores highly in all studies.

Easy-to-understand information on the availability of catalogue items is a key factor in meeting the demands for convenience. Information on the location of a physical item and its circulation status or the link to an electronic full text should be provided in the results list already. It should also be possible to limit searches to available items.

But the demand for convenient delivery options can also be interpreted in a wider sense. This demand suggests next-generation catalogues should hold more content than their predecessors. And they do indeed often contain journal information on an article level and go beyond local holdings, for instance by including other bibliographic databases or data from full-text repositories. This poses a challenge for the development of interfaces, because libraries will want to make sure that their holdings are successfully identified by their users and users will want manageable amounts of relevant information. Nevertheless, the Google paradigm is very much in place regarding delivery, and if libraries want to retain or even regain users, it seems advisable to strive for comprehensiveness as well as a steady increase of electronically available resources.

Most studies broach the subject of the export of bibliographic data to reference management tools or social networks. These features are generally met with only very little enthusiasm. This may have to do with the fact that only a very small proportion of students use these platforms. There might be more potential in creating connections between catalogues and learning management systems, but this has not been sufficiently researched as yet.

Towards user experience: likeable features

There is not much enthusiasm for connections between catalogues and social networks. Thus the integration of buttons to export data from catalogues to social networks would be 'putting lipsticks on pigs', as Roy Tennant succinctly put it back in 2005 (Tennant, 2005). Ensuring a modern look and feel to the catalogue is however still important and both librarians and vendors for library-related software have started taking up the idea of user experience (Sadeh, 2008).

Creating a catalogue interface that offers a positive user experience goes further than user-centred design. The aim is to offer a service that users like and want to use again. This still means that they have to be able to fulfil their tasks effectively. But with the high level of frustration with current catalogues, it might be advisable to put some thought into the development of particularly easy-to-use and likeable interfaces or features. The implementation team for Summon at the University of Huddersfield was rewarded with an 84% satisfaction rate, with users claiming the ease of use and simplicity as best features.

In the Beluga project, users were presented with different ideas for the visualization of the database's content and results lists. They have proven to be very fond of visualizations in general, particularly a shelf-browsing functionality and graphical representations of topics and contexts. The ability to make unexpected discoveries of content is a form of information behaviour that has often been described as 'serendipity'. Users may not actively ask for 'serendipity', but there is enough evidence that they will enjoy this functionality greatly if offered in addition to efficient goal-directed searching (Björneborn, 2008). Another example of a feature that is useful and likeable at the same time is the presentation of holdings information on a map, as employed in the Swedish union catalogue LIBRIS.[9] There is no record of users' reactions to this functionality, but with the high emphasis that users are putting on delivery information, it can be expected that it would be received very favourably, particularly in urban regions with lots of library locations.

Conclusion

The term 'catalogue 2.0' shows that functionality and design elements which are typically associated with the 'Web 2.0' seem to be relevant to library catalogues. However, it is not the 2.0-features that users want to see in the next generation of library catalogues.

Developing catalogues in the direction of social networks or folksonomies does not seem feasible because of the reluctant attitude of library users regarding the production of user-generated content. The 'social' features of catalogues are not at all what create the most enthusiasm in today's library users. Instead, users call for features which help them to search the catalogues more efficiently and conveniently. As pointed out before, at least some such features have been sketched in very early stages of the electronic catalogue, for instance relevance ranking, catalogue enrichment or browsing functionality.

But libraries are still very much social places, and tools like ShelfLife or collaborative reference management systems communities may help users to develop a deeper understanding that many of the features they wish for in searching and evaluating scientific information can only be met when more people share their expertise and experience.

The studies highlighted in this chapter have helped with the development of understanding for users' needs. Librarians who have helped to conduct these studies have characterized their work with users as satisfying and inspiring. The library catalogue is still very much the core product of any library, and librarians themselves have high stakes in this tool and fear that the involvement of users in the catalogue development might endanger the quality of the product. Qualitative and authoritative data, however, remains one of the most prominent wishes of users and libraries can provide this. The next-generation catalogue is one important interface to this data and it needs to reflect the changing patterns of user behaviour as well as the users' own ideas to fulfil its tasks.

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