Imperial College London

Library Services

Library Search UX report summer 2016

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0.0: Executive summary

During summer 2016, Imperial College London's Library Information Systems team ran a round of user experience research into the information-seeking behaviour of undergraduate and postgraduate students with a specific focus on the use of the library catalogue and discovery interface (Library Search – Primo by Ex Libris). The purpose of the work was to understand user behaviours and preferences to target development of practical improvements to the Library Search interface.

The research methodology used a grounded theory approach informed by Charmaz (2014) and comprised data collection using semi-structured interviews and comparative think-aloud exercises and data analysis using a constructivist approach. This work extends previous investigation into discovery usability and user experience and embeds a UX approach into the 'business as usual' of the Library Information Systems team.

The central research finding is that users' experience of Library Search is heavily influenced by the perceptions that they bring to Library Search when they come to use it. This is manifested in perceptions around: the role of a library and its relation to the print book; the view of how the library fits into the wider university and communicates with other areas of the university; the subjective idea of what 'relevance' means; and the perception of 'search' and time as a factor.

Key findings impacting Library Search include:
- The strong association of the library with physical space and print books.
- Library Search not being used as a starting point for information-seeking.
- The desire for close links between reading lists and library materials.
- The desire for close integration between academic departments and the library.
- The importance of keywords in searching and the lack of clarity on 'relevance ranking'.
- The difficulty of the Document Delivery process.
- Users' internalising of negative emotional experiences using Library Search making them less likely to use it in future.

This research points to future avenues of research into information-seeking behaviour. By investigating undergraduates and postgraduates at once, this research favoured broad but shallow findings: separate investigations into undergraduate behaviour and postgraduate behaviour could allow for deeper research into the unique information-seeking behaviour of these groups. Other points for further investigation include the role of reading lists, departmental recommendations, and starting points for research. There is also scope for further investigation into the emotional experience of using the library.

With regard to library systems, future research could use this methodology to investigate other aspects of library systems apart from Library Search: the use of mobile devices by library users, the use of reading list software, or other systems-based information-seeking behaviour.

1.0: Introduction

In 2015, Imperial College Library's Library Information Systems team led several user experience projects to assess the usability of their Library Search interface. With the assistance of placement students from UCL, library staff used semi-structured interviews and think-aloud exercises to determine what users thought and felt about the library's catalogue and discovery interface. The first round of research in 2015 (Primo UX 1.0) suggested that the interface was time-consuming, confusing, and overly-complicated (Primo Forum, 2015). Further research (Primo UX 2.0) suggested specifically to "remove unintelligibility from interface design" and to reorder search results (Bray, 2015). A third smaller project (Primo UX 2.5) discovered the stark differences in search behaviours between undergraduates and postgraduates or researchers and the need to incorporate features like recommendations and online help to make the interface easier to approach (Primo Forum, 2015).

The recommendations for further research from Primo UX 2.0 included studying users from a wider range of disciplinary backgrounds and educational levels, undertaking a quantitative investigation of usability, and thoroughly investigating the use of the library's Document Delivery Service through Library Search (Bray, 2015). This research project (Primo UX 3.0) specifically attempted to address these recommendations and to expand on previous testing. This report makes specific design suggestions for the Library Search interface and draws conclusions about the information seeking behaviour of Imperial College London Library users, specifically undergraduates and postgraduates studying scientific disciplines. These conclusions are relevant not just to the work of the Library Information Systems team or Imperial College London Library Services, but may be applicable or generally applied to other libraries in UK Higher Education.

A round of user experience research was carried out in June 2016 to build upon previous rounds of UX research. This report presents the methodology, findings, and evaluation from that research.

2.0: Methodology

2.1. Research objectives and questions

Library Information Systems uses an iterative approach in our user experience (UX) research of Library Search to gain better understanding of our users' information needs and uncover barriers to discovery, to design better solutions for search and discovery. In each round of UX study, we focus on specific areas which help us examine deeper our users' information needs and surface issues they experience when using Library Search. After each UX round, we are better informed through our findings to identify areas that require changes or further exploration. Each UX round also helps us to formulate, and subsequently refine, our research questions to better understand user experience in our libraries.

The research objectives and questions act as a guide to design our UX research, from planning the study to choosing the research techniques and methodology. Having clear objectives and research questions at the beginning of this UX study helped us see the different levels of the 'project'; such as understanding time and resources needed for UX sessions and the type of data (qualitative and quantitative) required to answer the research questions. As well as gaining insights to inform design and development work, we also wanted our practitioner research to expand our understanding of library users, improve our future UX research strategy, and invest in development opportunities for staff. The first step is therefore to outline our research objectives and questions and then choose the methodologies that support it.

The research objectives for this round of UX were:

- Review previous UX rounds and follow-up on areas requiring deeper investigation and suggested recommendations specifically from Primo UX 2.0.
- Expand on previous research into general information-seeking behaviour of Imperial College London Library users by studying users from a diverse sample in terms of department, subject, and educational levels.
- Undertake broad qualitative research of information-seeking behaviour to better understand how Library Search and the library fit into our users' information-seeking behaviour.
- A unique opportunity to compare the existing Primo UI with Ex Libris's newly-developed (Summer 2016) Angular.js-based Primo UI.
- Involve the Primo Forum working group in UX testing and grounded theory analysis and use this opportunity to develop further skills in UX techniques and data analysis methods for continuous improvement for future UX work.

The formulation of our research questions reflects our chosen research techniques for data collection (comparative testing, semi-structured interviews with think-aloud) and methodology (qualitative, grounded theory). Developing the research questions was an insightful process that helped us give shape and focus to the UX study. The qualitative research questions were focused on the 'why and how' of users' behaviour and their interaction with Library Search. It is worth noting our research questions changed as our

understanding of discovery issues and our users' behaviour and needs grew throughout the iterative process of the rounds of UX study.

The research questions and themes for this round of UX were:

- What are the information-seeking behaviours and needs of undergraduates compared to those of postgraduates?
- What is the role and purpose of Library Search in information-seeking?
- How do users get to Library Search as a source and how / why do they choose to use it?
- How do users approach Document Delivery as a service?
- How does the existing Primo UI compare with Ex Libris' new Angular.js-based Primo UI?

2.2. Research procedures

UX Research team: The core UX research team is made up of the LIS (Library Information Systems) team. We jointly work with the Primo Forum team; a working group made up of several members of different library teams (User Services, Academic Liaison, Information Resources, etc.) that contribute to decision-making when planning UX research and provide hands on support during the interviews and data analysis stage. We primarily use Trello to collaborate and plan as a team and Confluence for meeting notes and documentation of the rounds of UX study. For this round of UX, the Primo Forum team was involved heavily on the interview day, helping as interviewers and note-takers.

Research Sample: Based on the recommendations of previous UX research to select users from a wider range of disciplinary backgrounds and education levels, we selected a sample of users based on this recommendation. Our sample for this round of UX consists of 3 undergraduates and 2 postgraduates. The 5 users come from Environmental Policy, Civil Engineering, Aeronautics, Electrical Engineering and Earth Science. The 5 users were recruited through the Liaison Librarians. Because our research involved interviewing participants face-to-face in addition to collecting video and audio data, participants were given a consent form and information sheet to sign. We designed our consent form so it was as simple as possible with non-technical terms while also ensuring sufficient information was presented on the research so they can make an informed decision to decide whether or not they want to take part in the UX research.

Planning the UX research: Below is the list of tasks made during the planning stage. All tasks had name and status against each items to show progress. Phase 1 in the table below refers to exploring the back-end and front-end of the new Primo UI and making a start with the development work.

Week	Tasks	Details
Week 5	Overall Plan	Present Overall plan to Primo UX forum for Summer 2016

	Issues for Phase 1	Primo Forum members to provide all current known Primo issues sent to LIS
	UX Team availability	UX team will share the dates they are away in June
Week 4	Phase 1	Planning initial development work: include addressing any immediate outstanding Primo issues Categorising the changes and issues that we know we want to address
Week 3	Phase 1	Continue with Primo development work
	Design UX session format	Design and finalise UX session format: number of participants, type of participants, research ethics, data management plan, timing (lengths of sessions)
	Assign tasks	Assign tasks to UX Primo team
	Background reading	Background reading on chosen techniques / methods. Think-aloud exercises (focus on comparative testing approach) and semi-structured interviews
	Design marketing plan + recruitment	Participants recruitment plan (twitter/student union) + other marketing plans + incentives Complete final recruitment for planned sessions.
	Design sessions	Design sessions, think about questions to ask / tasks to run through.
Week 2	Phase 1	Continue with Primo development work
	Finalise sessions design	Format of interviews + finalise interview questions
	UX workshop	Training in techniques / methods
	Schedule sessions	Set up schedules for sessions. Scheduled for week 0: 13th-17th June. Weds 15th and Thurs 16th June: aim for 5 sessions per day. Book rooms for the whole day. Interviews (20 mins) > journey mapping (5-10 mins) > Comparative testing (20 mins)
	Consent forms	Design consent form and send to Karine for interview pack
	Interviewer/Facilitator guidelines	E.g. Discussion Guide, facilitator script with variables, degree of prompting etc. - send details to Primo Forum team
	Book interview rooms	Book interview rooms + room for welcoming participants etc. - send to details to Primo Forum team
	Book laptops	Book required number of laptops for sessions (power cable, other audio/video equipment) - Send to details to Primo Forum team
Week 1	Phase 1	Finalise development work
	Follow up marketing	Communication with participants for date/time and location of sessions

	Schedule interviewers/note takers	Schedule interviewers / note-takers / facilitators per session slots and share schedules
	Interviewer pack	Prepare interviewer 'survival pack' including completed ethics forms and guidelines, pen / paper for journey mapping
	Amazon vouchers	Buy and print amazon vouchers and give to Karine for interviewer pack
	Organise refreshments	Coffee, tea, donuts etc.
UX Week	Pilot testing	Pilot testing of interviews/sessions 1 or 2 days prior to interviews (if needed) Monday 13 - Tuesday 14 June 2016
	Follow up sessions participants	Confirming sessions/rebooking if necessary
	Interview rooms Setup	Laptops, audio, video, room testing - make sure all tools / equipment are ready for UX sessions Donuts and refreshments set up
	Meet and greet participants	Meet and greet at reception desk
	UX coordinator	Co-ordinate sessions

2.3. Data collection methods

It was fundamental from the beginning of this UX study to carefully select the data collection techniques and methods that would enable us to answer our research questions (see Appendix C on UX techniques). We agreed that the research had to be a qualitative study because, as mentioned earlier, we wanted to get a deep understanding of our users. Additionally, it was important to avoid pre-judgments and avoid letting our assumptions dictate our research findings. It was therefore key to get thorough data on the reasoning and feelings of our users for the research problems that quantitative studies often cannot provide.

Semi-structured interviews with think-aloud technique and example searches were the core tools of our UX study. We wanted the interviews to be structured with some pre-determined questions even if a variety of answers may be expected. We also wanted to be able to have a conversation with our users. Most of the questions were planned ahead of time, but prompting during the interviews was encouraged to follow up on interesting topics that emerged.

In our first round of UX study we found that what users say is often different from what they actually do. In this round of research we wanted to find more than preconceived attitudes toward using Library Search. Questions like "What do you dislike and like about Library Search" often do not explain users' behaviour so we included example searches to gather

data on what the user does and the reason why they do it a certain way. Think-aloud techniques help participants to articulate their thoughts and feelings as they perform actions on Library Search to complete a task. As Nielsen (1993) wrote, "[the] thinking aloud method is to show what the users are doing and why they are doing it while they are doing it in order to avoid later rationalizations". Think-aloud techniques give us a rich source of qualitative data.

We also used comparative testing as part of the semi-structured interview to evaluate the perceived strengths and weaknesses of our current Library Search in comparison to the new-UI Primo user interface. Our participants were given time to interact with both interfaces and asked questions on preferences of the different designs. It was a great way to show the new-UI Primo to participants and get their opinions before the launch and also a way to see what features they value in current Primo so we could take steps to make sure these are transferred to the new release.

2.4. Data analysis method

We chose the constructivist approach to grounded theory and used *Constructing grounded theory* by Kathy Charmaz (2014) as our guide for data analysis. As researchers it is our ethical responsibility to understand the methodology we are using to analyse our data. We agreed those involved with data analysis would read about the chosen methodology, support each other's learning, and complement each other's understanding of the method. Starting with limited understanding of grounded theory was challenging as there are not a lot of research articles that describe, with examples, the practical steps to take when using this method. We found articles tend to focus on grounded theory literature reviews and findings. We chose grounded theory as we wanted interpretations to be continually derived from the raw quantitative data collected through the interviews.

Data Analysis Workflow
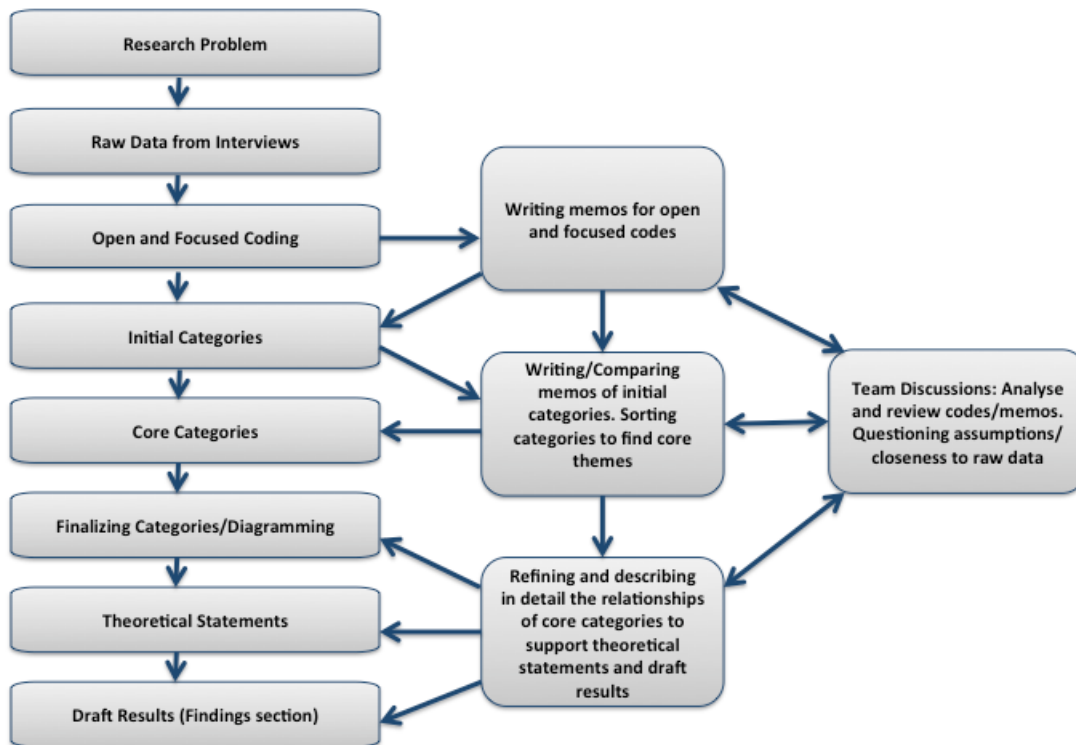
The data analysis work took two weeks to complete alongside other operational work in Library Information Systems. In the first week, the team spent three hours each day doing the individual coding and discussing the codes. The coding process included open coding, focused coding, and writing memos. Memos from the focused codes were then developed into emerging categories. By the end of the first week the team had a group of emerging categories. In the second week we developed our core categories from the emerging categories using diagramming, wrote our theories, and the draft of the data analysis findings.

Navigating through the concepts and stages of the grounded theory method was a slow process but the results have been rewarding when we look at our findings. While doing the data analysis, taking time in reading and planning the next steps prior to meeting and applying those steps made the directions and progress of our data analysis work clearer.

3.0: Findings

A major finding of this research is the extent to which users' experience of Library Search is influenced by the perceptions that they bring to Library Search when they come to use it. Users come to Library Search with information-seeking behaviours heavily influenced by the beliefs and attitudes they have about a variety of areas that would, at first, seem unrelated to a library catalogue and discovery interface. These include: the perception of the role of a library and its relation to the print book; the view of how the library fits into the wider university and communicates with other areas of the university; the subjective idea of what 'relevance' means; and the perception of 'search' and time as a factor.

3.1: Perception of the library

Users are strongly influenced by their perception of the 'library' and, particularly, their perception of the role of the library. Following coding, we categorised this as 'sense of space' referring to the users' perceptions of physical and digital space. Interviewees implied a strong conceptual distinction between physical and digital sources: that books are physical and journals are digital. Books and journals were also implied to be in physically different places. There was an association between the library and physical space: the role of the library is seen as offering physical study space and, relevant to Library Search, as a provider of physical materials chiefly print books.

This meant that undergraduate interviewees saw Library Search as a way to search for and locate books that are physically in the library. For these interviewees, Library Search is principally a tool for finding the shelf location and classmark of print books. Postgraduate interviewees, however, spoke about information searching in a broader manner and using Library Search to find articles and theses as well as books. One undergraduate interviewee did say they would search for articles if they had time to read them perhaps suggesting an awareness of the service but not the need to search for more than books.

Some interviewees expressed strong emotional reactions to the concept of borrowing from the library. Borrowing (as in borrowing a physical book from the library) was conflated with sharing which, rather than having positive associations, was felt as a "painful" experience. "I don't have to che... or someone else requesting it so I have to give it back so it's kind of painful." When items are borrowed or shared, there is not the security of sole ownership: for library books, it means other users can request a book and take it off the user when they need it. This pain associated with sharing comes down to the inconvenience of dealing with other people: "People keep requesting back the books…" This perception of borrowing from the library as a painful experience leads to users purchasing print books to avoid this pain and, possibly, finding other sources for non-physical materials.

3.2: Directed search

Alongside the perception of the library as a space to get print books, Library Search was not seen as a starting point for information-seeking. Interviewees spoke of their starting point for search being reading lists through the Blackboard VLE, online databases, publisher websites, YouTube, Wikipedia, Google Scholar, etc. There was a particular emphasis on Blackboard which implied a higher-than-expected reliance on reading lists and searches directed by recommendations from lecturers, Liaison Librarians, and other figures of educational authority.

Throughout the interviews we found a reliance on lecturers for guidance when seeking information. Interviewees are confident that lecturers will direct them to the right information they need. For example, they would go to them if they are unsuccessful with Library Search or if they are looking for specific information. Interviewees also implied the importance of early teaching sessions with Liaison Librarians directing their approach to search: many made an explicit connection between their use of Library Search and the direction received by Liaison Librarians at the start of their university experience.

The Blackboard VLE and reading lists were repeatedly emphasised as a key and valuable source for information. One interviewee said that Blackboard is organised, up to date and a central location for resources from lecturers. The interviewees value guidance from lecturer recommendations and equate content management with reliability. This could explain the high usage of Blackboard as a starting point for most of our interviewees. There was also desire for a clear connection between reading lists and Library Search: one of the interviewees mentioned that they copy-paste the resource title straight from the reading list into Library Search. In general, interviewees will try various channel/spaces (Library Search, asking tutor) to find reading list materials before buying the resource.

There seemed to be confusion or barriers around finding books from reading lists in the physical and digital space of the library which could highlight a broken connection (complexity of classmark, citation search functionality, etc.) between reading lists and Library Search. This should be partly mitigated by the newly deployed Ex Libris Leganto system which integrates with Library Search.

3.3: Perception of the library within the university

Interviewees also expressed differing perceptions of how the library fits into the wider university. Several assumed strong links between the library and their university departments with regular communications and integrations (particularly around reading lists); others saw the library as a very separate service existing independently of the rest of the university community. This perception informed how they approached the library and hence Library Search.

As mentioned above, use of the library and Library Search was heavily directed by reading lists, course material, and lecturers. This process needs to be fast and painless which links to certain comments on cross-department integration. Thoughts on this were varied, some desired greater integration between departments and the library and some thought that there already was clear connection between reading lists and Library Search. In contrast, one spoke about buying all of their course books as they didn't know they would be in the library and expressed surprise that they would be. Essentially, it was clear to the

interviewees that the library is key to their studies however, the extent to which the library is integrated with the rest of College was less clear.

3.4: Relevance and the importance of keywords

Another finding is the extent to which users' experience of Library Search is influenced by their subjective idea of 'relevance'. What the user deems 'relevant', may not match what the system or the library deems 'relevant'. We were able to gain insight into the meaning of relevance from the point of view of the interviewees by exploring the key factors and variables that helped them decide on relevancy when looking for information on Library Search.

A major factor in assessing relevance is keywords. Using keywords and being able to understand the system's use of keywords is important to users' overall search strategy. Interviewees showed a tendency to winnow useful results down by modifying initial keyword searches and spoke of 'scanning' the result to identify useful records, using the 'keyword highlighting' in the result panel as a visual indicator of relevance of the returned results. During the interview, participants adjusted their keywords in the search box as a means of refining the search. They "try to be as specific as possible" but also conscious that they do not want it to be too specific so they can "capture all the information" and not miss out on information. The importance of keywords is emphasised when they were struggling to see keywords in new Library Search that were not highlighted; they specifically mentioned that they prefer the current Library Search UI because of the yellow highlights. Seeing many yellow highlights is a sign for the interviewees that the search results are relevant. "If there are a lot of yellow highlights, then I would say that those are relevant to what I'm looking for." Keywords are therefore highly valued as a search function.

A second major factor to determine relevance is 'date'. Most of the interviewees mentioned that publication date is used as a primary factor to determine relevance with one undergraduate interviewee saying publication date "is the most important thing" and said that they found it difficult to assess relevance if something is not dated. During the interviews, the participants would scan the results page or details page for publication date.

Other key factors to determine relevance are the 'familiarity' and 'popularity' of resources. During the interview they explained that they would scan for specific authors and publishers with which they are familiar and identify "big name" authors and publishers. We found that the factor of familiarity and popularity is also linked to the desire for personalisation. One interviewee reflected on how having a personalised "list of major publishers" to see the most borrowed books from those publishers would be helpful as would having an interface per department or subject for "the most clicked books or requested books" related to that subject area.

3.5: Perception of search

The perception of the library as a place to find print books on the shelves influences users' experience of Library Search. Interviewees spoke of wanting to 'get in and get out' when using Library Search: as said above, they want to quickly find a shelf location and classmark (or, less often, a link to an electronic resource) and then move on. Library Search tended to be associated with the words 'get' and 'getting' implying its use as a simple intermediary tool used to get to resources quickly rather than a tool for deep research or broad literature searching.

There was also a view that certain features are 'secondary' because they are either not related to the primary 'getting' function or they actively delay getting in and out of Library Search: these features include My Account features, Actions button features like exporting, and 'More search options'. These features were either rarely used or assumed to be 'useful for other users' and were generally valued less highly than the core elements. Conversely, there was a perceived lack of visibility of certain 'primary' features (i.e. those features related to getting information quickly): these features include keyword highlighting, Document Delivery, requesting a book, suggesting a book, and Library Search help features. A clear example is that most of the interviewees had no knowledge of the Document Delivery service during the interview and found the Document Delivery form extremely difficult to use: this could explain why one of the interviewees visited various other libraries for resources.

In terms of design, this informed a preference for the new UI layout over the previous version. The hierarchical design in the new UI was seen as "easier to read" and the improved iconography in the results helped users distinguish book and article records. These are all features that aid the user in 'getting' an item as quickly as possible.

The interviewee's confidence (or lack of confidence) in Library Search had an impact on their approach to the system. Interviewees expressed feelings of trust and confidence in search engines like Google and databases like Google Scholar: they tended to use words like "rely" in relation to Google and referred to Google as a first port-of-call for searches and a source for links to items when Library Search fails. "Basically I'll Google it and get a free PDF copy." This is contrasted with their expressed lack of confidence in Library Search: when talking about Library Search, they more frequently used words like "try", "trying again", or "suss out". Interviewees expressed doubt in the capabilities of Library Search and expressed surprise when it offered basic search functions similar to other search engines: "Maybe I can put quotation marks. I don't know if this will..."

Interviewees were often hesitant about using Library Search: when using Library Search, interviewees demonstrated heightened concentration through body language or facial cues. They performed actions like opening records in new tabs "just to be safe that I can... go back to it [the results list]" seemingly because they didn't trust the record to be what they were searching for. This heightened concentration could be linked to flaws in accessibility elements of the system's design.

This sense of doubt also gave way to confusion at several elements of the system. Confusion was expressed about elements like classmarks and finding shelf locations. When completing the Document Delivery process, interviewees expressed confusion during and after the process. At the start of the process, they were unclear about what information might be required for a Document Delivery request. At the end, they were unsure what had been achieved at the conclusion of the process and whether the request had been placed at all. There was also confusion about seemingly filling in the form twice for a single request, that is, it was not clear to users that the initial Citation Linker form is to search the catalogue and the second is to send a Document Delivery request.

Rather than, as might be expected, interviewees blaming the system for negative emotional experiences, negative feelings were expressed by the users as self-doubt. Interviewees internalised negative emotional responses and interpreted search failure as indicative of personal failings rather than system failings. They expressed high levels of self-doubt, guilt, and personal blame when searches failed or the system didn't behave as expected. Interviewees tended to use first-person pronouns to refer to failings thus blaming

themselves rather than the system. We see this in quotes like "I'll just go search again because I did it wrong on the first go", "After I didn't find it... Even if I didn't find it", and "Is there something wrong with my internet?"

These perceptions contribute to Library Search not being associated with deep research. An expressed lack of trust in Library Search and a view of time pressures and deadlines as a major driver in information-seeking behaviour combine to make Library Search unsuitable for advanced-level searching.

Negative emotional reactions to Library Search, particularly the self-doubt and guilt from internalising system failings, leads to certain expectations of Library Search and impacts the user's likelihood to actively approach Library Search in the future.

4.0: Evaluation

To summarise this round of UX research, we met our objectives and answered the research questions raised by our previous round of UX research. The findings present deep, qualitative insights into information-seeking behaviour, the use of the Document Delivery service through Library Search, and users' experience of the Library Search interface. The research insights and methods are useful for other UX research in Library Services focused on use of library space and technology. These insights have fed into practical design recommendations which were integrated into a new iteration of the Library Search UI launched in September 2016.

This research therefore led to practical and, in future, measurable positive impacts on the experience of library users, chiefly undergraduate and postgraduate users. It also points towards further directions for research and further directions for design iterations for Library Search. The findings have the advantage of achieving reflective equilibrium: a state where both experience and intuition are satisfied. In the spirit of critical reflection (Gardner, 2014) and evaluation, this section presents some lessons learned and evaluation points throughout every stage of the research process.

4.1: Methodology and planning

This particular round of UX research gave the team much more appreciation of the impact of a chosen method on the research and the resultant findings and recommendations. The techniques and methodology of grounded theory heavily informed our approach throughout the research process. On reflection, it was felt that grounded theory provided a good structure which fostered team in communication and collaboration, and in doing so the development of new ideas that would not have emerged otherwise. Particularly for data analysis, grounded theory provided a good structure for analysing a large quantity of qualitative data.

The team have also appreciated how much time grounded theory and grounded theory-like methods require to use properly. Team members need time to be brought up to speed with grounded theory concepts and to understand the practical steps to take when using these methods. The analysis itself also took more time than we had initially planned. Having started the research using a grounded theory methodology, we had a moral obligation to the research participants to treat their data with respect and spend as much time as was required to analyse thoroughly to the precepts of grounded theory. Though navigating the concepts and stages of grounded theory has taken time, the results have been rewarding

and helped the team to develop analytical skills when writing down our core categories and inductively drawing out a grounded theory. We could not have achieved the depth of analysis we achieved without using grounded theory and the team appreciates the rigour that grounded theory provides. However, to meet tighter timescales in future we could try different methodological frameworks. This could partly be achieved with a thorough literature review of data analysis methods.

Considering outputs, we also need to review what we want to achieve with UX research. While we achieved our aims of gaining insights into information-seeking behaviour, we might want to focus in future research on the practical aspects of design and applying design insights. The design and application portion of the process felt rushed: in future, building the design brief should represent the middle point of the process rather than an end point. We should spend more time on making usable changes, moving through design iterations and UX builds, assessing how we meet the findings and recommendations, and, in general, focusing on the practical benefits to our users.

For the next round, we may also want to review the research methods and structure used for the past few rounds of UX research. Investigating methods different from semi-structured interviews and think-aloud tasks would help the team develop their research skills and provide fresh insights into user behaviour.

4.2: Research process

One of our findings was the stark contrast between undergraduate and postgraduate information-seeking behaviours and experience of search. This provides a firm answer to the research question 'What is the information-seeking behaviour of undergraduates compared to that of postgraduates?' The wide variety of users means that, in some cases, we have one finding for undergraduates and another finding for postgraduates. For these findings, rather than having a single finding backed up by a number of people, we have double findings backed up by two or three people. To some extent, the wider range of the research resulted in shallower insights. For the next round, focusing on a single user group (e.g. undergraduates only) would give us deeper insights into that user group's behaviour and more obvious actionable outputs.

On the topic of recruitment, we were also concerned about bias in sampling for research participants. By recruiting participants through Liaison Librarians and their contacts, we may have inadvertently taken a sample of users with an unrepresentative emphasis on communicating with Liaison Librarians and using information-seeking behaviours picked up in formal training sessions. For future research, we will want to think about how to eliminate bias as much as possible and to be inclusive in our recruitment process.

Some general observations on the practical research process:
- Interview questions need to be informed by clearly defined research questions and by the research questions and findings from previous rounds of UX research.
- Interviewers would benefit from more training and more instruction to ensure parity of interview technique and quality. Ensure all interviewers explain tasks and process in the same way.
- Ensure that pen and paper is consistently provided for interviewers and that notes are legible.
- Meet and greet participants before moving into the interview room and ensure consent forms are signed in the open area before going in to the more formal interview setting.

- For think-aloud tasks, ensure that the tasks flow smoothly into one another and that the items to be searched for make sense as searches for Imperial College London users and are available.
- Carefully consider what kind of data will be produced and how this data will be analysed before writing interview questions, think-aloud tasks, and using other research techniques.

4.3: Data analysis and findings

As mentioned above, it's important to appreciate how much staff time and resource is required for thorough data analysis. This needs to be planned well in advance and factored in when enlisting members of staff from across the library. Members of staff unfamiliar with research and data analysis methods also need thorough training and practical coaching. As a rough guide, for each 'green' data analyst, up to 3 weeks of 1-2 hours per day might be required as an estimate; this would be less for those with prior experience. For future coding based on grounded theory, it would be useful to fully transcribe the interviews. The team found working with video and audio to be limiting when conducting analysis.

Given the amount of time and effort that this kind of research involves and the time pressures imposed by term dates and acceptable windows for practical systems implementations, for future research we might want to scale back research to what we can achieve with a small, experienced team rather than a larger, inexperienced team. This could mean: fewer research participants (approx. 5-7 rather than up to 15); less scope in questions but more focus; shorter interviews/tasks.

5.0: References

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