POLITECNICO
MILANO 1863

DIPARTIMENTO DI DESIGN

Master of Science in
Product Service System Design

TONGJI UNIVERSITY LIBRARY ONLINE DISCOVER SERVICE DESIGN: USER INTERFACE DESIGN BY EXAMINING USER EXPERIENCE

Supervisor: Prof. Davide Fassi

Master Graduation Thesis by: Tang Hanyu

Date: 6th December, 2017

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ABSTRACT

The application of user experience (UX) in libraries seems to have become really popular in recent years. More and more examples of UX library projects that have resulted in service developments and improvements, or which have had a positive impact on student experience, appear to be surfacing. In this paper I will try to discuss some of the reasons why UX has recently become popular as a research method, and suggest that it is in part a response to the fact that the traditional quantitative metrics and measures used by libraries (e.g. statistics on footfall, holdings, loans, renewals, database use, downloads, views, social media followers, etc.) do not reveal anything about the success or quality of the interaction experienced by the library user and ultimately the value or impact that this has on the user. According to many case studies, I found that the focus in higher education (HE) on 'student experience' has led library managers and administrators to look at how and why library users use libraries in the way that we do (as opposed to the ways in which librarians think that they use them) in order to better understand what users want from libraries.

Library Web sites are evolving into information gateways, unlocking access to library resources and services as well as electronic indexes and databases, primary research materials, and the Internet at large. Although intended to ease the process of information access, the staggering amount of information available via these sites can produce a kind of "information overload" that can bewilder, confuse, and even discourage users. There is a fundamental need for "user research" in library Web sites and user experience design is an invaluable tool for involving interfaces in terms of their effectiveness and ease of use.

This paper focuses on Tongji University Library service system. As a very typical system model of university library, the library wants to improve its service through innovation manners. In order to achieve the goal of making the library accessible (including service and information two parts), I will use user research methods to learn users' behaviors and gather their needs of information discover experience. Since library's key function is letting users discover information and collect resources, this article reviews the concept of user research methods in the UX library design process and the output of user research and user interface design.

KEY WORDS: *User Experience, High education library, Information discover experience, User research, User interface design*

1 INTRODUCTION

1.1 BACKGROUND

Libraries are portals today - as they have always been-to content, to information. They are also increasingly locations that provides access to people and tools and places for the creation of something new. As locations for collaboration-among students, among stuff, among community members- libraries stake a claim to something new, and something terrifically difficult to quantify. Universities are not just in business of reproducing their faculty nor should they be, not any more than they simple vocational training grounds. Thus, libraries must be about access for all, not about the narrow range of users who will go on to be professional scholars.

The role of the academic library is constantly shifting. No longer just gatekeepers to information, information professionals in the higher education (HE) sector are actively collaborating with researchers to create content, working closely with teaching staff to train and educate students and often conducting their own research alongside this work. The nature of 'library resources' is becoming more and more intangible; born-digital material, open access and advancements in digital humanities mean that the notion of the 'holding library' is becoming less and less relevant to the ways in which people look for and interact with sources of information. Methods of retrieving this content are also changing, as library catalogue systems, based on relationships with traditional catalogue records and metadata, are no longer sufficient for current user needs. There has been a move across HE libraries away from the traditional catalogue to discovery systems. Conceptually, these systems are very different from catalogues; they aim to open up areas of discovery for their users, in basic terms, highlighting resources related to what people are searching for. Discovery systems search for local printed resources alongside ebooks, online articles and databases, institutional repository data and more. They rely on sophisticated ranking algorithms and emphasising the relevancy of resources, in order to provide an intuitive, seamless user experience without complicated pre-search options. Users of discovery systems are provided with a simple search bar and are expected to refine their search afterwards using filters.

The majority of libraries at Tongji University began using the Online Library Scholar Discover Discovery and Delivery (henceforth 'Scholar Discover') system in September 2014, naming their version of the interface 'Online Discover Service'. The current version of Scholar Discover in use at the University was very new at the time it launched, with Tongji being early adpoters of the service. Although Online Library have conducted User Experience (UX) work which fed into the development of the Scholar Discover service, we felt that it was vital to conduct our own study to find out how people were experiencing and using the platform in Tongji. The complicated make-up of Tongji's physical collections, the extensive online resources held, the research-intensive nature of the University, all of these things mean that the University's library system is in an almost unique position, which leads to very specific needs and behaviours on the part of its users. As Online Discover Service will

be a key part of the lives of Tongji students and staff for years to come, it is important that time and effort is invested to make sure that the developing interface is based on their needs, behaviours and preferences.

This paper outlines the research, analysis, findings and outputs of an intensive user experience study carried out by the UX Library Project between June and August 2016. The primary research methods employed were interviews and observations with people using Online Discover Service. Personas were developed based on this work, which were used to inform the subsequent analysis process and the resulting project recommendations and outputs. As well as talking to people about Online Discover Service and watching exactly how they used the service, there was a focus on finding out how this related to the ways in which people interacted with information more generally, and how this sat within their wider Tongji experience.

1.2 PROJECT AIMS AND SCOPE

1.2.1 Aims

- To gain a deeper understanding of our users and of how people are using Online Discover Service.

- To identify current key issues with Online Discover Service.

- To visibly engage with and respond to our users.

- To find out more about what other search tools people use and for which purposes.

1.2.2 Scope

- Identifying potential ‘quick-wins’ for the Online Discover Service user interface.

- Collecting evidence to support requests put to Online Library, the supplier of the Scholar Discover service.

- Assembling information to inform the design of help pages, widgets, pop-ups and other opportunities around the Online Discover Service user interface.

- Arriving at insights and knowledge to inform changes as new iterations of the service are released.

Alongside recommendations for the re-configuration of aspects of the interface and feedback for the supplier, as the project moved forward there was an increased focus on user education and communication.

How could we use the lessons we had learned from our research to inform the ways in which Tongji library staff communicate with users of the Online Discover Service platform, and what are the key messages we should consistently be giving people? It was decided that the project team would work on producing materials which could be used when working with students and staff at the University, outlining key information about Online Discover Service and how to approach and use it effectively.

2 LITERATURE REVIEW

2.1 UX in Library

Libraries are in a constant state of evolution as we adjust services to better meet user needs. Incorporating user-centered changes in the design of services allows libraries to stay lockstep with evolving needs and expectations. Librarians have explored a variety of techniques and methods to study and assess user behavior in order to guide changes and improvements to services. Usability studies are a common method libraries have used to find out more about how users access and use information. These have focused primarily on the interaction between humans and computers, but it is also imperative that we study the services and spaces our patrons or customers use (Dreyfuss, 1950)[1]. In recent years, libraries have increasingly incorporated traditional anthropological analysis and assessment tools such as ethnographic research into their assessment of library spaces and services in order to better understand the various cultures of libraries and library patrons (Duke & Asher, 2011; Foster & Gibbons, 2010).[2] While this gives libraries a better understanding of user behavior, the type of ethnographic research practicing librarians often have time for tends to focus on bits and pieces of users' library experiences rather than looking at the entire service ecology of a library and the community it serves. Service design, a holistic, co-creative method, puts the user in the center of the service delivery model and focuses on the users' entire experience, rather than bits and pieces.

Librarians are not new to designing or assessing services, but they tend to develop each service in isolation from the other services we offer and with little to no user input prior to implementation. For example, circulation policies are usually developed by circulation staff and then distributed to the rest of the library staff. Likewise, interlibrary loan, reference, collection development, and so on all tend to focus on their own policy development. The way librarians typically bring services together is to communicate with one another what each department has decided and then get user feedback by assessing services after they are in place. Service design demands that we look at our seemingly disparate services as a whole entity and from users' perspectives so that the service is "compelling and indispensable [and] delights the user" (Heath, 2014, para. 1).[3]

Service design is a holistic, co-creative, and user-centered approach to understanding customer behavior for the creation or refining of services (Mager & Sung, 2011; Polaine, Løvlie, & Reason, 2013; Stickdorn & Schneider, 2011).[4]

User Experience (UX) is a set of strategies for understanding users' needs and behaviors and then applying that understanding to designing useful, usable, and aesthetically pleasing systems and services. Although there is no substitute for doing user research, libraries often don't have the time or resources such research requires.

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[1] Dreyfuss, Henry. "The Industrial Designer and the Businessman." 28.6(1950):77-85.

[2] Duke, Lynda M., Ed, and A. D. E. Asher. "College Libraries and Student Culture: What We Now Know. " *Reference & User Services Ouarterlv*52.2(2012):223-224.

[3] Marquez, J., & Downey, A. (2015). Service design: An introduction to a holistic assessment methodology of library services. *Weave: Journal of Library User Experience*, *1*(2).

[4] Mager, Birgit, and Tung-Jung David Sung. "Special issue editorial: Designing for services." *International Journal of Design* 5.2 (2011).

This lack of resources, mixed with the desire to make data-driven decisions, can potentially result in a sort of user research paralysis—that is, we don't want to make decisions without data, but we don't have time to collect the data, so we fall back to making design decisions by committee or making disconnected and uninformed decisions under deadline. Fortunately, we have access to an expansive body of knowledge generated by the fields.

Libraries interested in user-centered design are faced with a number of options for measuring and improving their library user experience—usability tests, contextual interviews, and direct observation being a few popular user research methods. While experts often encourage the use of multiple techniques for a fuller understanding of users and their needs (Pruitt & Grudin, 2003; Rohrer, 2014)[5], this can be difficult for libraries with fewer resources or time for dedicated user research, making it important to consider practical tools to assess library UX and spur user-centered thinking

Like many libraries, they have sought out budget-friendly ways to incorporate UX into our everyday library practices. For example, they employ a lightweight usability model that allows us to quickly gather feedback without formal test procedures, and recently adopted a continuous design model that allows us to quickly respond to problems and make improvements as we learn more about our users' needs. As a complement to this agile, budget-friendly approach, this article will propose a similarly lightweight method of persona creation that allows personas to be developed quickly and improved iteratively as they are put into practice. Taking persona for example, helping both communicate UX findings and knowledge of users, and helping guide the design process by ensuring that the right questions are being asked and users remain the central focus in decision making. The power of personas lies in their ability to distill knowledge of a target user group into relatable characters that are easy to remember and empathize with (Harley, 2015)[6]. This can help address a common problem among product design teams known as the "elastic user," where a team's definition of users will shift at different stages of the design process, and will often be different for each team member, reflecting their own personal biases and preferences (Cooper, 1999). By creating a concrete and shared definition of target product users, personas are a first step in creating a common, consistent vocabulary for user-centered design, helping facilitate discussions and encouraging a shared vision for product UX.

2.2 Case Study

2.2.1 UX in Libraries with a Case Study at NYU Libraries[7]

The New York University Library has carried out a project for improving online library service. The projects included an information architecture redesign of the library website, an evaluation of the EBSCO Discovery Service, library access permissions page, and LibGuides. The resources hosted on the LibGuides CMS are

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5 Pruitt, John, and Jonathan Grudin. "Personas: practice and theory." *Proceedings of the 2003 conference on Designing for user experiences*. ACM, 2003.

6 Sundt, Alex, and Erin Davis. "User Personas as a Shared Lens for Library UX." *Weave: Journal of Library User Experience* 1.6 (2017).

7 http://slanypublications.org/2014/07/07/ux-in-libraries-with-a-case-study-at-nyu-libraries/

sometimes known as research guides, subject guides, and course guides. NYU Libraries uses LibGuides to host over 550 guides and was looking into upgrading to Version 2, which offers sidebar navigation tabs and responsive layouts. Virtually all of NYU Libraries' guides are different from each other because they vary in layout and content. Without one definitive template our team faced the problem of testing over 500 interfaces. They had access to analytics data but this information only told us what guides were being used and how many times.

When the group approached this project they decided to start by defining the goals. They wanted to know two things: what NYU student research behavior is like and what students know or don't know about the guides on the library website. Our testing goals were to gather feedback about the current LibGuides interface and its navigational elements. They determined that a focus group and guerrilla usability testing were the most appropriate ways to gather data about user needs and what those users encounter when using guides.

They invited students for the participation in the one-hour session, which was divided into four stages: research behavior; general questions about various types of guides; LibGuides interface; closing remarks. The focus group started with questions that would help us understand how students do research online. They progressed to questions about what their knowledge and general awareness of guides, and finally explored a selection of guides with them on the library website.

After the focus group concluded, they set up a table and two laptops in the Bobst Library atrium to do guerrilla testing. Offering granola bars as an incentive to participate, we conducted five-minute interviews with students. (We nicknamed this approach "speed dating" because of its formal testing qualities and rapid nature.) Each session was divided into three sections: a pre-test questionnaire that asked students to provide demographic information, a test in which they asked students to explore a guide of their choice and think out loud so that we could better understand their process, and a post-test in which students filled out a survey about their experience of using a guide. With this testing methods, they were able to gather 27 interviews in two hours.

After synthesizing the data for both the focus group and guerrilla testing, our major findings included the following:

- Students often rely on websites like Google Scholar and Wikipedia as a starting point because they find them straightforward and direct.
- Students were also more likely to use guides if they were a part of a course curriculum.
- Most students were not fans of the tags and tag clouds in guides
- External links in the guides opened in the same browser tab, which disoriented users.

This information allowed them to make recommendations that would resolve problems and address user needs. They created recommendations in the form of a style guide that addressed four main areas: navigation, visibility, usability, and

consistency/branding. To further illustrate the recommendations, They inserted a style guide in Version 2 of the LibGuides CMS and created a redesign mockup of the NYU LibGuides homepage (Figure 2) that incorporated user feedback and a clearer starting point. Following the UCD Process, we did user research through our focus group, evaluated the NYU LibGuides interface with guerrilla testing, and redesigned the interface by creating a mockup. The full reports of all four NYU Libraries UX Lab projects can be accessed and downloaded so that others can read about our process and methods. They hope that our work will help others to implement their own testing.

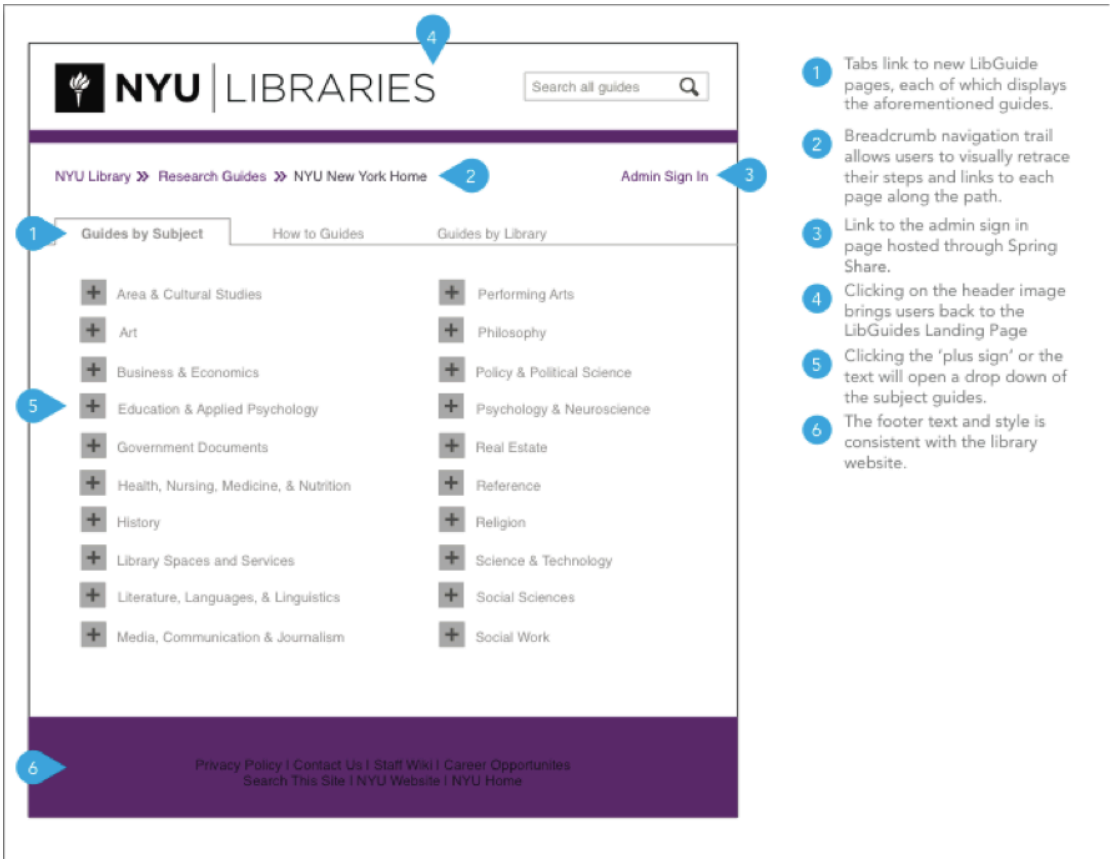

Figure 2.1 A redesign of the NYU Libraries LibGuides landing page

They received positive feedback and were told by audience members that their libraries were facing similar usability issues. Some libraries have dedicated UX librarians or departments, while others at least know the value of UX and are beginning to incorporate these concepts with existing staff. While UX methods do take time to plan and implement, some methods, such as guerrilla testing, are relatively quick and inexpensive. More importantly, providing this kind of platform for users to be heard and to participate in the process of designing library services and products gives patrons a more meaningful experience.

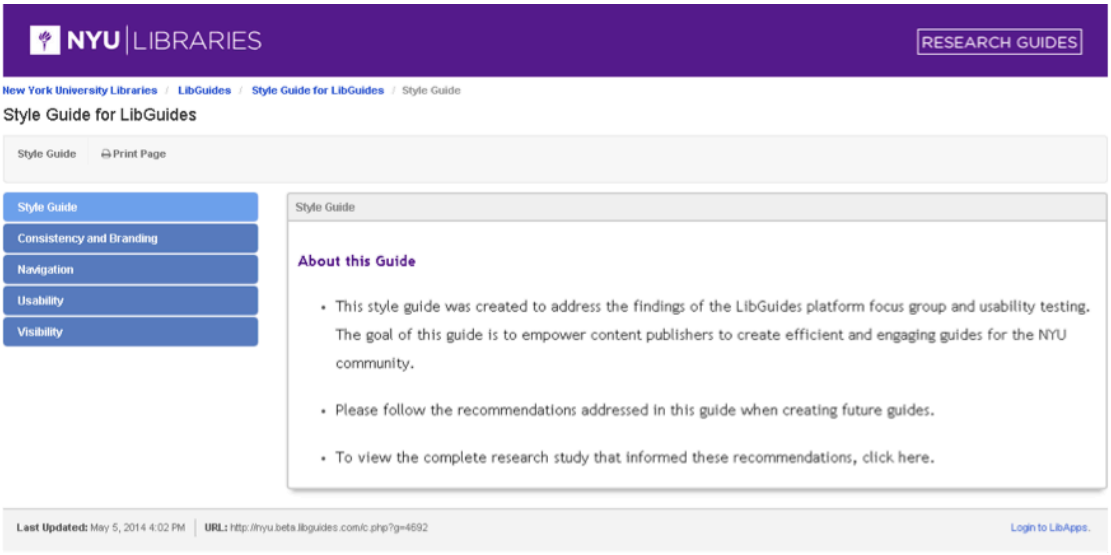

Figure 2.2 LibGuides Version 2 style guide

2.2.2 Journey into the user experience: creating a library website that's not for librarians[8]

Auckland University of Technology Library started work on a major redevelopment of its website in 2012. The problem was that the website content, as is the case for many library websites, had been written by librarians with almost no user input. The challenge was to redesign the website, rethinking our entire focus and placing the user at the centre of the process. This is the story of a journey of transformational change based on our user-centric approach. They believe they have achieved what they set out to do and created a website that's built not for librarians but for users

The redevelopment project was initiated with the objective of improving and enhancing user access to and use of Library services and resources via the website. Their goals were to improve the design, layout and overall usability of the website; to upgrade and significantly reduce the content; and to review and adjust the management of the website to improve processes and procedures. Foremost in our minds was the goal of creating a user-centred website by consulting their users directly, rather than vicariously through our librarians. They intended to achieve this goal through focus groups, interviews, and user surveys. It was also important to be able to accurately measure the use of elements of the website via a selection of online tools and statistics.

They used a wide range of techniques to build up a picture of the wants, needs and feelings of our users, as they related to the existing website. The most significant of these techniques were statistics, online tools, focus groups, interviews and user surveys, and external assessment of the website.

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[8] Murdoch, Craig, and Shari Hearne. *"Journey into the user experience: creating a library website that's not for librarians."* (2014).

The research outlined above confirmed two of our early suspicions. Firstly, that their website was not meeting the needs of our users. Secondly, that they had come to a point where they could not achieve what they wanted to with incremental changes. Essentially, only revolutionary change would solve the issues that they were facing. This was not an ideal situation as the magnitude of such change is disruptive in itself for website users. However, it was important for them to recognise and respond to the situation. Once they had done that, it was in fact a relief to be able to move forward with a clean slate.

They were also aware that the processes for managing the website would be subject to significant change. At the same time as designing a new site, rewriting content and establishing a user focus at the core of their practice, they also needed to revise the oversight and day-to-day management of the website. The major goal was a focus on users and their needs, to be achieved by building in monthly usability testing, incremental changes to the site in response to the testing, and an appropriate content strategy.

By using design tools: persona (Figure 2.3) and scenarios, they decide the redesign part: including site design and the content. After the research, they choose to work with Consortium opened up new opportunities for the Library group. Their expertise and experience in graphic design, typography, and website design in general enabled them to move away from a mindset where they were essentially copying what they felt were current exemplars of good academic library website design.

Concurrently the group worked on a design brief, which illustrated broad design goals to the University's Web Centre. In this phase of the project, they were working to a very fluid request from the University Web Centre. Effectively they were told to 'specify to the point to which we felt comfortable'. The design brief included a list of words intended to direct the design towards our desired 'personality' for the site. These included 'simple', 'fresh', 'friendly', 'credible' and 'inviting'. They suggested a colour palette that reflected and enhanced the personality. We did considerable work on colour theory and the psychology of colour, sought input from the Disability Resources Office, and tested their conclusions with Library users.

With the design brief, they hope to make the website with the following key features:

1 . Simplicity, conciseness and clarity;
2 . Prominence of the search box;
3 . Responsive/adaptive design;

This paper has described the redevelopment of our library website as a collaborative journey with our users. Their main focus was to ensure that the new website presents information resources and services in a simple but professional and inviting way that appeals to our users. They aimed to provide easy access to our resources with a minimum of clicks, and provide full functionality via the mobile devices that are now mainstream and indispensable to the current generation of users. They have integrated user collaboration into their website management procedures and workflows so that they can ensure the website will remain fresh and responsive to users' needs into the future. They also have an array of online tools that will assist in this. In the final

analysis, they believe we have achieved what we set out to do and created a library website that's built not for librarians, but for users.

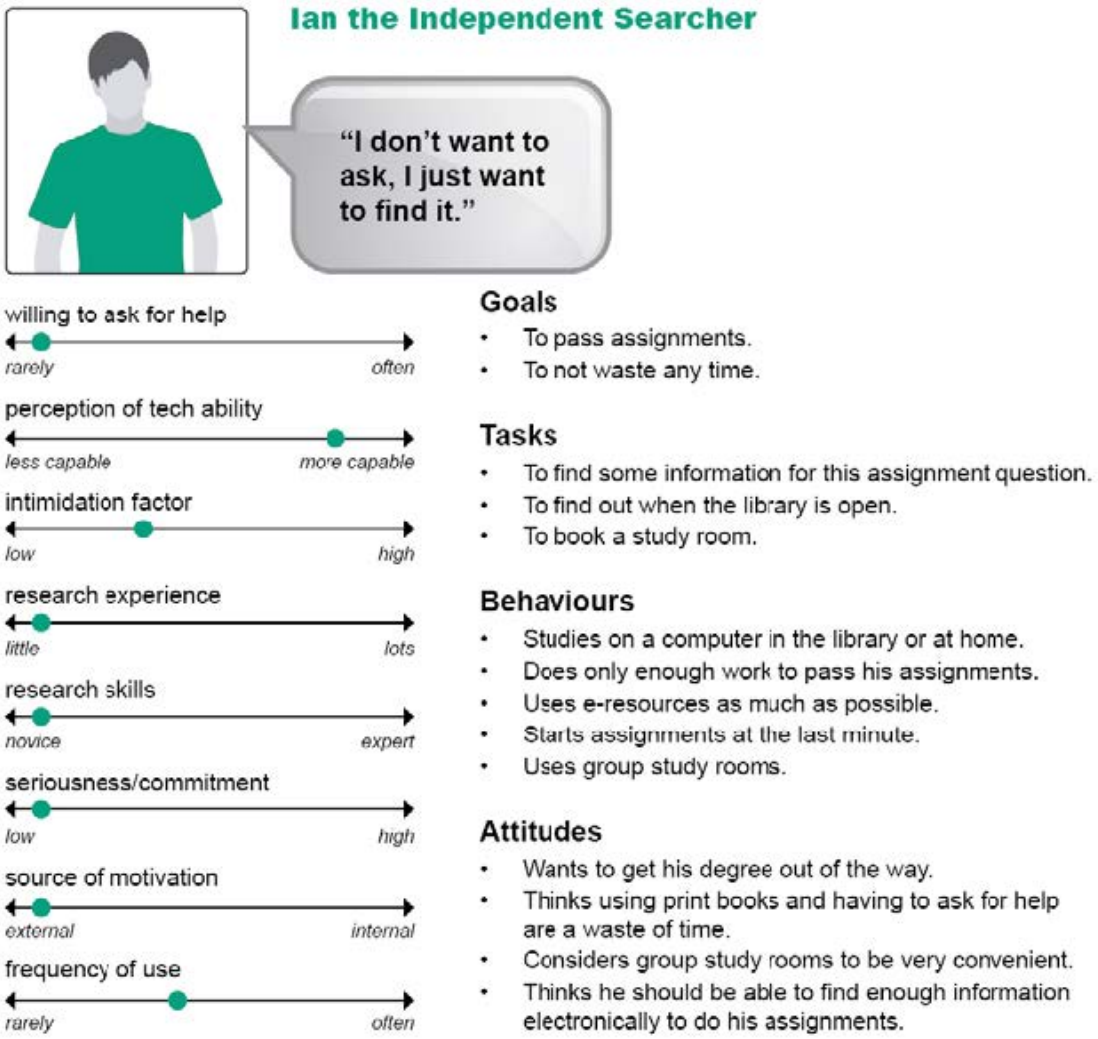


Figure 2.3 Persona

3. METHODOLOGY

3.1 Analysis of existing feedback

Since its launch, the team responsible for developing and implementing Online Discover Service have been actively seeking feedback from users of the service. This meant that prior to the UX Library project there was a large amount of user data which could be analysed. In order to give some context to the project this feedback was examined, with the following considerations:

- People who had chosen to provide feedback on the development of the platform may not be representative of its users as a whole.

- Much of the feedback related to issues that had since changed. Although useful in informing the early stages of the project, this feedback was not included in the final project analysis and was superseded by data gathered by working with Online Discover Service users over the course of the project.

3.2 Brainstorming session with Tongji library staff

We recognised that the knowledge Tongji library staff possessed about the experiences their users were having with Online Discover Service was of great value, and it was important to tap into this during the initial stages of the project. Over the year that the underlying Scholar Discover service had been in use at Tongji, many developments (locally and on the part of the supplier, Online Library) meant that it was necessary to start to identify what the current key issues were. An open-invitation meeting was held, where the project was presented and library staff participated in a brainstorming session, discussing the following two questions in groups:

- What, for your users, are the current key issues with Online Discover Service?

- What workarounds, if any, have you put in place at your library since the launch of Online Discover Service?

WHAT, FOR YOUR USERS, ARE THE CURRENT KEY ISSUES WITH ONLINE DISCOVER SERVICE?	
Positive	**Negative**
Searches very widely	Duplicate results showing for the same item
You can save favourites and searches, emailing yourself a record = easy	Students struggling to find printed books quickly.
Very good for key words search	Which database aren't indexed?
	Student confidence has gone
	Incorrect information on the filters.

	Not good for searching for specific items
	‘Multiple versions” terminology can be misleading.
	Vocabulary not helpful, e.g. thesis listed as book and working paper as article
	Logins don’t work all the time
	No option to search by publisher
	Too many results
	“May be available” electronically- remove items where we do not have access
	Records within FRBR groups effectively disappear
	Works like Google, which is fine if you want to find absolutely everything like Google, but nit if you want to find a very specific thing

Form 3.1 Brainstorm Result

The session was invaluable in informing the early stages of the project and gave the work a necessary context. Offers to help with the research came from library staff present at the session, which were also very welcomed. The most valuable output of the session came from the group brainstorming sessions, particularly where library staff were asked to outline what the current key issues with Online Discover Service for their users were. A summary of the output of this exercise can be found overleaf.

3.3 Project team

For the project to be successful, help would be needed with data gathering, analysis and idea generation. Members of Tongji library staff were contacted and asked whether they would be able to spend some time helping with the project. Not only would this provide a valuable opportunity for a ‘hive mind’ approach to the analysis work, it also meant that a starting point would be in place for the research with users, as library staff would have access to mailing lists and other means of contacting their students and academic staff. The project team consisted of:

- 3 members of staff from STEM (Science, Technology, Engineering and Medicine) libraries.

- 2 members of staff from AHSS (Arts, Humanities and Social Sciences) libraries.

- 2 members of staff from Tongji main library rooms.

- 1 member of staff from the Reader Services Desk team at the main University Library.

3.4 Interviews

Alongside observations with people using Online Discover Service, interviews with students and staff around the University provided a large part of the project data. The following interview questions were used to form a semi-structured interview schedule. For short, ad-hoc interviews these questions could be used on their own, for longer, more in-depth interviews the questions provided valuable starting points for deeper, more investigative conversations:

- Where, online or in person, do you look first for information and resources? Does this vary depending on the nature of your task?

- What, to you, is important in terms of a platform used to search for information and resources?

- What types of search do you do most often [e.g. known-item, exploratory, etc.]?

- What, for you, are the good and bad things about Online Discover Service?

- Can you think of a specific problem you encountered with Online Discover Service recently? What did you do?

Demographic information was captured for each participant, including their college, their department or faculty, whether they were a student or member of staff and what their level of study or the nature of their staff position was, their area of study or research, and their preferred device and web browser.

The interviews were conducted with a range of people, from some who used Online Discover Service frequently to some who had never encountered it before. This gave us the opportunity to learn more about the other search platforms people were using, which tasks they used them to perform, and why. As always, the conversations also led to valuable insights into people's wider lives at the University. In terms of people's experiences of Online Discover Service, there was a focus on both macro- and micro-level issues, i.e. how they interpreted, understood and approached the platform conceptually, as well as what they liked or disliked about aspects of its search functionality and user interface.

3.5 Observations

Shadowing people using Online Discover Service and observing them closely was vital in providing data for the project. It was essential that we worked with people

from as many different disciplines and with as many different levels of academic experience as possible. With this in mind, we intentionally worked with people in and outside of library spaces, in locations where they felt comfortable. Where possible we worked with people using their own devices and web browsers, to give us as unfiltered a view as possible of their 'usual' Online Discover Service experience. If it was not possible to work with people on their own device, we offered them a choice of MacBook or Windows laptop to work with instead, which was a familiar setup for most people. We also conducted observations with people using Online Discover Service on their tablets and mobile phones.

We used talk-aloud protocol during our observations; asking participants to tell us exactly what they were doing, what they were currently looking at on the screen and which elements of the interface they intuitively understood, or were puzzled by. We watched as people performed tasks similar to those they would have to complete as part of their studies or research, and in the latter stages of the project also gave them tasks we had developed to complete. During the observations, as well as recording what people said, we specifically wanted to find out about:

- The initial approach people had to searches, i.e. which search functions, search terms and pre-search filters they used.

- Whether post-search filters were applied to refine search results.

- Which aspects of the user interface were noticed, used, missed, or ignored.

- How terminology present in the interface was interpreted and whether it was intuitively understood.

- Whether users were expecting, or were surprised by, various aspects of the interface, including the lists of results it retrieved based on their search terms.

After each observation, we conducted a brief exit interview with the participant. This allowed us to further explore their experience and gave them the opportunity to expand on what they had found intuitive and useful, as well as areas where they had struggled or found things less simple.

Across the observations we conducted, we looked for similarities from users in terms of interpretation and approach, consistencies in where people struggled with Online Discover Service and where they succeeded easily. Although each person we worked with was very different, over time commonalities started to emerge, which began to lead to ideas about how changes could be made to the platform that would potentially benefit the majority of its users.

3.6 Student workshops

Due to the fact that the project took place outside of Tongji full term, it was difficult for us to recruit and work with undergraduate students. In an attempt to engage with as many undergraduates as possible, three workshops were held and promotion and advertising was directed towards these students. The workshops took place at the Engineering Department Library, the English Faculty Library and the Education Faculty. Although not attended by as many students as we had hoped, the workshops did give us the opportunity to talk to and work with representatives of this key user group. Brainstorming sessions helped us to get a quick overview of the undergraduate Online Discover Service experience and the workshops allowed us to conduct interviews and observations with some of the students that attended.

3.7 Our participants

It was key to the success of the project that we worked with people from as many disciplines and with as many different levels of academic experience as possible. It was also necessary, however, that we spent enough time with each person to really get to grips with how they approached the platform, the role it played in their work at the University and the experiences they had whilst using it. On average, we spent between 30 and 45 minutes working with each participant, which gave us the opportunity to talk to them in reasonable depth and to observe and work with them while they used Online Discover Service at their own pace.

Academic disciplines represented

Architecture and Urban planning, Design and Innovation, Economics and Management, Humanities, Chemistry, Life Sciences and Technology, Mathematics, Ocean and Earth Science, Physics Science and Engineering, Foreign Language, Software Engineering, Law, Medicine, Arts and Media, Political Science and International Relations

Academic 'levels' represented

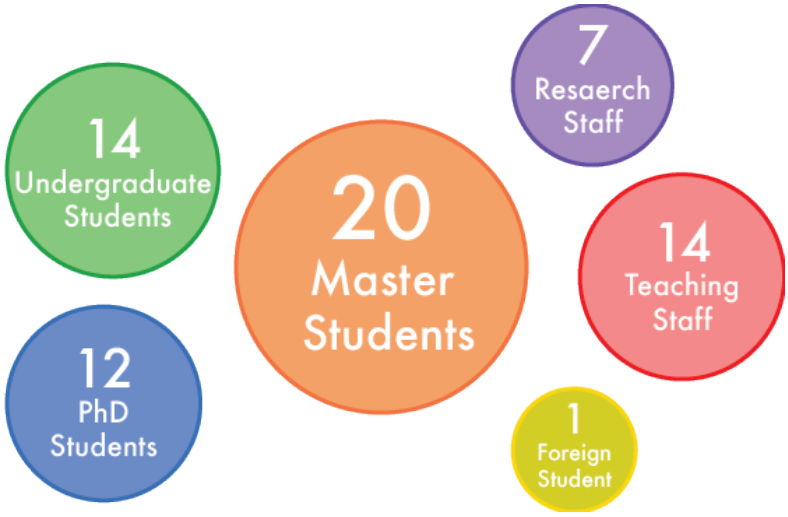
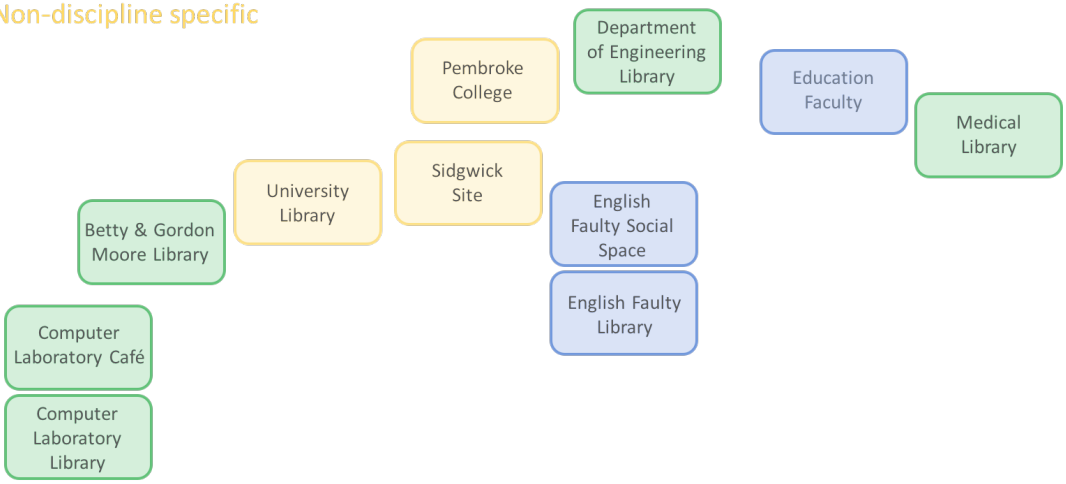


Figure 3.1 Academic Levels

Where we conducted our research

- Science, Technology, Engineering and Medicine
- Arts, Humanities and Social Sciences
- Non-discipline specific



4. INTERIM ANALYSIS

4.1 Idea generation session with project team

When the interviews and observations with users had provided sufficient data, the project team met to discuss insights gathered so far and to come up with ideas for task-based usability tests which could be used to conduct further research in the next phase of the project. Points of interest from the research so far included:

- Commonalities across academic disciplines and levels of academic experience, in terms of what people expected from Online Discover Service.

- An appreciation from users of the way the interface looked, i.e. the cleanliness of the design and the visual hierarchy of the information and options represented.

- A reluctance amongst many people to use filters during their searches, either pre- or post search.

4.2 Developing task-based tests

Examples of the task-based tests, arrived at as a result of this session and refined afterwards, can be seen below. These are four examples from a wider range of tests, 19 in total.

Find article with article information	***Cite record for entry***
[Open Online Discover Service and find item record for specific online article, using information from the article level metadata] *-How does user approach this (i.e. search bar, filters, etc.)* *-Is the process intuitive or are they indecisive/confused about hoe to approach the task?* *-Would they usually use Online Discover Service for this, or another platform?* *-Where are the points of fail?* *- Are they able to complete the task?* *-What is confusing or unexpected during the task?*	[Do this form record which has been found by user already as part pf another test?] *-Is the [Cite] button identifiable?* *-When found and used, what is the users' reaction to the cite window that pops up?* *-Is the process intuitive?* *-Which parts of the cite window are seen as useful by user?*
Load previous search history	**Pin/save list of results**

	[Do this from results list already founded by user as part of another task]
-Does user correctly identify clock icon as useful for task? *-Is the process intuitive or does user struggle to work out how to approach?* *-Does the user attempt to use any other aspect of interface to attempt to complete task?* *-Does user log in? Do they realise intuitively why they should at this stage?* *-Is the task completed successfully?*	*-Does user correctly pin top right of screen?* *-Is the process intuitive or does user struggle to work out how to approach?* *-Does the user attempt to use any other aspect of interface to attempt to complete task?* *-Does user lo in? Do they realise intuitively why they should at this stage?* *-Is task complete successfully?*

Form 4.1 Task-based test example

4.3 Developing personas

One of the aims of the project was to arrive at personas which could inform the continued development of the Online Discover Service platform in Tongji. Personas are fictional characters used to represent users of a website or other service. Created based on data gathered from real users, personas provide a valuable opportunity to focus design and development. These user archetypes can be a practical reminder of the people a product or service is being developed for. Our personas continued to take shape over the course of the project, but at this stage we were aware of some keys ways in which the platform was used and some commonalities across different users. To give them their necessary context, the four personas arrived at during the analysis of the project data can be found in the 'Project Outputs' section of this report.

4.4 Identifying areas for further research

At this stage in the project we had worked with a large number of students and staff at the University, looking at the ways in which they used Online Discover Service and their experiences of both Online Discover Service and other platforms they used to find and interact with sources of information. We were conscious, however, that we had still not seen enough, in terms of how Online Discover Service was being used across Tongji. There are specialised ways in which Online Discover Service is used which required our attention. Areas identified by the project team as being in need of further exploration included:

- Special collections: we were aware that users of special collections have very different needs from platforms such as Online Discover Service, and that this was an area we had not yet explored thoroughly enough.

- Undergraduate students: as previously mentioned, we had struggled to recruit undergraduates due to the time in the academic year.

- Finding printed resources: working with users in environments familiar to them had produced valuable data, but we needed to conduct more work with people trying to find printed resources in libraries, as this is a key way in which Online Discover Service is used. In the second phase of the project efforts were directed towards these areas.

5. SECOND PHASE OF RESEARCH

5.1 Working with users of special collections

People working with rare books, manuscripts and archives have very different needs from digital platforms used to search for resources. At the University of Tongji, although manuscripts and archival material are listed in various different catalogues, Online Discover Service is the primary system used to search for rare books. Tongji is a research-intensive University and many of its research students and staff, particularly in the Arts and Humanities, rely heavily on its rare books collections.

During the second phase of the project we worked closely with research and teaching staff in the Arts and Humanities, several of whom made use of early printed resources frequently in their work. Many of the ways in which these academics used Online Discover Service and a lot of the experiences they had were similar to other participants we had worked with. Some, however, did use Online Discover Service in significantly different ways, for example when trying to locate resources published between specific dates, held in specific named collections and when trying to locate resources using copy-specific information.

There was a focus during the observations we conducted with these members of staff on the Online Discover Service Advanced Search functionality. It emerged that one way in which it may be possible to allow for more precise queries to be formulated in Online Discover Service, would be to include additional options and parameters in the Advanced Search. Many of the academics we interviewed and conducted observations with made use of aspects of other search platforms and catalogues (for example the National Library of CHINA online Chinese Short Title Catalogue) which were not currently present in Online Discover Service.

The data gathered during this work with Tongji academics in the second phase of the project was included in the wider project analysis process and also led to specific recommendations for the development of the Advanced Search functionality in Online Discover Service.

5.2 Applying task-based tests

The reason for the development and application of task-based usability tests was to identify consistencies across Online Discover Service users, in terms of areas of difficulty and points of fail. We found during the tests, however, that approaches to the tasks, levels of persistence and the points at which participants would give up and abandon their task were too varied to provide any useful comparable data. This is not to say that the exercise was not valuable; observing participants during their attempts at completing the tasks provided us with more and more data and added to our understanding of the overall Online Discover Service user experience.

During this phase of the project we also concentrated on working with people who were using Online Discover Service to locate the records for printed library resources, predominantly books. We worked with undergraduate and postgraduate students and research and teaching staff, examining in detail the way in which people approached this activity. We had learned from our work in the first phase of the project that many people primarily used Online Discover Service as a tool for findings printed books in Tongji. We were also aware that this was an area in which people often struggled. The additional data we gathered while focusing on this aspect of Online Discover Service was invaluable in informing the project findings and outputs.

5.3 Integrating Behavior User Studies with Log Analysis

Statistics were collected from the Online Discover log tables SEARCH_SUMMARIES and CLICK_SUMMARIES for the following periods corresponding to weeks 2 to 6 of each semester from 1 Semester 2016 through to 1 Semester 2017:

Sep-30	11 September –14 October 2016
Oct-31	12 October – 14 November 2016
Nov-30	15 November – 13 December 2016
Mar-2	11 February – 14 March 2017
Apr-4	9 March – 12 April 2017

The SEARCH_SUMMARIES log table indicates usage of the different search scope options within the Catalogue. Results have been normalized to treat Aleph and Tongji scholar scopes as equivalent. The different search scopes available are listed below, though it should be noted that not all of the scopes were available in all of the data collection periods.

All Collections – all records from the library management system (Aleph/Collections), plus all records from Digitool (Archival Collections and Tongji Research – see below), plus records from Superstar Scholar Index.

• Books, Journals, AV, etc. – all records from the library management system (Aleph/ Tongji Discover).

• Reserve – a subset of records from the library management system (Aleph/ Tongji Discover). comprising records linked to units in Reserve/eReserve.

• Journals A–Z – a subset of records from the library management system comprising records for electronic and later also print journals. This scope was not available during the sample periods for 2016.

• Last 7 days – a subset of records from the library management system for items received during the previous 7 days. This scope was only available during the 2016 sample periods as the functionality is not supported in Tongji Discover.

• Last 30 days – a subset of records from the library management system for items received during the previous 30 days. This scope was only available during the 2016 sample periods as the functionality is not supported in Tongji Discover.

• New Journals – a subset of records from the library management system for recently added journal titles. This scope was only available during the 2016 sample periods as the functionality is not supported in Tongji Discover.

• Recommendations – a subset of records from the library management system allowing clients to track progress on physical items ordered on their behalf. This scope was only available during the 2016 sample periods as the functionality is not supported in Tongji Discover.

Table 1 reports the number of entries in the S_SEARCH_SUMMARIES table for the different available scopes in each of the sample periods. The largest number of searches was made in the All Collections scope (Sep-30 = 76.58%, Oct-31 = 71.95%, Nov-30 = 76.10%, Mar-2 = 74.55%, Apr-4 = 77.43%).

Scope	*Sep-30*	*Oct-31*	*Nov-30*	*Mar-2*	*Apr-4*
All Collections	979,027	882,035	1,321,859	1,019,257	1,189,792
Books, Journals,AV etc	101,212	160,177	71,361	39,670	57,121
Reserve	191,033	154,656	173,982	110,190	135,462
Journals A-Z	0	0	165,854	195,584	151,044
Tongji Research	2551	1957	2806	1794	2222
Archival Research	648	382	742	407	710

Table 5.1 Number of searches by search scope

This is to be expected given that this is the default search option and promoted by Library staff as the most appropriate starting point for a general catalogue search. The next highest numbers of searches are in the Reserve and Books, Journals, AV, etc. scopes, reflecting the importance of targeted searches for items on student reading lists and perhaps also for specific monograph items in the Library's physical or electronic collections. It is notable that the number of searches in the Books, Journals, AV, etc. scopes dropped significantly in the October-31 and subsequent samples (i.e. following the migration to Tongji Discover). This drop, however, is offset by a significant number of searches in the newly available Journals A–Z scope, suggesting this was recognised as a more effective way of searching for known journal titles. Apart from this discrepancy, searching across the different search scopes remained approximately consistent through all of the sample periods, the four specialist research scopes receiving low but consistent usage. The Other category in this table

combines searches on the four recent additions/recommendations search scopes, which were not available after the migration to Tongjin Discover. The increase between the September -30 and October-31 sample mostly relates to the Last 7 Days search scope, though the reason for the large difference between the figures is unclear.

Table 5.2 shows the percentage of searches in each search scope which produced no results.

Scope	*Sep-30*	*Oct-31*	*Nov-30*	*Mar-2*	*Apr-4*
All Collections	5.14	4.74	5.13	5.00	4.58
Books, Journals,AV etc	17.63	12.88	19.57	17.33	12.85
Reserve	19.71	21.05	30.68	26.71	19.14
Journals A-Z	n/a	n/a	42.60	42.49	38.40
Tongji Research	30.46	22.33	19.60	24.75	29.43
Archival Research	36.27	31.15	33.02	27.76	35.77

Table 5.2 Percentage of searches with no results.

Overall, searches with no results represented about 10% of all searches (Sep-30: 8.50%, Oct-31: 8.78%, Nov-30: 11.90%, Mar-2: 12.51%, Apr-4: 9.55%). The percentage was lower for the larger search scopes – around five per cent for All Collections, while the more specialised search scopes, which by definition contain fewer records, show a higher failure rate. This was particularly high for the Recently Received/Recommendations scopes, where it was impossible to guess the nature of the content in advance even approximately. Variation from year to year does not appear to be significant, apart from the Reserve scope, where the percentage of searches with no hits was notably higher in the October-31 and Novermber-30 samples. This may be attributable to transitional issues with the implementation of Reserve in the Tongji Discover environment.

The CLICK_SUMMARIES table records the extent to which particular search functions or options for manipulating or interacting with search results are used by library clients. The figures for selected actions are given in Table 5.3. Actions relating to specifically systems functionality and to linking have been omitted as not directly relevant to the discovery experience.

The predominance of the seven actions noted above suggests that the vast majority of user search and result management requirements are being met without recourse to the sophisticated mechanisms available through the Catalogue software. Basic Search, for example, receives much higher use than Advanced Search (around 2%), and although the link to Advanced Search is not particularly prominent in the display, it is visibly located near the Search button, and some users are clearly finding it. Actions relating to social media related functionality in particular – Add a Review, Add Tags, Display Tags and Reviews, Tags Page – showed very little usage, justifying their

removal from the Catalogue in early 2015 prior to moving platform to the cloud, where this functionality is not fully supported. The ability to save searches and set up alerts is also very little used, as is browse functionality – perhaps because this is relatively unprominent in the Catalogue screen layout.

	Sep-30	*Oct-31*	*Nov-30*	*Mar-2*	*Apr-4*
Add a review	8	12	6	7	0
Add page to e-shelf	248	331	209	278	273
Add tags	6	16	4	8	0
Add to eshelf	12,685	31,220	17,123	14,738	15,877
Advanced search	48,062	35,014	61,524	36,647	44,469
Basic search	513,792	432,738	646,054	514,315	566,632
Browse search – title	n/a	112	270	70	101
Browse search – author	n/a	101	279	71	90
Browse search – subject	n/a	325	169	74	104
Browse Search– other functions	n/a	6708	1504	742	946
bX hot articles (= show popular articles)	10,048	7493	11,989	8426	6072
Create alert	15	0	11	10	5
Details print	139	96	329	175	366
Did you mean	98,537	98,973	111,075	96,966	104,508
Display details tab (= full record)	128,538	131,006	192,667	124,798	158,826
Display tags and reviews	7044	7488	6971	5223	115
eshelf page	23,865	53,286	29,806	24,939	27,545
eshelf print	280	85	95	38	80
Full display	16,597	6081	1670	1511	1380
Next page	221,303	173,943	251,838	439,489	223,751
Previous page	3383	2349	3424	2855	3317
Recommendations (= further reading)	2986	3843	1445	620	1321
Refine (= facets)	209,205	242,951	260,080	161,239	220,698
Save search	60	69	52	53	35
Send an email	875	990	1075	1473	1256
Sign-in	96,833	91,731	179,000	128,370	187,689
Start session	212,074	609,206	399,990	351,973	621,430
Tags page	1	5	98	86	0
Total for selected actions	1,606,584	1,936,172	2,178,757	1,915,194	2,186,886

Table 5.3 Number of log entries for selected catalogue actions.

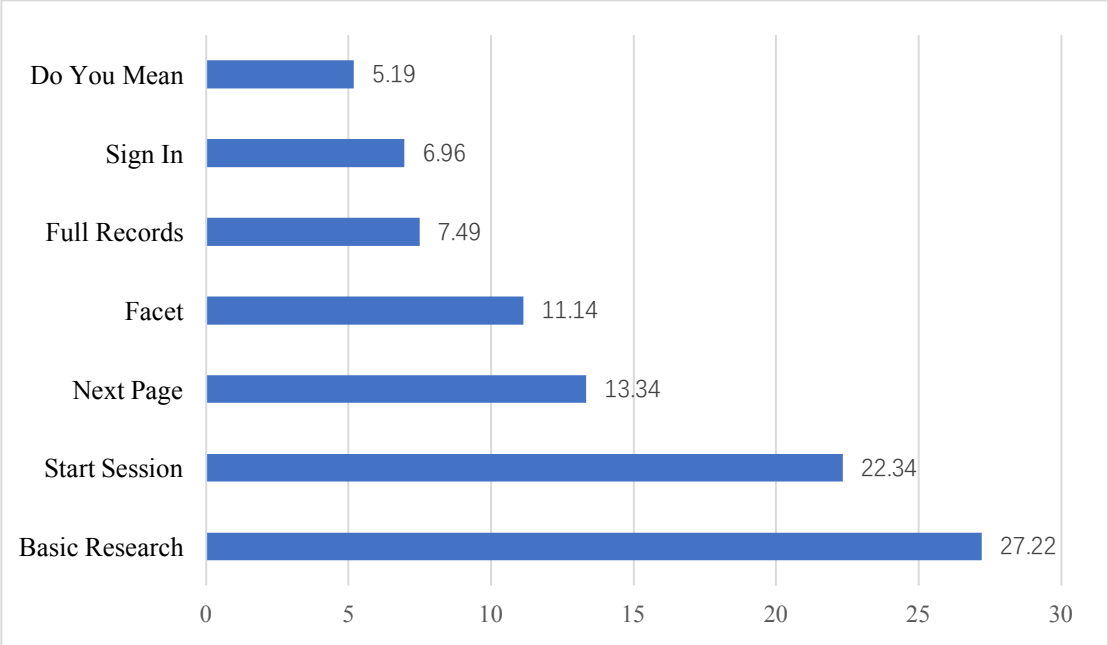


Table 5.4 Percentage occurrence of top seven actions.

There is some variation across the different survey periods. The proportion of Basic Search appears to be declining slightly (Sep-30= 31.98%, Oct-31 = 22.35%, Nov-30 = 29.65%, Mar-2 = 26.85%, Apr-4 = 27.22%) and seems to be consistently higher in first semester than second semester – possibly an indication that users are becoming more familiar with the way Discover Platform works, so conducting fewer searches to find what they are looking for. The proportion of facet use similarly appears to be declining (Sep-30 = 13.02%, Oct-31 = 12.55%, Nov-30 = 11.94%, Mar-2 = 8.42%, Apr-4 = 10.09%) – possibly indicating that users are becoming more familiar with facets and getting to what they want with fewer clicks. On the other hand, the percentage of sign in actions appears to be increasing (Sep-30 = 6.03%, Oct-31 = 4.74%, Nov-30 = 8.22%, Mar-2 = 6.70%, Apr-4 = 8.58%) – possibly indicating that more users are more aware of additional functionality available after signing in. The Discover Platform logs provide detailed information about the use of facets in the Catalogue.

Statistics for the first choice of facets available in the main, Library Collections, tab of the Catalogue are shown in Table 5.5, in the order in which they appear in the Catalogue display.

Facet Group	*Sep-30*	*Oct-31*	*Nov-30*	*Mar-2*	*Apr-4*
Top level facet	72,514	66,469	108,307	73,704	100,272
Resource type	52,936	41,587	53,215	30,218	38,195
Library or collection	3581	6835	2165	1674	1882
Author or creator	6705	35,315	5955	4087	4586
Topic	18,590	37,056	20,579	10,045	12,047
Creation date	30,969	28,055	46,278	26,755	48,948

Table 5.5 Use of facet

Although there is some longitudinal variation, there is no clear trend, beyond the overall slight decline in facet use noted above, but the top-level facets receive significantly more use than the others, partly perhaps because this facet option (branded as 'Show Only') is located at the top of the facet list, but also because of its nature. Three options are available: Peer- Reviewed Articles, Available Online and Available in the Library. Of these, Peer-Reviewed Articles is the most popular, probably following an emphasis on this type of publication in research training and student assignments. Available Online also receives considerable use, reflecting a reliance on electronic media for both students and staff. The second most used facet is Resource Type, followed by Creation Date, then Topic, then Author or Creator, then Library or Collection. It is notable that this order is not the same as the order in which the facets are displayed on the screen, suggesting that catalogue users are making deliberate decisions about facet use, not simply following the line of least resistance. Within the Resource Type facet, there is a clear preference for certain values over others.

Table 5.6 shows the overall percentage use of the ten most popular values for initial facet selection, comprising 97% of the whole.

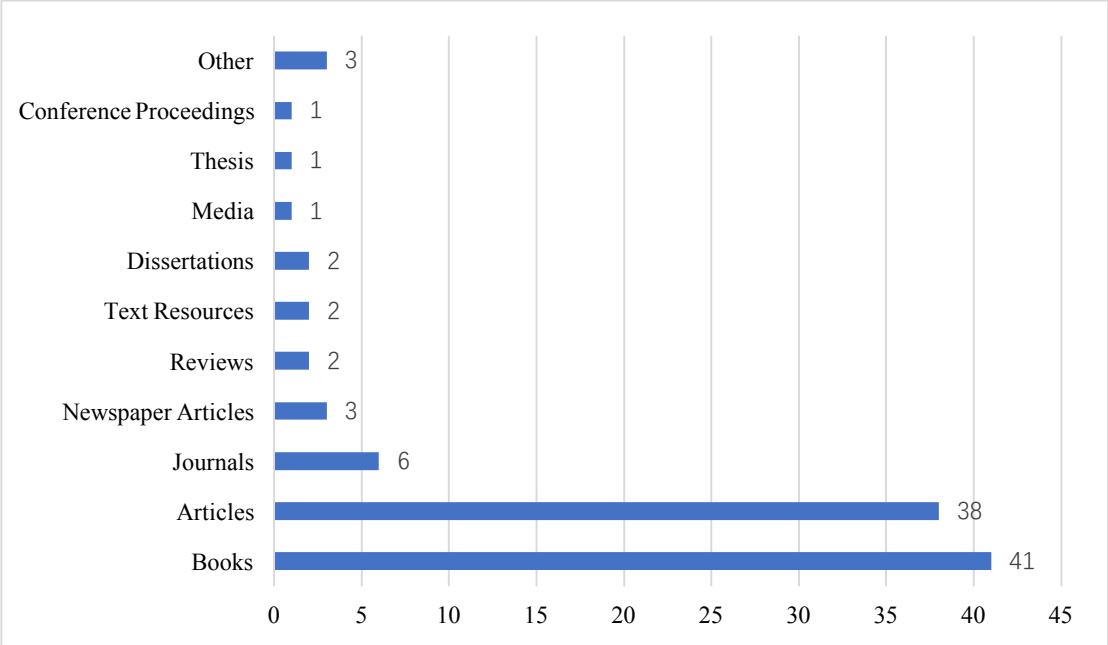


Table 5.6 Percentage of different values of resource type facet.

Seventy-nine per cent of Resource Type facet selection is aimed at isolating book and journal article content. The Other category, taking up 3% of the whole, contains 22 separate value options. Most of these are predetermined values within Tongji Discover System, the exact meaning of which may not be clear to Catalogue users. (This also explains the distinction between Theses, a value describing Aleph/Tongji Discover records, and Dissertations, which refers only to records found in Tongji Discover System.) The Other category includes facets used only within the Reserve

scope (unit name/number and lecturer, together with a small number of facets that were only available for limited periods in 2016, including language, order status and school (academic department).

6. MOBILE DEVICES

During our research participants mentioned that they rarely used Online Discover Service on mobile devices. People told us that they accessed electronic resources through Online Discover Service almost solely on laptops, desktop machines or tablets, and that if they had to find and collect printed resources they would either use Online Discover Service on terminals in libraries, or prepare lists with the details they needed before visiting libraries. We were, however, keen to understand as much as possible about the Online Discover Service mobile user experience, so focused on this where possible during our observation sessions.

Many of our participants only used Online Discover Service on their mobile phones when they were inside library spaces, checking references for printed material. This meant that they focused on the speed and performance of the platform, as well as being able to quickly and efficiently find classmarks for specific copies of printed books, as this is what was important to them at the time.

Key findings from our research with people using Online Discover Service on mobile phones

- The responsive web design was recognised by participants as being superior to that of other similar platforms they had used. - There was a frustration from many participants at how much mobile phone screen real estate was taken up by the Online Discover Service logo, search bar and login message.

- Few people intuitively understood what the Advanced Search icon represented, and that it was an active link to further search options. Those who did had often found out accidentally. - Some people did not immediately notice the location of the ‘refine my results’ option, but when they did it was seen as a sensible way to incoroporate the options needed into the mobile interface.

– It was seen as difficult to go ‘back and forth’ through different screens on mobile devices, for example when moving between lists of results and item records. N.B. As the tablet view of Online Discover Service was identified early on in our research as being very similar to the desktop view, testing this with users was not a key focus of our research.

7. KEY FINDINGS

7.1 Online Discover Service is one of many tools used to search for resources

Our work during this project highlighted the range of different approaches people have to looking for information sources and how this affects the tools they use to do so. We spoke to research staff who relied almost solely on Google Scholar, PhD students who listed 10 or so subject-specific databases they checked regularly and Economists who talked about primarily using access-restricted government datasets. For some people, Online Discover Service was something they used every day and relied heavily on. For others, who had often never seen the platform, it was purely a curiosity.

- "I tried a few years back to stop using Google for everything and start using the other databases. This didn't last long…" (Engineering postdoc)

- "For general searches I use Google Scholar, MLA Bibliography, JSTOR or Early English Books Online, then Online Discover Service." (English PhD student)

- "I use subject-specific databases, but don't trust them to capture 100% of what's out there in the field." (Chinese Philosophy PhD student)

Although behaviours and approaches varied greatly amongst the people we worked with during the project, the model below represents an approximation of the different tools participants used to search for information and the situations in which they used them.

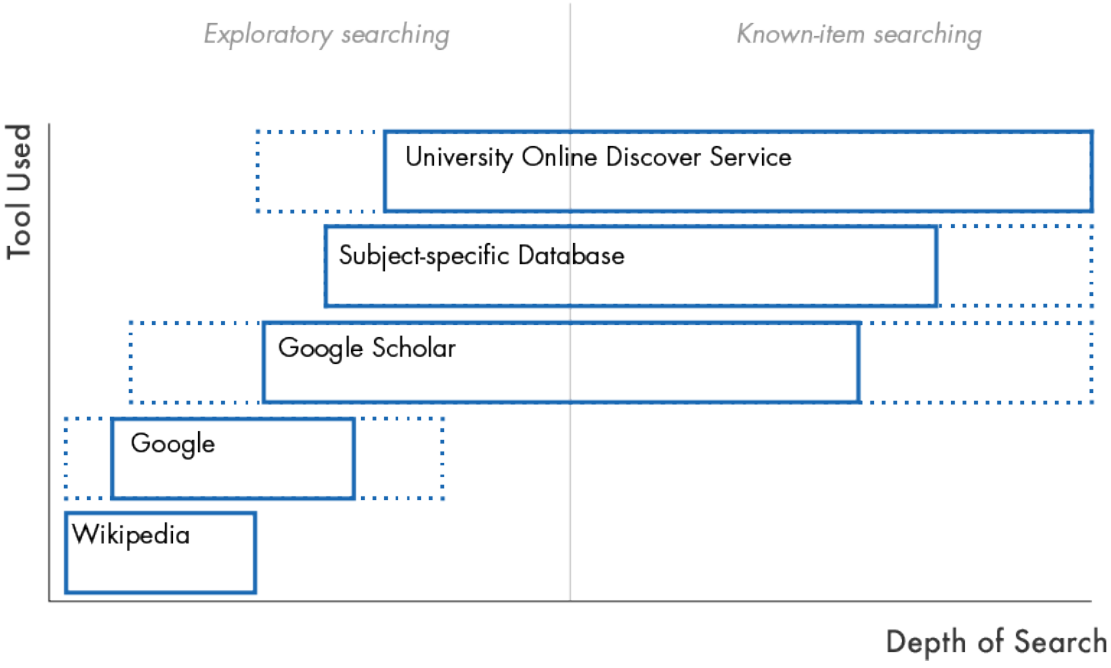


Figure 7.1 Online search tools presented

7.2 People expect Online Discover Service to primarily search for local resources

Whether they used it regularly or were seeing it for the first time, the majority of participants in our research shared an expectation that Online Discover Service would primarily, or solely, search for resources which they could access as members of the University of Tongji.

- "It's the University system, so I'd expect to have access to everything I find here." (Medicine PhD student)

- "I'll use Google Scholar if I'm doing general searches, with Online Discover Service I'm using it because I'm looking for something I know we have at Tongji." (English PhD student) Some people assumed that Online Discover Service would prioritise resources at a more local level than institutionally.

When interviewed in library spaces, there was an expectation amongst some participants that the ranking of results would prefer the library they were in:

- "I'd expect the computers in the Engineering Library to look for books in the Engineering Library." (Engineering undergraduate student)

- "It would be good if [Online Discover Service] used my location to give me results in libraries near to me. I've come to associate Online Discover Service with the library - I'd use it more for books than [online] journals." (Main Library staff)

The expectation that Online Discover Service would have been designed primarily to search the holdings of the University was common across almost all our participants. This was due to several factors, including the fact that most used other search platforms and databases to search for online content (although many used Online Discover Service when they had the exact reference for an electronic source they needed) and that people were familiar with more traditional library catalogues and expected Online Discover Service to exhibit similar behaviour. When working with people who were unfamiliar with the platform, the fact that Online Discover Service was hosted on a University website and had the University logo present was enough to suggest to them that it was a tool designed to search for Tongji content.

It is important to note that during our project a large deletion of records, many of which showed content not subscribed to by the University, from Online Discover Service reduced this frustration greatly for our participants.

7.3 The level of simplicity of a search interface informs search approach

Over the course of our study, a key emergent theme had to do with the way in which people approached searching for resources using Online Discover Service. Very few people limited their results pre-search and many did not make use of the post-search refining filters. The inviting, simple-looking Online Discover Service search bar seemed to inspire confidence in the system and people approached it in the way they would Google, or other powerful search platforms. Many participants commented along the following lines:

- "I don't bother with the side bar." (Economics MPhil student)

- "It seems simple. The user interface seems flat but then you have to go through layers, then back to search, then back again." (Architecture and urban planning PhD student)

- "You think it's going to be easy, then after your search you think, ah, OK, this is going to need a bit of work…" (Humanity Ms student)

To fully understand this would need a great deal of research and was outside the scope of our project. The key insight was the expectation from users that the simple Online Discover Service search function would automatically return a list of results as sophisticated and relevant as they would expect from other, more powerful search platforms. This led to frustration when, for example, a search for a journal title returned a number of articles and other results before the link to the journal holdings and links to online access. At this point, when asked what they would do next, many of our participants answered by saying that they would start using another search tool. Very few of the people we worked with, regardless of academic discipline or level of academic experience, used the Online Discover Service Advanced Search functionality, and surprisingly few used filters to refine results after their initial search. A lot of the reluctance to use these options seemed to stem from a feeling that Online Discover Service should be prioritising certain types of result, without intervention from the user:

- "The 'format' filter is useful, but I shouldn't have to use it when I want to find books." (Life Science M.S.S.W. student)

- "You want to get to the book straight away. That's what it [Online Discover Service] is there for, right?" (Arts and Media M.F.A.student)

7.4 Perceived complexity of a search affects user expectations

Students and staff we worked with during the project reported distinct types of search they conducted at different points during their academic work. Sometimes they needed to explore a subject area they were unfamiliar with in order to identify themes

and find out who the key contributors were in that field. At other times people were following references from footnotes or trying to locate resources they knew existed, for example when given a reading list by a supervisor. People had very different expectations when conducting these different types of search and often mentioned this to us:

- "With Google I don't mind if it's slower to work through the process as I want more resources. I want Online Discover Service to be fast and easy. When I use it I know what I need to find and I want it to be quick and seamless." (Environmental science PhD student)

- "It's frustrating when you put in all the information [for a known resource] and other things come up." (English undergraduate student)

- "If I type in words I expect to be given results with those words in the title." (Mathematics Ms student)

We noticed a definite relationship between the perceived complexity of an individual's search and the time they were willing to spend in order to find the result(s)they needed. When a search perceived as simple by the user took too much time and too many steps to resolve, it led to dissatisfaction and frustration with the tool(s) being used.

Figure 7.2 Relationship between the perceived complexity of an individual's search

7.5 Online Discover Service is used by many people to conduct known-item searches

As mentioned previously, our participants often used several different search tools to look for information sources and used these for different purposes. Many people used Online Discover Service when they knew of a specific resource they needed to find and wanted to locate and/or access it as quickly as possible. Comments from participants included:

- “I might use [Online Discover Service] to look for something in a library, or if I can’t find something in Google Scholar.” (Medicine PhD student)

- “To me, the most important thing is being able to quickly and easily locate books in the different libraries I use in Tongji. Online Discover Service doesn’t seem to be designed to do this.” (History academic)

- “I use Online Discover Service when there is a specific book I need to find.” (Physics Science and engineering PhD student)

One of the fundamental aspects of discovery systems is that they are designed to open up access to millions of resources, potentially resulting in users uncovering new and valuable avenues of exploration. This is very different from the traditional library catalogue user experience, wherein with enough information it is relatively easy to ‘drill down’ to a specific resource. Many of the people we spoke to had found it difficult to conduct these known-item searches using Online Discover Service, i.e. when looking for information on how to access a specific known resource, either online or in a physical library. Part of the frustration in this regard was due to the fact that, as mentioned previously, many people saw Online Discover Service as a tool they would use for this purpose, rather than for the more general or exploratory searches that they would conduct with other search tools. People who had struggled to locate resources in this way often commented along the following lines:

- “It’s difficult to narrow searches in Online Discover Service.” (English undergraduate student)

- “Book reviews above books just don’t make sense!” (Architecture and urban planning PhD student)

- “When looking for a book, you’ll end up with a random science article.” (Arts undergraduate student)

- “If you search for a title that only has a few words in it, even if you type it in correctly, other less relevant titles will come up first.” (Civil engineering M.C.E student).”

In contrast, people we worked with who used Online Discover Service for more exploratory searches appreciated the range of results which it returned:

- “I often look first for recent and niche journal articles on a subject – Online Discover Service is good for this.” (English undergraduate student)

• “It’s useful that Online Discover Service shows newspaper articles and things like that. These wouldn’t show on PubMed and could be useful when presenting to people who don’t understand the field.” (Chemistry postdoc)

• “Online Discover Service is useful for e-books. You find more than you would on Google.” (Design and Innovation undergraduate student)

When conducting these different types of search, people have very different needs and expectations from the platform they are using. The chart below gives an impression of levels of importance placed by people on the behaviour of search tools when conducting known-item and exploratory searches.

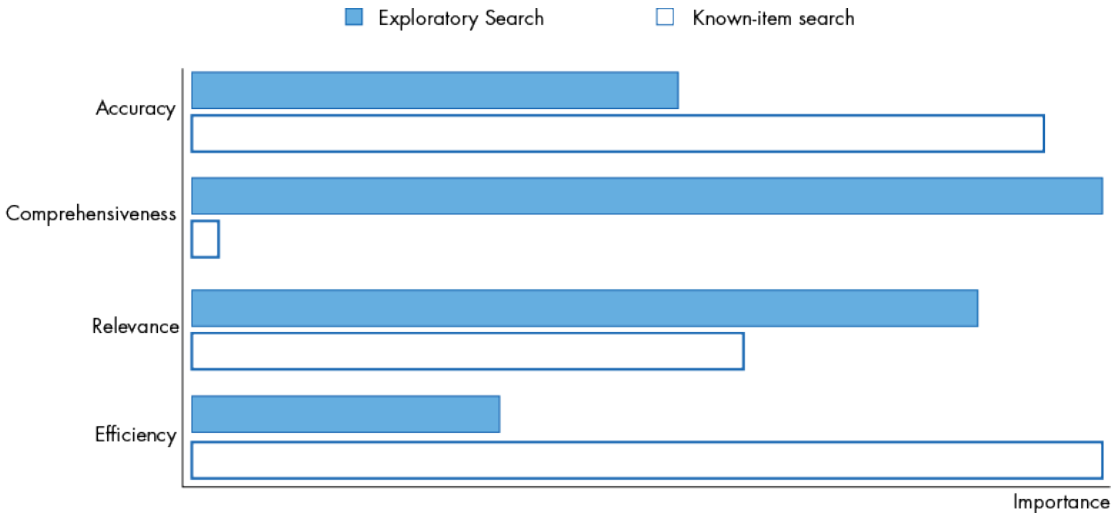


Figure 7.3 Behaviour of search tools

It is important that we continue to be aware of the different ways in which people continue to use Online Discover Service, and discovery systems in general. Although there is clearly value for some in being able to search across millions of resources and multiple databases and resources types, some people also often need to use Online Discover Service and similar systems to quickly and easily locate specific known resources.

7.6 Quick and seamless access to resources is a priority

One of the key concerns for people we worked with over the course of the project was having quick, seamless access to the resources they needed. This often meant online articles and other electronic content, but also applied to printed library resources. Whether it was a full text online article or a classmark for a library book, people wanted to be able to access this information as quickly and easily as possible. Expectations, perhaps informed somewhat by experiences with platforms such as Google Scholar, were that it should be possible to move from an initial search to a full-text resource, for example, in one or two clicks. Comments from people we worked with included:

- What's important to me is quick, immediacy of access to online resources." (Design and Innovation Ms student)

- "I want a list of links that takes you to a paper, not a link to a link to a link." (Architecture and urban planning PhD student)

- "I don't want to see this 'send to' when I look for a paper. I want to see the abstract." (Engineering PhD student)

Often, people did not realise that the 'Full text available" option in the Online Discover Service results list view would, in many cases, take them directly to the online resource. This added to the perception of Online Discover Service as being complicated and forcing them to go through too many stages to get access. This approach and expectation may be because, by the time the user had successfully found the listing for the content they needed, they had already gone through several steps and therefore expected to have to go through more. During our observations participants commented:

- "I just want a big button saying 'pdf'." (Engineering postdoc)

- "[I want to be able to] search it, find it, click it, access it!" (Law PhD student)

After having found the listing for a resource they needed in the results list and clicking through to the item record, participants sometimes assumed that the item record screen would have the full text present and were confused when they were unable to see it. Although some people need and use a lot of the bibliographic information present in both the results and item screens of Online Discover Service, in a lot of cases people are looking for either the link they need to access an online resource or the location information they need to find a physical resource.

7.7 System performance and efficiency are very important

During our research people often mentioned being frustrated when having to wait for websites to load while they carried out searches and navigated between screens. Our participants had often experienced these issues with Online Discover Service, but also talked about having had similar problems with other online tools they used to search for information resources. People were particularly discouraged by this activity when they had to look for a number of resources in the same visit to a website. Online Discover Service seemed to perform reasonably well when people used University networks, where people had encountered real issues with its speed and performance it had tended to be when they were away from the University. Some people mentioned giving up when in these situations, as Online Discover Service was taking too long to load search results, or would not load them at all.

- "Online Discover Service is very slow. Because it's looking for all these resources you're not interested in, it takes ages to bring back the results." (Research staff)

- "There's too much going on in Online Discover Service – it's clunky, not smooth." (Chemistry undergraduate student)

Due to this frustration with loading times, aspects of the Online Discover Service user interface which were perceived by users to take processing power from their devices were often seen as 'overkill'. Two things which people commented on specifically were the diamonds shown when Online Discover Service is loading new screens and lists of results, and the screens which slide across lists of results showing item-level information. This added to the frustration people already had when having to move back and forth through different layers of Online Discover Service to find classmarks for books, bibliographic information, access links and so on.

It is worth mentioning that the introduction of the Online Library 'Tongjin Discover' library management system at the University should improve many of the issues users are experiencing in this area at the time of writing. The system is designed to work with Scholar Discover and the speed with which data is retrieved should increase significantly. At present Tongji metadata is held on several databases, with the implementation of Tongjin Discover the metadata will be held on one database instead, which will have a positive effect on the performance of Online Discover Service. Although it is an important part of the user experience, we were aware during this project that work was being done to alleviate these issues, so it was not a primary focus of our work with people using Online Discover Service.

7.8 Relevant results are key to a successful user experience

When asked what was most important to them in terms of platforms used to search for information resources, the words 'relevance' and 'relevant' were used by a large number of our participants. This was directly linked to a desire for seamless, efficient searches which yielded appropriate and useful results, without the need to use pre- or post-search options to limit or refine them. People were often frustrated at the lack of percieved relevancy in the initial results list, after having used the main Online Discover Service search function.

- "There's no logic to the order in which things come up." (Foreign Language PhD student)

- "I tried Online Discover Service when it first launched. It didn't give me any relevant results, so I gave up." (Chemistry postdoc)

- "How are the results listed? What is the reasoning behind the relevance? And why is there no indication of this?" (Engineering MPhil student)
- "The results [Online Discover Service] returns seem to be random and only loosely related to what I'm searching." (Architecture PhD student)

During our research, many people expected that Online Discover Service would be powerful and sophisticated enough to prioritise lists of results in the way that other platforms such as Google do. This may, as previously stated, have been partly due to the confidence inspired by the clean, simple, initial search bar. People also often thought that Online Discover Service would make conceptual links, looking for resources related to their search terms, when those terms were not present in the metadata for the resources they needed. One example came from a PhD student we worked with at the Computer Laboratory Library. They were trying to find a book using Online Discover Service which they knew was in the Library, which, from their understanding, was about big data architecture. The search terms 'big data architecture' would return the book as a result in Google Scholar, but not in Online Discover Service, due to the fact that the words did not appear in the title, subject headings, etc. for the resource.

While we were aware that the relevancy of search results was a key issue for users of Online Discover Service from an early point in the project, we also knew that this would improve over the time the platform will be in use at the University. Because of this, during our interviews and observations with Online Discover Service users we intentionally tried to spend time exploring other aspects of the interface as well, with the aim of identifying areas for improvement.

As with the performance issues, a lot of development work is focusing on the way in which Online Discover Service retrieves and ranks results. Many people we worked with had noticed improvements over the time they had been using Online Discover Service, particularly when attempting searches they had struggled with previously. Several of our participants mentioned that the results Online Discover Service retrieved during our observations were a significant improvement on those from previous attempts they had made with the same search terms and approach.

7.9 Library systems are seen as reliable and trustworthy

When our participants talked about Online Discover Service, particularly in terms of why and when they would use it instead of other platforms, many focused on its trustworthiness and reliability. In the case of undergraduate students, this was often in relation to the content they expected it to retrieve:

- "I would expect more reliable sources [in Online Discover Service] than I would in Google." (Engineering undergraduate student)

- “Google might have more news articles, [Online Discover Service] would have more academic articles.” (Environmental Science undergraduate student)

When working with postgraduate students and academic staff, we found a strong reliance on, and faith in, Online Discover Service in terms of the metadata it held and retrieved. Many people used it to find the correct bibliographic details for references they had been given or found, and also to check standardised formats for aspects such as journal titles and author names:

- “I use Online Discover Service to plug in missing bits of information from secondary sources.” (Research staff)

- “I use Online Discover Service to check the standardised format for author names, and for finding other bibliographic details.” (Research Staff)

It was reassuring to find this confidence in ‘the library’ from both students and academic staff. Although many of our participants preferred other search tools because of aspects such as speed and efficiency, many people used Online Discover Service when they needed to be sure that the resources or metadata they found would be reliable. This is an important consideration for the development of discovery systems, as in order to continue to be seen as valuable by their users they need to appeal to existing attitudes, approaches and behaviours. In this case, maintaining this reliability, or perceived reliability.

8. CONSIDERATIONS FOR DEVELOPMENT

Online Discover Service is a platform which will continue to develop and evolve over the time that it will be in use in Tongji. There will be many opportunities for the needs, behaviours and preferences of our users to feed into this process. This may be when considering the implementation of new functionality in Online Discover Service itself, when designing web pages and online help tools, or when communicating in-person with people using Online Discover Service. Although this activity should be ongoing, the following considerations for continued development and design are based in the findings of this project.

Continued development should be based on the tasks people use Online Discover Service for

One of the key findings of our research was that people use many different tools to search for information resources. Our research has shown that people use Online Discover Service for specific tasks, so time and effort spent on developing the platform should focus on optimising these.

Areas to do with the relevancy of search results should be prioritised

The relevancy of search results is key to the Online Discover Service user experience. During our research participants most often expressed frustration with Online Discover Service when the results they received after conducting a search did not seem relevant to them. People had noticed improvements to this over the time that they had been using Online Discover Service and this was recognised as being of significant value to them. In order for Online Discover Service to continue to be seen as useful by members of the University, it is essential that attention continue to be directed towards providing what our users judge to be relevant sets of search results.

Online Discover Service should continue to focus on providing access to Tongji resources

Our research participants shared an expectation that Online Discover Service would search primarily for content which they could access as members of the University of Tongji, specifically printed and full text online resources, rather than non-subscribed resources, book reviews and abstracts. As this expectation is so prevelant, continued development of Online Discover Service should focus on highlighting the extensive printed and online collections held at, or subscribed to by the University. Providing information about other resources should be seen as a secondary priority. This aspect of the Online Discover Service user experience should improve with the introduction of a tabbed search bar, giving people the option to limit their searches. The tabbed interface, although not a direct output of this project, is based on feedback from users and is directly corroborated by evidence gathered during this project.

Where possible, the facility for a tailored user experience should be provided

The user experience of a search tool can be significantly improved by providing people with the ability to tailor aspects of its functionality to their own preferences.

People we worked with often mentioned that they would like to be able to 'set' preferences, such as their preferred library/ies or resource type, some also mentioning that it would be useful to be able to turn on or off aspects of functionality such as predictive text. Wherever possible during the development of Online Discover Service, opportunities for customization of this nature should be provided to the user.

User choices should be consistently applied throughout the search process

One thing which people find frustrating when using Online Discover Service is when refining a search in a certain way does not have the effect that they expect or are aiming for. A specific example is that when refining a search by an individual Tongji library, people are confused when that library's holdings are not prioritized in subsequent search steps, i.e. in the results list and item view after they have refined their search. If possible, as Online Discover Service develops, priority should be given to this issue and changes made to searches by the user should have an effect on the user interface at as many levels as possible, as would seem natural to the individual conducting the search.

Quick, seamless resource access should continue to be prioritised

It is of paramount importance to users of Online Discover Service to have quick and seamless access to resources. This may mean finding the classmark for a printed book, or finding and accessing the full text for an online source. It cannot be stressed enough how key this is to the overall user experience and development should be focused in this area. Consistent help options should be integrated into the Online Discover Service interface Users often do not know where to look for help and advice when using Online Discover Service. We would recommend that help options be provided at every stage in the user interface. One way this could be achieved would be to include a link to the LibAnswers service on each page in the Online Discover Service interface.

Multiple results lists should be user-centred and intuitive

Where there are options for the user in terms of resource type, the list of options should reflect user preferences and existing behaviours. Specifically, printed book records should appear before ebook records and subscribed online content should appear before non-print legal deposit resources, for both books and journal articles.

9. CONFIGURATION SUGGESTIONS

The following suggestions for the continued development of the Online Discover Service interface are more specific than the 'considerations for development' listed in the previous section. They accompany a set of very specific, micro-level suggestions for re-configuration of the interface, which can be found in Appendix 1 of this document.

- Users should be able to apply multiple post-search filters using tick-boxes or similar functionality, rather than being sent to the top of a 'new' page after each filter is applied or removed.

- If possible, holdings information for 'multiple versions' records should expand and collapse within the results list view, rather than slide across in a new window.

- A 'back' button should be included to move from item record screens to results lists, in addition to the existing 'X' option.

- More than 10 results should be included in the initial list of results retrieved, if this can be achieved without losing too much speed and performance in the interface. This would need further testing to be optimised.

-Access links should be prominent and obvious and aspects of the interface suggesting access should be active links wherever possible. An example is the green 'Full text available' text at the top of item record screen for online resources, which at present sits next to a hyperlink symbol in the interface but is often not active.

- In cases where printed material is held in 'dark store' locations and inaccessible to users, there should be clear and prominent information advising users to request a free Inter-Library Loan. At the moment this link is too hidden amongst other aspects of the interface and the meaningful information users need is held away from Online Discover Service and is difficult to find.

- If possible, without detracting from other important elements of the interface, citation numbers should be included in the results view for online resources.

- The visibility of the Scholar Discover 'X' functionality which suggests related resources should be increased. Many of our participants used and enjoyed similar functionality in other systems they used, but were not aware of its presence in Online Discover Service.

- Continued efforts should be placed on ensuring that search retrieval algorithms prefer words found together and in key fields such as title and author. During our observations often results were prioritised that contained many instances of a word in the description or abstract for a resource.

10. PROJECT OUTPUTS

This project was a first for the project, in that it concentrated on the use of an existing, third party service. The outputs took many different forms, which we hope will be useful both at the University of Tongji and to inform the continued development of the Scholar Discover service.

10.1 Suggestions for reconfiguration of the Online Discover Service interface

In addition to those outlined in the 'Configuration suggestions' section of this report, a number of suggestions for specific changes to the Online Discover Service user interface were arrived at based on the project data. It is important to note that the intention was to provide an impartial user perspective. We are aware that some changes will be more difficult to implement than others, that some may not be possible with the current configuration options in Scholar Discover, and that others may not be achievable at a local level and would rely on development work from Online Library.

10.2 Recommendations for Online Library

In addition to this report, documentation has been prepared to inform Online Library, the supplier of the Scholar Discover service which Online Discover Service acts as a 'front end' for, of the main findings of the project. This document contains evidence and recommendations to inform the development of the Scholar Discover service. As Tongji are the first major research-intensive University to begin using the current Scholar Discover software, we hope that this evidence-based account of the ways in which Scholar Discover is being used and experienced at the University will be a valuable way of communicating the needs of our users.

10.3 Education and communication: tools and recommendations

As mentioned previously in this report, key outputs which were considered throughout the project were tools which could be used by library staff working with users of Online Discover Service. It is key to the success of the platform that Tongji library staff give consistent and positive messages to people using Online Discover Service throughout its development. Working closely with the team responsible for implementing changes to Online Discover Service has led to a number of ideas about how to communicate these messages to our users.

The document overleaf is one example of tools arrived at on the basis of these discussions, aimed at new students starting at the University, with no previous experience of Online Discover Service.
Here are 10 points of Online Discover Service Insights:

1. Online Discover Service, the main search platform for the Tongji University Library content, will show you listings for almost all of the printed and electronic library resources held at the University. With one search you can find e-books, online articles, printed books, journals, maps music and more

2. The University holds millions of books and has access to millions more articles and sources online. Searching all of this together means that you will need to refine your Online Discover Service searched. To find the resource you need, try using the filters on the screen to search by the libraries you have access to, or by the author you need, etc. Use the “available in the library” filter to cut out almost all the electronics resources.

Online Discover Service uses responsive web design, which means it adapts well used on mobile phones, tablets and computers.

Online Discover Service presents different levels of information about resources at different points and different screens. You may have to “click through” a few times to see the code you need to find a book, or the link an online resource.

To find sources which you have information about, for example from a reading list, try to search with a few key words, for example, the author’s surname and a couple of distinctive words from the title.

Online Discover Service is not (quite) exhaustive. For some resources it may be necessary to use the “database a-z”, linked at the top of the main Search webpage.

10.4 Personas

The personas presented in the following pages of this document represent archetypal users of Online Discover Service. They are based on data gathered during work with real users, with different needs, goals, motivations and approaches. Importantly, each persona does not represent a level of study or members of a specific academic discipline, rather a distinct set of values and expectations, which could be found, for example, in an undergraduate student or member of research staff.

This project provided a large amount of data and insights which will allow for some immediate and short-term changes to Online Discover Service. It is important to note, however, that both Online Discover Service and the underlying Scholar Discover platform will continue to develop over the coming months and years. While it will be essential to continue working with real users as this happens, we hope these personas will prove useful when considering the implementation of features and functionality to Online Discover Service.

We believe that one persona may be missing from this set. During the project, we worked with few undergraduate students; those that we did were in their second, third or fourth year of study. Due to the stage in the academic year we were also unable to work with any graduate students who were new to the University. Lacking the necessary research data, we were unable to confidently design the fifth persona, someone who would have had very little experience of using academic libraries and associated systems.

Liu Wei: "My top priority is getting on with my work"

Description: ***Liu Wei finished his PhD 5years ago at Shanghai Jiao Tong University. Since 2013 he has been employed by the Tongji University as member of staff,*** working with in a number of different research groups in the Department of Life Science and Engineering. His work id often lab-based and involves visiting various academic and industrial partners in and outside China. He enjoys working in a fast-moving and varied field and feel motivated when collaborating with people who are conducting research in other academic disciplines.

Needs and goals:

- Wants to be able to find and access content such as peer-reviewed journal articles and conference proceedings as quickly and simply as possible.
- Needs enough information to identify and access the resource she is looking for.
- Experts search algorithms to be sophisticated enough to link related terms and concepts and to prioritise results accordingly.

Pain points:

- Having to go through multiple website screens and spend time moving from a search to the desired online resource.
- Key resource access linked being 'hidden' alongside lots of other textual information, e.g. links and other options.
- Having to use complicated search methods in order to achieve his goal.
- Seeing lots of references to content he is unable to access

Real Online Discover user say:

- "It's frustrating to see so many things I can't access, before the things that I can."
- "Search it, find it, click it, access it!"
- "I just want a big button saying 'pdf'!"

Xu Tian: "Studying at Tongji is hard enough- I don't want to waste my time and mental energy on the admin that goes along with it"

Description: ***Xu Tian received a first class honors degree after completing his undergraduate studies at another University.*** He enjoys the research side of the

Urban Planning master's degree he is currently pursing at the Tongji University and is happiest when conducting interviews with partitions. He often needs to use different resources, such as books, academic journals articles and government publications. He rarely uses library except when he needs to borrow books and would rather be conducting search in the field that reading and writing.

Needs and goals:

- Needs different resources at different points in his studies and priorities having quick and uncomplicated to these
- Like websites that feel familiar and has converted to using the complete range of Google products as this means a high level of compatibility and one login.
- Often needs remote access to electronic resources when on filed work away from the University.

Pain points:

- Being confused and over loaded by information he doesn't see as important or relevant.
- Having to learn to use various different complicated system that don't fell familiar.
- Not having quick and easy access to electronic resources when away from University computers and wireless networks.

Real Online Discover user say:

- "I like Google as once you're logged in, you're logged into everything."
- "It annoys me when it takes too many clicks to get away from the results page to the article!"
- "I prefer website that look similar to ones I've used in the past"

Professor Wu: "I'm willing to take the time, but things need to be done right"

Description: ***Prof. Wu has had a long and varied career in academia and has worked at a number of prestigious institutions around the world.*** Over time his work has shifted from teaching students to conducting his own research. She has published three successful monographs in theological anthropology and is considered one of the key experts in the field. She prides herself on being conscientious and thorough in her research, She is primarily motivated by wanting to make a valuable contribution to the discourse in her academic discipline.

Needs and goals:

- Is often trying to find record of as many copies of a specific text as possible, helps both at the university and elsewhere.
- Will happily spend time searching for information source, if the outcome is a relevant and suitably exhaustive list of what she needs.
- Needs to compile and check extensive bibliographies or a regular basis.

Pain points:

- Knowing that a suitably structured search for resouces has not yielded appropriate and relevant results.
- Not being able to easily find the editions and copies of the printed book she needs to complete her work.
- Being overloaded with software functionality which she sees as irrelevant and not useful for the task she is trying to complete.

Real Online Discover user say:

- "Sometimes it's useful to see this book review, but 99 times out of 100 I want the object itself."
- "It's important to be able to filter results effectively"
- **"**I often need to check the standardized format for author names and other bibliographic information**"**

Zhou Yi: "I'm always looking for a new and niche articles- It's competition at Tongji"

Description: ***Zhou Yi is in her second year of an undergraduate degree in Law at Tongji university.*** She has always had a passion for reading and exploring different areas that are related to what she is currently studying. She is keen to become an author of criminal novels and much of her spare time is spent pursing this. She enjoys challenging herself with the essays she writes as part of her degree course and is constantly trying to improve her writing and provide new and original points of view.

Needs and goals:

- Wants to keep "ahead of the game" and enjoys publications by authors who question established academic theory
- Is often looking for resources that have not yet been discovered and read by her peers
- Compiles long lists of further reading for herself, so that if she is unable to read the whole of a resource at the time she comes across if she can find it again later.

Pain points:

- Missing out on resources she may have found useful or interesting, by not being able to find them.
- Not understanding how a website worked and how her interactions with it affects its behavior.
- Feeling patronized when presents with overly-simplified functionality or too much help information.
- Not being able to find the printed books she needs quickly and easily

Real Online Discover user say:

- "I like the fact Online Discover shows you lots of different and new articles"

- "I don't understand why the results are in that order."
- "I like databases which have options before you search, as otherwise you have to narrow down your results afterwards and it takes ages"

Table 10.1 Persona

10.5 Scenario

Flowing directly from the development of the personas was our work on scenarios. "A scenario is a short story about a specific user with a specific goal"[9]. Scenarios take the one dimensional personas and put them into action. Working in small groups, the team worked on creating scenarios for each persona's goals. Later the whole group assembled and refined the scenarios until they accurately represented the ideal journeys that the personas would take through the Online Discover Service. It is important to note that these were 'ideal' journeys at this stage. Limitations of many types would be imposed on the site as the project progressed, but at that point, we were designing for the best possible experience.

Our scenarios focused upon what the user did and how they did it, as well as why they did it and their feelings. This further encouraged the empathy and understanding begun with the personas, extending it beyond the persona itself and into the associated decisions, emotions and perceptions.

Where the scenarios were an exercise in creative story writing, the next step, extracting site requirements from those scenarios, was more like detailed technical writing. Site requirements were drawn from the scenarios, and indicated the specific content and features needed in the site to meet users' goals. These in turn were used to guide decisions made in the various stages of Online Discover design.

10.6 Improving Online Discover UX Structures

Keep in mind that users are on your website for a specific reason. They rarely go to your website to discover or explore or find something new. Library websites especially are often heavily transactional websites. Users go there to search, they go to find your hours, they go to find information on your services, they go to connect with a librarian or ask a question. They have a question in mind when they come to your site or they're thinking about a task that they want to complete.

Users skim on the web. They also skim in print as well. The difference between digital content and physical content is getting fuzzier, I think, and the way people are interacting with print media and digital media is becoming strangely similar.

But especially on the web, people are skimming. They're goal-motivated. They're task-driven. A heat map from our Contact Us page shows a core set of things people

[9] U.S. Department of Health and Human Services 2012, p.1

are doing on that page. They're not reading through everything or looking at everything. They're very task-driven.
Users are also very impatient, especially on the web. They only stick around if it's worth the time investment that they're putting into it.

On the Tongji University library site, the vast majority are really only on the site less than a minute. They're not there for twenty minutes, 30 minutes, diving deep, deep-reading the content. That's just not the way people are interacting with our websites. Very few people are on more than 10 minutes on our site**.**

So when we are trying to improve the library online service UX structures, we need to keep 4 features in mind:

- **Keeping things simple by hiding the complexity**

It's important to keep the appearance simple, especially for new students. Library Online Search Tools that's difficult or intimidating to use isn't of much use. With a huge number of new students coming in every year ago, the IT staff doesn't want to be buried in requests for help. There should be a single sign-on for all library services, rather than making them log in again for each of the online services the library maintains.

In many places, on-campus computers automatically have access to most library materials. For machines that belong to the university, this is just a matter of keeping a list of their IP addresses and letting them through without further checking. That's not to say it's a trivial job. A large university has lots of computers, managed by lots of departments. Keeping track of all the addresses that belong to the university is a significant task.

- **When signing on is required**

Users accessing restricted materials from public Wi-Fi access points and off-campus locations need to be authenticated. Universities set up authentication systems for access to other services, such as course registration, so the library will normally build on the university system. This may require building some complicated software bridges, but it satisfies the single sign-on requirement. Students and faculty only need to log in once, and then they can access any library services for which they're authorized.

The details vary a lot. Each institution has its own sign-on system. Some work smoothly across all services; others may rely on the service to set up the user interface, and so they'll have a less uniform appearance.

- **Dealing with the fine grain**

Sorting out restricted and unrestricted materials can be messy. Users of Tongji University Online Library will find a mix of materials which anyone can use and ones which only authorized users can access. They see the list of restricted and unrestricted items, and they aren't required to log in till they try to access a restricted one.

Not everyone on campus necessarily has access to all restricted materials. Materials might be licensed only for use by the biology faculty or the law school. in those cases, the library system will need to check the logged-on user's affiliation. This requires access to additional information on the user's identity.

Students, faculty, and staff will use the library's website to reserve books and other physical materials. In these cases, the site needs to interface with a reservation system that stores individually identifiable requests. In general, though, it's better for the server not to keep a record of users' activity. It only has to check whether they're authorized to access the material, not to remember what they accessed.

- **Outside services**

Libraries provide access to contracted outside services, such as SCI Database and Safari Books. The site has to let authenticated users get access without forcing them to go through another round of logging in. Usually it isn't necessary to identify individuals to the service, only to confirm access rights, but those rights might be restricted to a subset of the user community. This is another case where the software needs to check the user's role and affiliation.

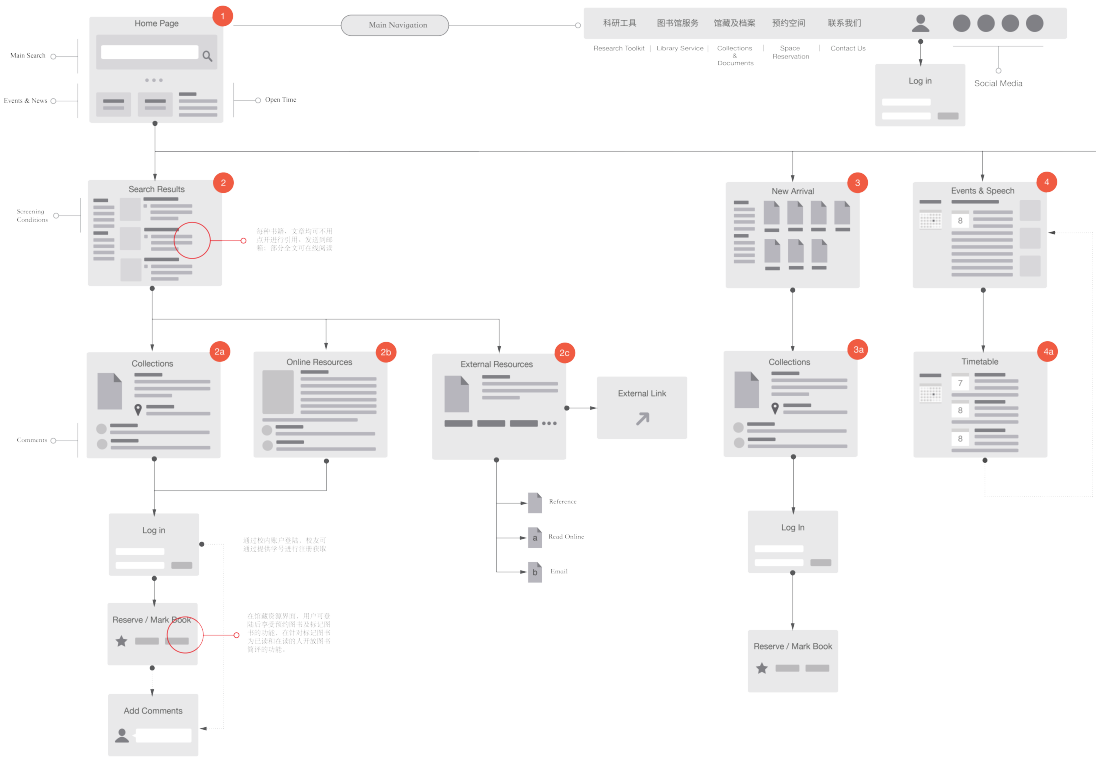


Figure 10.1 UX Wireframe

10.7 Prototyping Design

The following pages show the user interface design of Tongji Library Online Discover Service. These design results review all the concepts of user research.

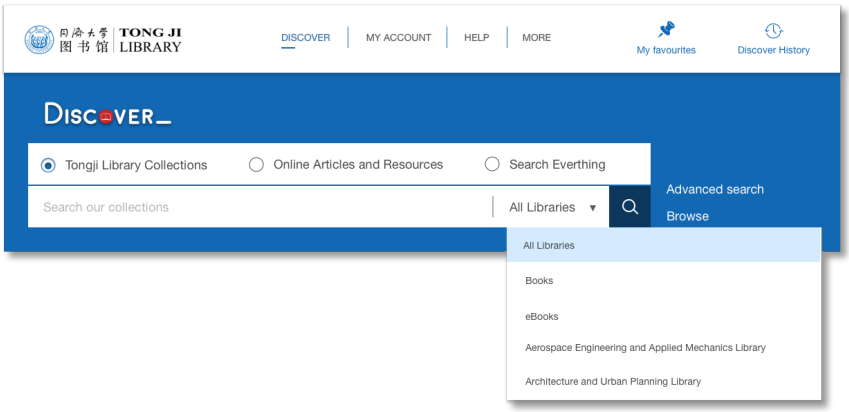


Figure 10.2 Basic Research

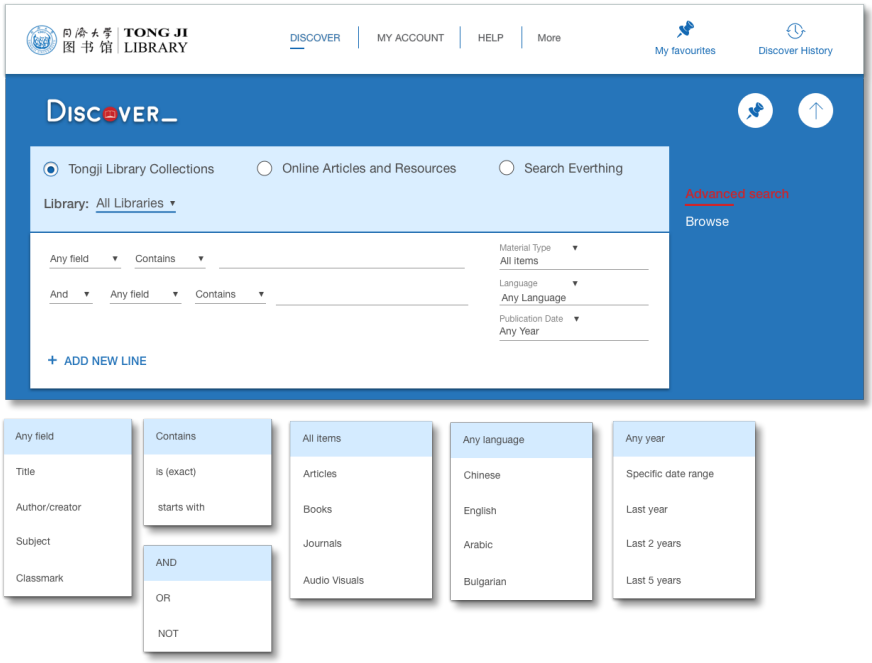


Figure 10.3 Advanced Research

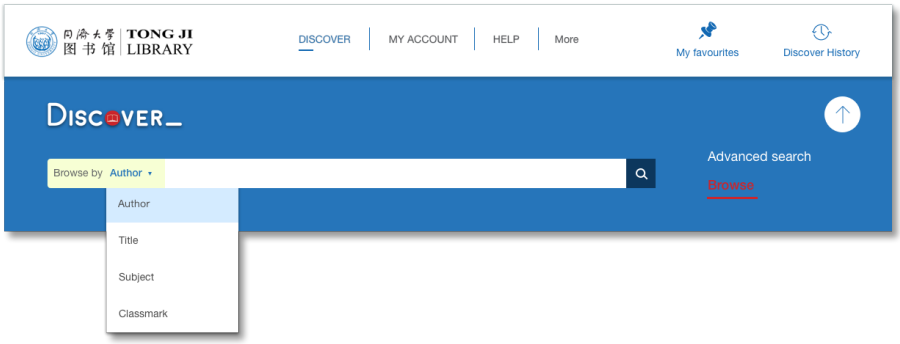


Figure 10.4 Browse

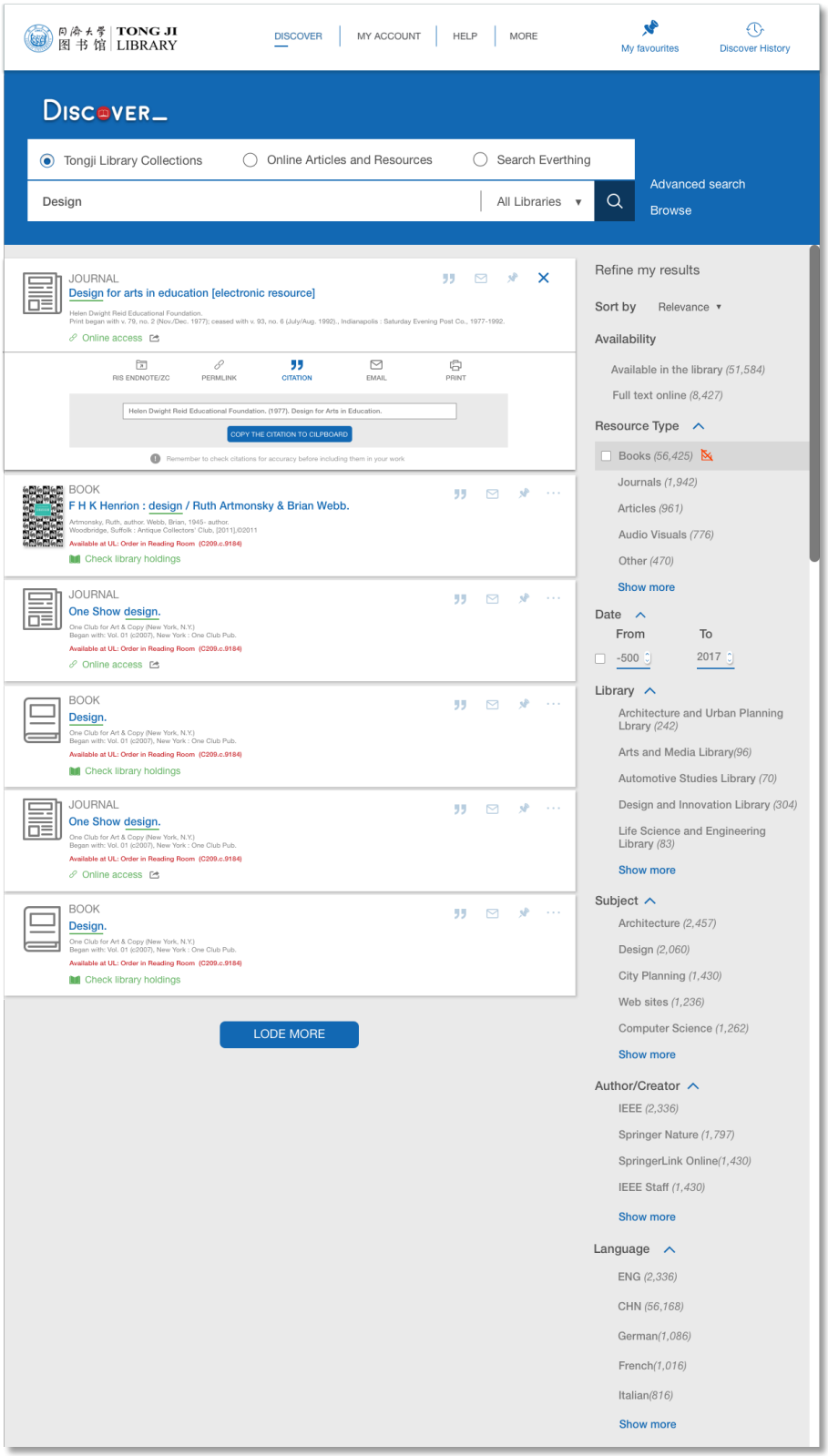


Figure 10.5 Results List

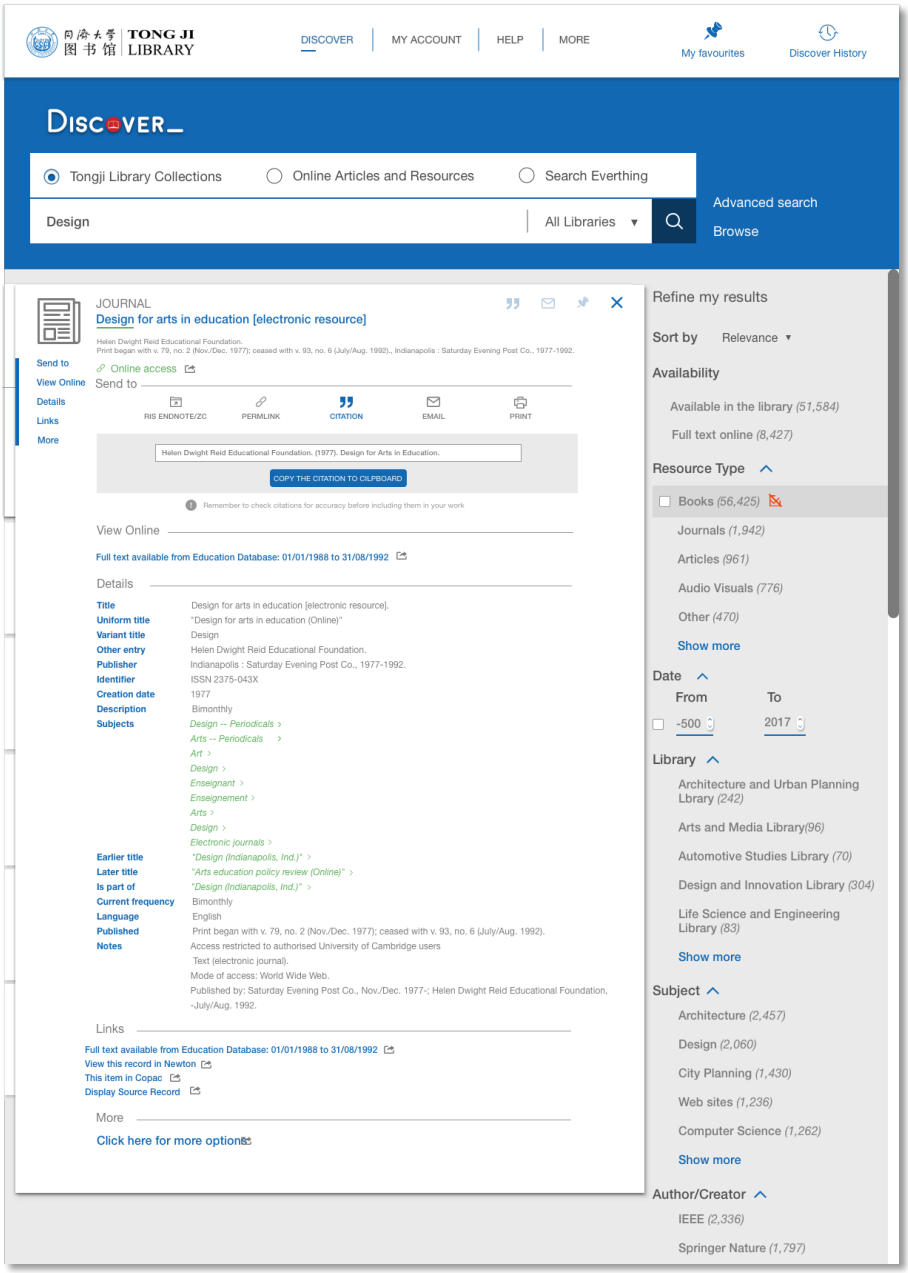


Figure 10.6 Resource Detail

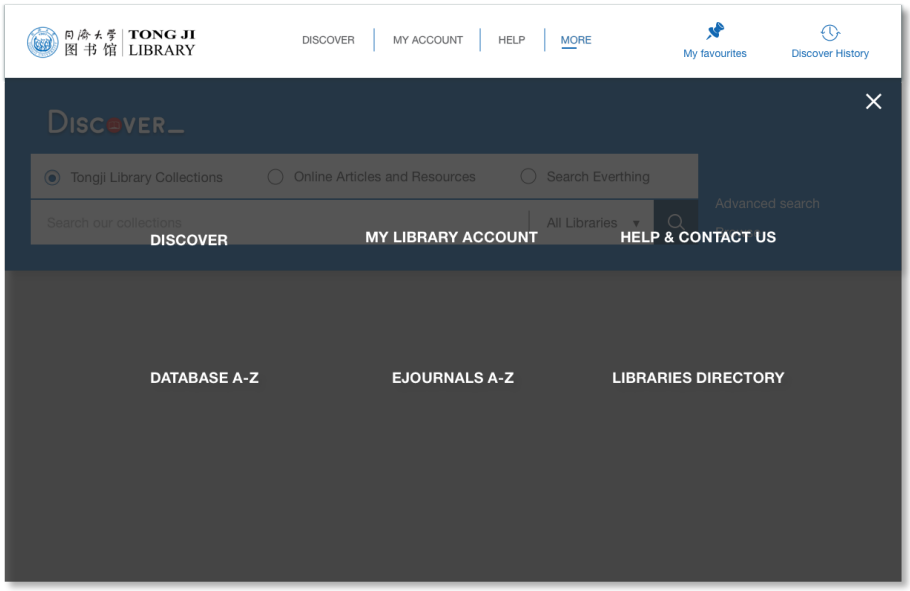


Figure 10.7 More Service

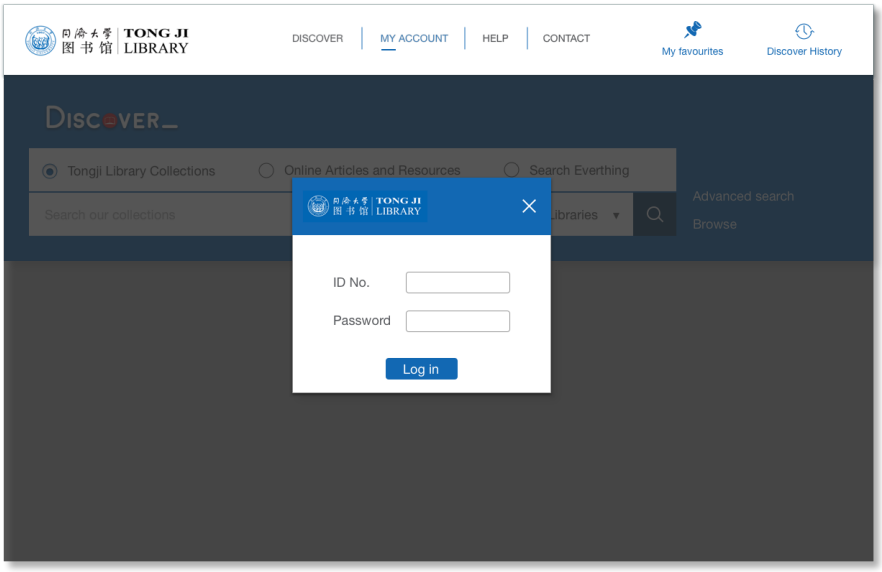


Figure 10.8 User Log in

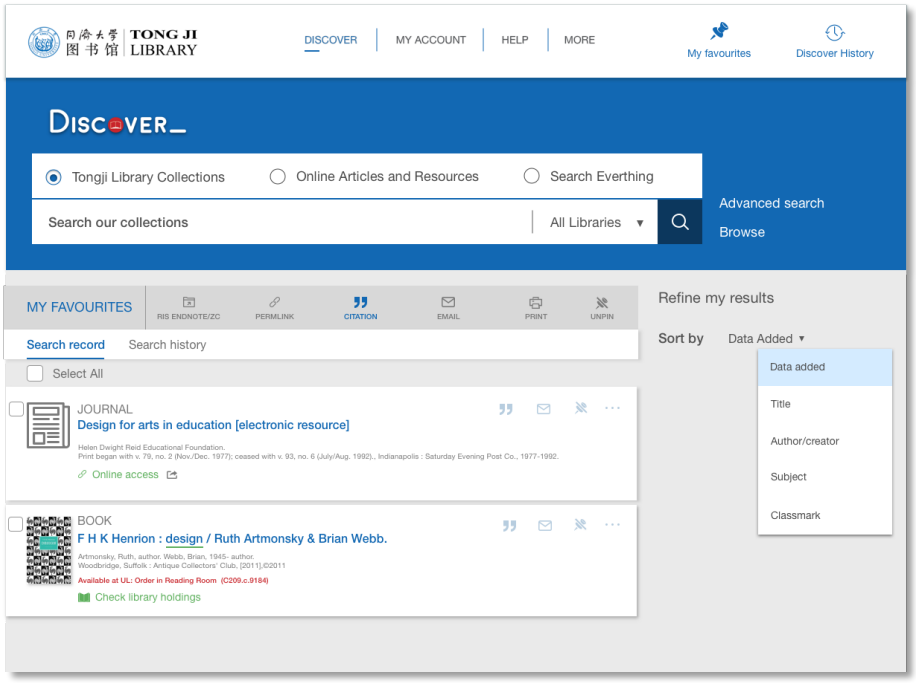


Figure 10.9 User Favourites

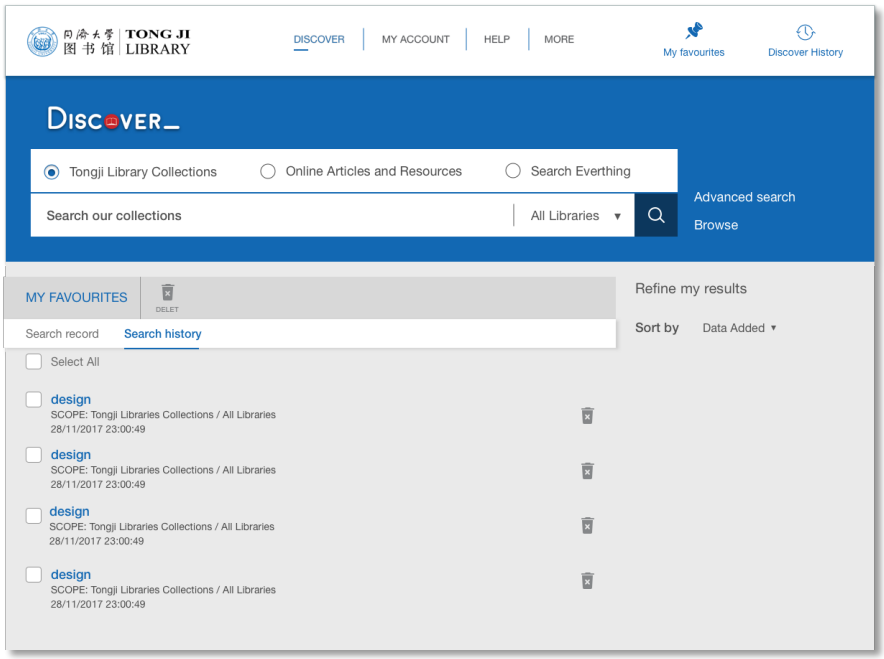


Figure 10.10 User Discover History

The UI design aims to approach the cleanliness of ser interfaces that people are willing to look at. With the idea of hiding the complexity, the designer chooses the only showing the necessary functions of Discover tools rather than put all the buttons displayed on the screen.

11. LIMITATIONS OF PROJECT

Due to the nature of the Scholar Discover platform, i.e. that it is constantly developing and much of the work in this regard is done by its supplier, it was necessary for us to apply established, 'traditional' user experience research methods in a non-traditional setting, i.e. a software platform which we at the University are unable to re-design. The ideal methodology would have involved an initial period of research with users of Online Discover Service, followed by a re-configuration and re-design of the platform based on this, followed by further research to measure differences in the user experience, repeating this until the experience had been optimised. Although outside the scope of this project, we hope that, resource permitting, this may be possible to achieve in essence over a longer period of time, as the platform develops.

Another method which would have added depth to our data would have been the use of digital eyetracking technology, to record which aspects of the Online Discover Service user interface were identified by users at different points in their search processes. Although the talk-aloud protocol used during our observations gave us valuable data and insights, in some cases we were unsure whether an aspect of the interface had been seen and interpreted correctly by the participant, before having to ask them, which meant that their response could not necessarily be relied on.

We are aware that Online Discover Service is part of a much wider University experience for students and academic staff. Although we learnt a lot about these experiences during our study, we did not focus efforts on examining what happened directly before and after people used Online Discover Service. Examples could include the specific behaviours and approaches taken by students directly after receiving a reading list, or examining the processes people follow when trying to find a printed library resource, directly after using Online Discover Service to find its location and class mark.

12 CONCLUSION

This project has given us a deep level of understanding in terms of how people interpret, approach and use Online Discover Service, and how this fits with the ways they in which they interact with information more generally. It reiterated for us the importance of identifying how people understand the “library” in the context of their wider lives studying, conducting research and teaching at the University. This knowledge should underpin the development of all aspects of our services, including our digital products. It should also inform the way we communicate with and educate our users.

The data gathered and analysed during the project has provided information which can be used to improve and enhance the Online Discover Service user experience. Alongside this, it has given us an evidence base which can be used to inform further decisions as the product develops and support requests put to its supplier. The recommendations and other outputs detailed in this report do not represent the entirety of the project outputs; close work with the implementation team will see more changes to Online Discover Service, including aspects such as the Advanced Search configuration, the placement and content of online help information and tools for user education. This project would not have been possible without the interest, enthusiasm and dedication of the project team.

Although the institutional context of this work is extremely important, we believe that the insights and knowledge gained will be useful and of interest to those outside of the University of Tongji. The version of Scholar Discover under study here represents the ‘new wave’ of resource discovery systems. We hope that our findings will be of use to other institutions considering, or currently implementing, similar products.

REFERENCE

1. Dreyfuss, Henry. "The Industrial Designer and the Businessman." 28.6(1950):77-85.
2. Duke, Lynda M., Ed, and A. D. E. Asher. "College Libraries and Student Culture: What We Now Know. " *Reference & User Services Quarterly*52.2(2012):223-224.
3. Marquez, J., & Downey, A. (2015). Service design: An introduction to a holistic assessment methodology of library services. *Weave: Journal of Library User Experience*, *1*(2).
4. Mager, Birgit, and Tung-Jung David Sung. "Special issue editorial: Designing for services." *International Journal of Design* 5.2 (2011).
5. Pruitt, John, and Jonathan Grudin. "Personas: practice and theory." *Proceedings of the 2003 conference on Designing for user experiences*. ACM, 2003.
6. Sundt, Alex, and Erin Davis. "User Personas as a Shared Lens for Library UX." *Weave: Journal of Library User Experience* 1.6 (2017).
7. http://slanypublications.org/2014/07/07/ux-in-libraries-with-a-case-study-at-nyu-libraries/
8. Murdoch, Craig, and Shari Hearne. *"Journey into the user experience: creating a library website that's not for librarians."* (2014).
9. U.S. Department of Health and Human Services 2012, p.1
10. Marquez, Joe, and Annie Downey. "Service design: An introduction to a holistic assessment methodology of library services." *Weave: Journal of Library User Experience* 1.2 (2015).
11. Sadeh, Tamar. "User experience in the library: a case study." *New Library World* 109.1/2 (2008): 7-24.
12. Stickdorn, Mark. "This is Service Design Thinking." (2011).
13. Zomerdijk, Leonieke G., and C. A. Voss. "Service Design for Experience-Centric Services." *Journal of Service Research* 13.1(2010):67-82.
14. Marquez, Joe J. *Library Service Design: A LITA Guide to Holistic Assessment, Insight, and Improvement*. 2016.
15. Baird, Catherine. "Useful, Usable, Desirable: Applying User Experience Design to Your Library." *Technical Services Quarterly* 32.2(2015):142-143.
16. Mclaughlin, Jean E. "Focus on User Experience: Moving from a Library-Centric Point of View." *Internet Reference Services Quarterly* 20.1-2(2015):33-60.
17. Webb, Katy Kavanagh, et al. "Our Experience with User Experience: Exploring Staffing Configurations to Conduct UX in an Academic Library." *Journal of Library Administration* (2016):1-20.
18. Pretlow, Cassi, and K. Sobel. "Rethinking Library Service: Improving the User Experience with Service Blueprinting." *Public Services Quarterly*11.1(2015):1-12.