Novice user experience in academic libraries:

About wayfinding in a digital and physical space

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Abstract

Users of academic libraries can find the experience of searching for books difficult, especially when they have little experience in the use of a particular library building. This dissertation studied, by means of a field test in the library of the University of Reading, the elements involved in a novice user journey when looking for a specific book. By going deeper into users' journeys, the aim was to gather crucial information in order to reveal gaps in the current wayfinding system and thus suggest the need for new systems or tools for guidance.

The results were visualised as journey models and experience maps and were analysed in order to suggest ways to improve the search process of academic libraries, considering mobile technology capabilities. The use of journey models and experience maps represent an innovation for academic research relating to libraries.

The main results emphasise the need of clarifying the library sections in the computer search as well as the physical space. The role of human help and its responsibility is also considered as an important point in the library experience. Additionally, the ways in which mobile technologies and guidance tools in general can help support the decision process are discussed.

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1 Introduction

1.1 The context of academic libraries

Academic libraries are, according to Fuegi and Jennings (2004), libraries whose central function is to "serve students, academic and professional staff in universities and other institutions of education at the third (tertiary) level and above; may also serve the general public". Under this definition and for the purpose of this research, the library of the University of Reading will be used as a case study and as a representation of academic libraries.

Academic libraries represent an interesting case of study for wayfinding because of the number of novice users that they have every year, the type of users (national and international students) and the importance of self-guidance in the process of using the services.

1.1.1 New students every year

Unlike public libraries, where the amount of new users increases each year but the amount of visits decreases, the amount of new users registering for academic libraries increases, as well as their physical visits to the building (Fuegi & Jennings, 2004).

Academic libraries, therefore, deal with large numbers of novice users every year. Novice users in this case are new students who are not familiar with the library classification and who have little or no experience retrieving items from the book shelves. Additionally these students have never used the library building which is usually big, complex and therefore intimidating.

The library staff plan every annual cycle carefully in order to offer enough activities to instruct new students in how to search for books, journals and how to use the library services (Appendix 1). The University of Reading for example, has a whole section on the library website with Information for new library users. On there the students are invited to join workshops, download tutorials and watch instructional videos.

Thus, the library aims to reduce the stress and disorientation of the people experiencing it for the first time. Mellon (1986) calls this 'library anxiety' which, in accordance with her

study, is related to the students' lack of knowledge of the research process but also their lack of knowledge of the building's size, distribution and classification.

1.1.2 International students

University libraries are furthermore international spaces where students from different nationalities must learn how to move around. Thus, all the wayfinding system must work for British people with different levels of expertise in the use of libraries, and it needs to communicate effectively, as well, with student who are not necessarily fluent English speakers.

In the conversation with the liaison librarian of the University of Reading (Appendix 1) he mentioned how international students usually face more problems when trying to understand numerical systems and alphabetical order in a foreign language.

There are special needs that novice users, including international students, have in the way they need to be orientated in the library. The information now delivered by the library catalogue in order to guide the user through the building, may not be enough to create the feeling of a straightforward interaction and an easy process.

1.1.3 Self-guidance in libraries

Giving the autonomy of moving around without human help is one of the aims of academic libraries. This is because the library frequently opens from early in the morning until late at night and the staff are only there during the regular working hours. In the particular case of the University of Reading's library, during term-time the library is open for full service and support from 9:00 to 17:00 but the actual building is available for self-service from 8:30 until midnight. According to Pollet and Haskell (1979, p.X), even if there is nobody in the library to ask for help a student in his first visit should be able to find his way to the books he needs.

The academic library, then, tries to assist the students by giving them tools to guide themselves in the building. Pollet and Haskell (1979, p.4) state that there are four operations related to wayfinding processes. These operations are orientation, choice of a route, keeping to the right track and recognition of the objective. The information aids placed in the library try to anticipate the users call for information in these four operations. Nowadays, this information is provided mostly in forms of directional signs, floor plans and digital catalogues.

1.1.4 Technology and academic libraries

While with time more technology has been incorporated to academic libraries, there is still a need from libraries to catch up with user expectations (Sadeh, 2008). Tamar Sadeh shows on her article 'User experience in libraries' how the everyday use of internet affects the users' expectation of the technological infrastructure of the library. In that case, the friendliness and ease of use of online services such as Youtube, Facebook, Flickr and MySpace suggests that there are new patterns of preference on what people find easy and on what they expect from their libraries.

Technology, from the users perspective, participates in library processes primarily through digital catalogues and book loan systems. This gives more independence to the users as it allows to search, borrow and return the books they need without asking for help. However, the process of searching for books in large libraries and finding them is still considered to be difficult and slow (Aittola, Ryhänen and Ojala, 2003). That is the main reason why academics, firstly in the University of Oulu in Finland and later in other universities in the US, started studies and projects with the aim of addressing the problems of wayfinding in libraries. The focus of their project is based in how new mobile technologies could improve the experience of finding books in academic libraries.

Even though some of these projects started almost a decade ago and the apps do exist, they have not fully succeeded in gaining widespread adoption by students or other users (Hahn, Twindale, Gutierrez and Farivar, 2010). Jim Hahn comments on an email conversation about his project (which will be described in the literature review) saying the they are "experimental prototypes and aren't part of the library's production system yet" (Appendix 2).

1.2 The physical and the digital

Wayfinding in academic libraries is both physical and digital in different parts of the process. The catalogue search is based in computer interfaces and it represents the starting point. The interaction with the catalogue helps the user to determine what he is looking for and to collect the call number of the specific book. In the library of the University of Reading the catalogue search also provides critical information relating the type of loan/book and the floor where it is located. Right after the catalogue search, starts the physical navigation of the building. Here is where the signage system plays a key role. From floor plans to books organisation, all the information is placed so that the user can find the correct shelf and the specific book.

Both spaces, physical and digital, work together to guide the user and the way in which these spaces are connected has an effect in the user experience, which can be positive or negative. Reducing the gap between these two spaces is one of the aims of academic libraries. Hahn (2011, p.6) in the article 'Location-Based Recommendation Services in Library Book Stacks' states that the information about the physical space is always meaningful, even in the digital context. This is a way of saying to librarians that there is a need to think about the integration of the whole user experience in libraries.

Studies have been carried out relating user experience in libraries. There are mainly three types of studies. Studies considering just a part of the experience of use in the library (catalogue search, for instance) such as the case of Sadeh's article (2008). There is other type of study which is usually focused in testing a specific app or technological service. In this case, despite the inclusion of users in the study, the documentation seems to be focused on technological aspects and on how the apps can be integrated in the libraries' system. These studies, thus, do not actually test the experience of use of a library, as it is the case of Aittola, Ryhänen and Ojala (2003) and Hahn, Twindale, Gutierrez and Farivar (2010). Finally, there are studies centred in understanding the experience of use in the library for specific users, or some other times patrons in general. This last type of study is the most interesting for this research, because it studies the user's experience as a means to improve the library service.

2 Literature review

This chapter will review projects and studies relating to mobile wayfinding and user experience in libraries. Additionally, the importance of visualising the results of studies as experience maps will be raised.

2.1 Mobile wayfinding in academic libraries

There are various attempts to introduce mobile wayfinding in libraries, more specifically academic libraries, some of which started almost a decade ago. Two cases will be presented below. The first one is from the University of Oulu in Finland and it is considered to be the first project of mobile wayfinding for an academic library. The second project is from the University of Illinois in the United States of America, which is about to release a wayfinding mobile application for its students.

2.1.1 SmartLibrary

In the article 'SmartLibrary - Location-Aware Mobile Library Service', Aittola, Ryhänen and Ojala (2003) present the project 'SmartLibrary' created and tested in the University of Oulu, Finland. The service addresses the problem of searching for books in large libraries and novice patrons are the main prospective users. The service was created to work on PDAs and its main feature is to provide a map-based guidance to books and other collections. Apart from accessing the catalogue search in the device, the user can ask for guidance from his current location to the specific shelf where the book is stored.

The mobile service was tested with real users. The researchers explained to them how to use the PDA and the software and gave the participants two tasks to find a specific book and periodical. One task was meant to be completed using just the terminals and shelf classification and the other using SmartLibrary. The participants filled questionnaires after the task in order to give feedback about their impressions. With this test, The University of Oulu showed that the SmartLibrary service (and as an extension the concept of mobile wayfinding for libraries) helped the users of the library find books easier in comparison to the conventional shelf classification.

In the conclusion of the article 'SmartLibrary - Location-Aware Mobile Library Service', the authors state that they will "continue collecting user feedback for further

improvements of the user interface" (Aittola, Ryhänen and Ojala, 2003). The researchers also have many considerations about how to improve the information provided to direct users as well as the solutions for floor guidance and they even mention the importance of building support for mobile phones. Nowadays SmartLibrary prototype exists and it is available for desktop users, PDA users and mobile phone users (Oulu University, n.d.). Nevertheless, the project has not moved beyond being an experimental service (Hahn, Twindale, Gutierrez and Farivar, 2010). Almost 10 years have passed and SmartLibrary is still not a service that can be found in other academic libraries.

2.1.2 Mobile Digital Library: Extensible Wayfinding System

In the article 'Methods for Applied Mobile Digital Library Research: A Framework for Extensible Wayfinding Systems', Hahn, Twindale, Gutierrez and Farivar (2010), researchers from the University of Illinois, USA, decided to continue with the existing project of SmartLibrary and to extend the work in the field of mobile wayfinding for libraries. The study presents a mobile software application which can be used by library patrons on their mobile phones. The application enables them to locate libraries across the campus as well as navigate the libraries from the inside. This project has a strong emphasis on the technological characteristics of the application which represent a big part of the innovation and one of its strengths.

As a starting point the authors used the experience of previous projects, such as the one of the University of Oulu. Additionally, they built on the existing literature about user behaviour and traditional wayfinding in physical libraries. In the article though, the researchers state that "novel technologies are complex and confusing and raise additional challenges in developing both the functionality and the interface" (Hahn, Twindale, Gutierrez and Farivar, 2010, p.10). Among the challenges they mention "How much can we gain by understanding how people cope with existing navigation challenges?" and later they respond "We believe that the best way to address such challenges is by rapid iterative analysis, design, and evaluation".

The path suggestion application from the University of Illinois has had 2 iterations after the article was written in 2010, as well as several technical refinements. The main way used to get feedback is testing a functional prototype for Android phones with real users, as it is described in the article 'Rapid prototyping a collections-based mobile wayfinding application' by Hahn and Morales (2011). The researchers state in this study that they feel confident to release the application to the market for student use. In an email conversation with Jim Hahn (Appendix 2) he mentioned that in the next academic year (2012-2013) the app will be available to new students, but that the mobile wayfinding is still an evolving project.

2.1.3 Reflections

The two projects described above represent technology driven innovations for academic libraries. They are based on the user's needs found in previous studies, however, in an early stage they have prioritised the functionalities over the experience that patrons have whilst using that service. The fact that both projects are centred on solving the technological problems justifies the decision of leaving the interface design for later stages. But this may have an effect on users and in the interest that they express for the applications.

Furthermore, although rapid prototyping and continuous testing is important for the process of design and development of applications or services, the first prototype should target towards the right direction. In all the further tests, the opinions of the users will be influenced by the application that they are testing. The question raised by Hahn, Twindale, Gutierrez and Farivar (2010) about how much can be gained by understanding the existing navigation challenges, can be a key point to understand why some of the projects have not gained widespread adoption. The app needs to have solid foundations in terms of functionality and feasibility of the project before starting the iterations of the first prototype.

Additionally, it is interesting to question what makes an application or service 'experimental' or what makes it 'ready to release'. The amount of people using the app, the look of its interface, the number of iterations of its functions and design plus the amount of marketing and promotion that it has may be some relevant points. Basu (2008) says that software is ready for public release when it "does what it claims to do and doesn't have any show-stopping bugs". He talks about 'forever beta' as a way of ever improving the application or software but also mentions the need of drawing a line at some point in the development in order to actually release the software.

2.2 User's needs in libraries

While many studies address only specific parts of the searching process, such as the 'computer catalogue search', some others try to have a more general approach to the students problems when using the library. The first type of studies are more specific and they often determine at the end concrete solutions of how to improve the service. However, rather than testing the library service in order to improve the user experience, these studies propose unconnected solutions that may not necessarily work together as a whole. For that reason, and for the purpose of this dissertation, the articles selected below intend to have a holistic view of the user's experience in an academic library.

2.2.1 User feedback on mobile computers and wireless tools for library patrons

Jones, Rieger, Treadwell and Gay (2000) begin their article 'Live from the Stacks: User Feedback on Mobile Computers and Wireless Tools for Library Patrons' stating that in order to have more robust and effective digital library research it is important to integrate the end-user opinions and viewpoints at all times, from research stages to design and finally development. In the article, the researchers present the results of a double study. The first part was a user survey which aimed to reveal user's views and expectations concerning digital library technologies. The second part consisted of a field test conducted in a small library to find out the preference of library patrons relating to library mobile services. In the test, the participants were asked to do tasks such as searching for books on the online catalogue and using an interactive map to locate books.

The results of this study show that the users were enthusiastic about the possibility of accessing the online catalogue constantly and no matter their location in the library. However the use of maps was thought to be more useful for larger libraries. These results were the fundamental basis for projects regarding mobile wayfinding such as 'SmartLibrary' from the University of Oulu in Finland, described in the previous paragraphs.

The authors also mentioned in the article the importance of changing the focus of the studies concerning human-computer interaction towards user activities in natural contexts. They say that as the field has expanded so has the need to alternate the research methods. Using only quantitative measures may not be enough to understand the user behaviour, conversely, mixed methods have proven to be more effective for better understanding of the user.

2.2.2 First-year students navigation and the wayfinding implications

The article 'How first-year students navigate the stacks: implication for improving wayfinding' written by Hahn and Zitron (2011), presents a study of first-year undergraduate students' behaviour in an academic library which aims to reveal attributes related to the building layout and identify its fail points. The study shows the thought processes of the participants as they navigate through an unfamiliar library. The research examines qualitatively the navigation of the library physical space, emphasising that quantitative data "does not in itself present the story as we truly want to understand it" (Hahn and Zitron, 2011, p.2).

With the purpose of collecting user's thoughts, the participants were asked to think aloud and the researchers developed a record plan based on what was verbalised by the students while doing the test. Thus, all possible fail and successful points in library navigation could be noted easily by the researchers. The 'points' included were library classification, arrangement of stacks, library labels, shelf arrangement and signs and maps.

Many observations came out from the test. One of the most interesting conclusions which the authors describe as "a fundamental lesson to be learned about in-building navigation" is how crucial the presence of staff is for student when they need help. Accepting that library guidance cannot only be based on the signage system is essential to understanding the context of first-year students and their 'lack of prior knowledge'.

2.2.3 Reflections

The point noticed by Jones, Rieger, Treadwell and Gay (2000) about the importance of using more than one research method to understand the user behaviour is very important for further studies in the field. They mention for instance how ethnographic methods, observing behaviour in natural settings, can help to achieve a more robust view of the user. The common characteristics of ethnographic research are that it takes place in the field, the primary data collection technique is observation, interviews are used to clarify observation, attention is paid to context and artefacts and field notes are coded and analysed (Bryan, 2010).

In the study by Hahn and Zitron (2011) the participants start the test with a call number to focus on how students conceptualise the search for a book in the library after that. However, the process of searching for a book in the library would naturally include the process of browsing the online catalogue adding another layer of difficulty to the task. The students are not always sure that they are looking for the right number after the catalogue search. This initial uncertainty can also have an effect on how they continue the task of searching for the book.

Even though Hahn's and Zitron's study (2011) is based on the physical experiences of students in the library, the results are presented in tables which separate the elements and present them individually. The results feel unconnected to the physical space. The flow and route of the participant disappeared after the test and it was converted into an abstract list of elements, out of their physical context. On the one hand, the abstraction of the results helps to extrapolate the points mentioned by the authors to any other library. But on the other hand, an important part of the test is ignored which could bring more relevant information to the discussion. There is a chance that this part has been missed in the research process.

2.3 About mapping the results

Re-thinking the way of showing the results of a field test based on tasks could help to find gaps that have not been seen in detail and analysed yet. Experience maps could offer an interesting way of visualising the results, based on the following description: "A holistic view of experience through time with specific touchpoints promotes better coordination of cross-channel design and reveals opportunities for new or improved interactions." (nForm, 2008). Risdon (2011) described the experience map as "an artifact that serves to illuminate the complete experience a person may have with a product or service."

According to Smith (2010) sometimes the research is much richer than anything that can be captured by tables, models or diagrams. In those cases, experience maps can be used to visualise the user's journey including the stages of the process and different channels of interaction, among other elements involved in the overall experience.

3 Method

This chapter will explain the methodology used for the case study which will be analysed in the next chapter. An explanation of the hypothesis and the goals of the study will be described, followed by the structure of the test, the process and the results.

3.1 Hypothesis

The hypothesis for the study is that the novice users' journey in an academic library, presented as an experience map, may suggest ways in which mobile technology that may not have been created yet can help in the process of searching for books.

In order to demonstrate the hypothesis above, a test was designed in relation to academic libraries. The goal was to observe and analyse novice users' journeys in order to create an experience map which could allow to suggest that there are specific capabilities of mobile technology that may not have been created yet. This excludes the projects described in the previous chapter, however the findings could explain the reasons why they have not become widespread.

In order to achieve the main goal some other specific objectives were established:

» To reveal the elements involved in the novice user experience in an academic library

» To map the users' journeys to compare their experiences

» To get feedback from the users and personal impressions of how their experience of searching for a book was developed

The field test aimed to look deeper into what a journey is like for an inexperienced user of an academic library and how they feel about the process (read more about it in 'The users'). For this, the library of the University of Reading was used as a case study and as a representation of academic libraries. A deeper understanding of users' journeys could provide critical information to reveal gaps in the current wayfinding system which could imply the need for new systems or tools for guidance.

The information that needed to be recorded in order to build a user journey, based on Risdon's (2011) description of an experience map; was the paths of the participants, the wayfinding elements with which they interacted in order to accomplish the task and the

qualitative information related to how users felt whilst doing the task. The components of the journey maps and a comparison of the results will be described and analysed in the next chapter.

3.2 The users

The importance of testing with novice users is explained by Fueggi and Jenning (2004) when they talk about the basic sources of orientation for students when navigating a library. The researchers establish that there are four sources starting with the architectural features such as stairs, doors, etc; graphic material such as signs, symbols and maps; the library social environment (asking a staff member or observing and copying other people); and the use of their memory, which helps the user to feel comfortable when moving through the space. Whilst the first three sources can be controlled and measured in a test, the last one, memory, varies with the participant and can be affected in unpredictable ways.

For this reason, to test the wayfinding system of the library it was fundamental to test participants that had little or no experience in that space or system. This is to keep the effect of memory to a minimum.

3.3 Structure of the test

There are three main sources of information that were collected in the study. The researcher kept notes to track the navigation route that every participant followed and the tools (signs, maps, computers, staff, etc) that they used to locate the book. The researcher also collected data from the initial questions and the debriefing interview after the task. Additionally, during the test the researcher recorded the participants' emotions according to the part of the process and the part of the building that they were navigating. The participants were asked to express their thoughts and feelings aloud in relation to anything that was helping them or hindering them to accomplish the task. All the information retrieved was organised in order to build journey models that show the different elements that participated in the users' journeys and how they affected the overall user experience.

The purpose of the initial questions was to obtain information about the participants; their sense of direction, technological skills and library familiarity. It was expected that the participants had a medium level in each of the three criteria. The level of technological

Figure 1: Participants' familiarity with the *University of Reading library*

Number of participants
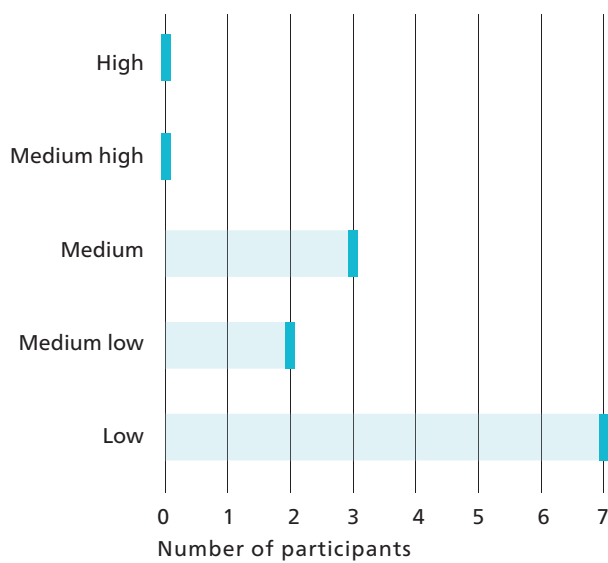
Seven participants of the test had never used the library of the University of Reading before. All the other participants had medium or medium low experience with this particular library.

Figure 2: Participants' familiarity with *libraries in general*

Number of participants
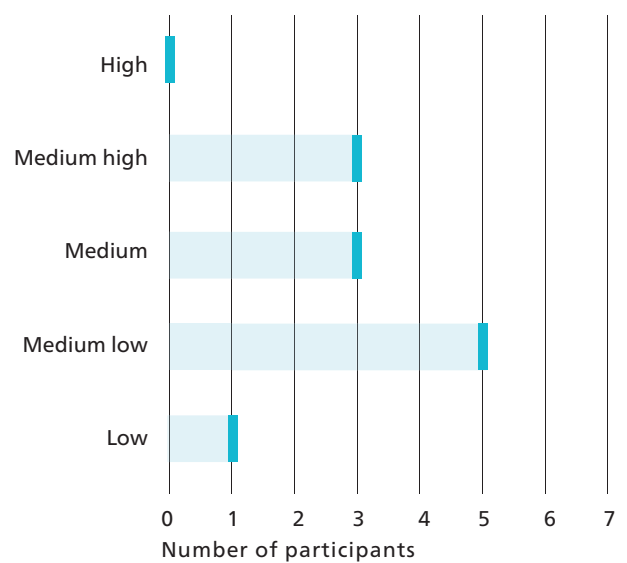
None of the participants of the test considered themselves as highly familiar to other libraries. The most popular option chosen was 'Medium low'.

skills was expected to vary from medium to high and the library familiarity from medium to low. The initial questions were carried out at Cafe Libro in the University Library, which was also considered to be the starting point of the following task.

The final questions were orientated to describe the experience in the library after accomplishing the task. The participants were asked to rate their perception of difficulty of the task and to comment on how helpful the digital and physical information provided by the library was.

An example of the material used by the researcher to take notes including questionnaires and floor maps can be found in appendix 3.

3.4 Process

The test started with the recruitment of potential library users who voluntarily accepted to participate. People were selected from the library cafe or near the library. Because the study was carried out during the summer, most of the people in the University were prospective undergraduate or masters students from abroad with a medium or high level of English.

Once in the library cafe in the ground floor (the starting point), the users were asked to respond to the initial questions where they rated their sense of direction, their ability to read maps and chose their preference in terms of what they do when they feel lost. Additionally, they rated their level of library familiarity and their technological skills, detailing favourite features on their phones and the type of phone user that represents them best.

After the questions, they were given the name of a book and its author and instructed to find the book in the library in the way they would normally try to do it. It was explicitly mentioned that they were free to ask for help and that they could use any other library tool in order to accomplish the task. All the participants received the same information about the book: *Analysis of Qualitative Data*, Volume two by Haberman (author). This book is in the 'Normal size book' section, on the second floor of the library building. Nevertheless, the first volume of the book is on the fourth floor. The participants were free to give up if the task was considered to be too complicated or if they ran out of ideas to find the book. This last point however was not mentioned explicitly in order to encourage the participants to try to find the book as if they really need it.
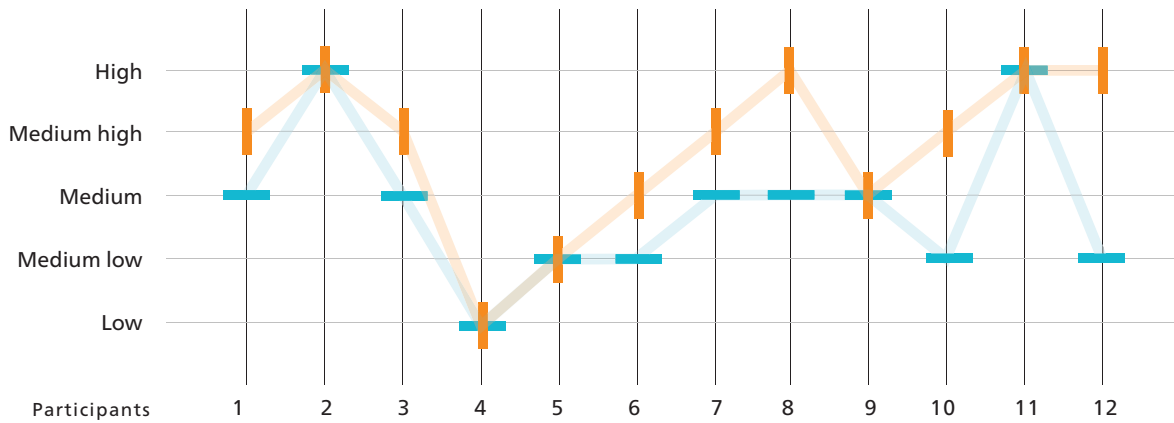
Figure 3 Participants' sense of direction and ability to read maps

Ability to read maps
Sense of direction

The lines that link the points above do not represent a flow. It was used, instead, to emphasise that the participants rated both abilities very similar, going up and down consistently. However, in general they evaluated their ability to read maps higher than their natural sense of direction.

Figure 4: Participants' preference when feeling lost

'Looking for signs' and 'asking somebody around who seems to know better' were the two preferred option by participants when choosing what they do when they feel lost.
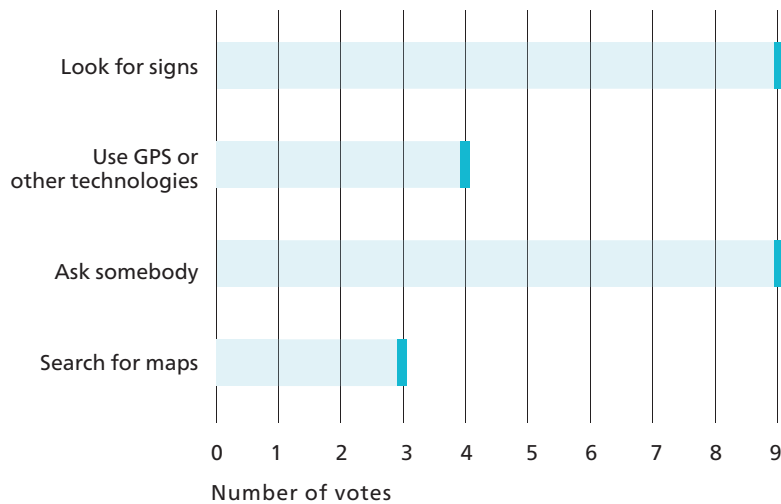
Figure 5: Participants' technological skills

No participant considered himself as having 'Really poor' technological skills. On the contrary, most of the participants evaluate themselves as 'Medium', 'Good' or 'Very good'.
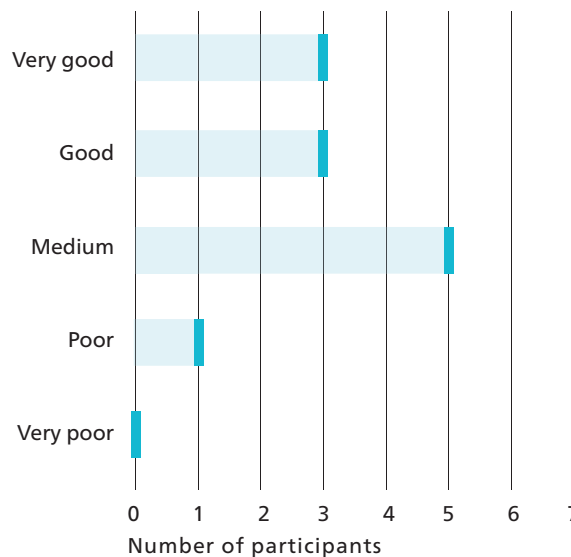
Finally, after searching for the book the participants rated the difficulty of the task and commented on the information provided by the computer catalogue and the information offered by the library building and staff. The researcher encouraged the participants to expand on the different subjects that they mentioned and to give other comments relating to the library experience.

The following section will present the results of the test and the next chapter will analyse in depth the users' journeys and the overall experience of use of the University library.

3.5 Results

The results of the test are divided according to the information provided by participants in the questionnaire and later in their performance during the task.

3.5.1 About the participants

Twelve users in total participated in the test. Ten of them were international students and two of them British. From all the participants, seven were using the library of the University of Reading for the first time whereas all the other participants had medium or low experience with this particular library (Figure 1). According to the responses, the level of expertise of the participants using 'libraries in general' varied from 'Low' to 'Medium high', 'Medium low' being the most popular option chosen (Figure 2). None of the participants considered themselves as highly familiar to any other library.

Figure 3 shows how the participants rated their sense of direction and their ability to read maps. It is interesting to note that most people trusted their skills to read maps more than their natural sense of direction. In a scale from one to five where one is really poor and five is really good the average sense of direction was believed to be 2.916 whereas for the reading map ability was 3.833. The interviewees also chose among the options one or more than one method to deal with being lost (Figure 4). The majority of the participants chose trying to solve it by looking at signs around them and asking somebody who seems to know better as the options that they were more likely to use.

Figure 5 shows the participants´ technological skills rated from one to five where one is 'Really poor' and five is 'Really good'. None of the participants considered themselves as having 'Really poor' skills and only one of them chose 'Poor'. Whilst the most selected option was number three representing a medium level of skills, the average was 3.666. From the total of twelve, ten participants stated that they own a smartphone. The different

Figure 6: Participants' level of use of smartphones

- ■ Heavy user
- ■ Medium to heavy user
- ■ Medium user
- ■ Medium to basic user
- ■ Basic user
- □ Do not own a smartphone
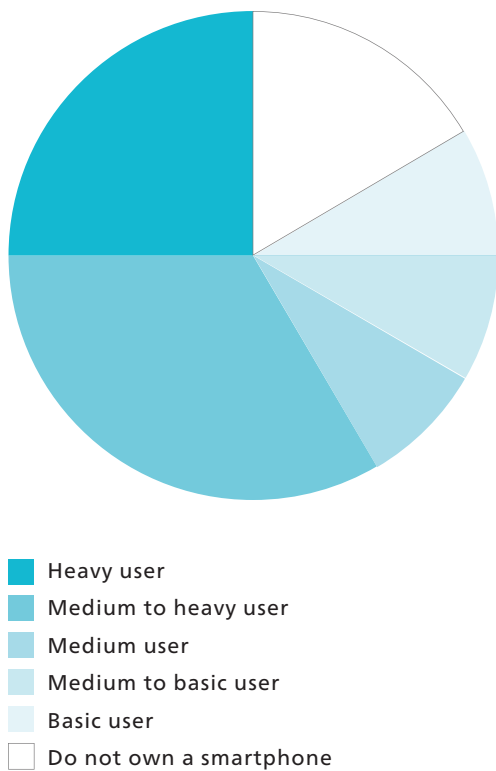
More than half of the participants considered themselves as 'Medium to heavy user' or 'Heavy user'. On the other hand, only two participants said that they did not own a smartphone at that time.

Figure 7: Participants' most used features on their smartphones

Number of votes
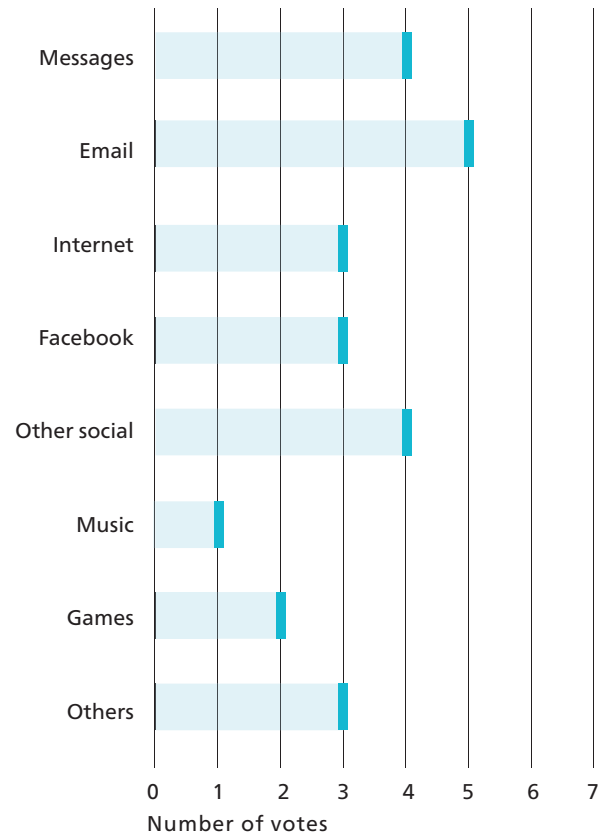
The most frequently mentioned smartphone's features were checking emails, text messaging and using social networking apps.

Figure 8: Participants' type of mobile app user

Number of votes
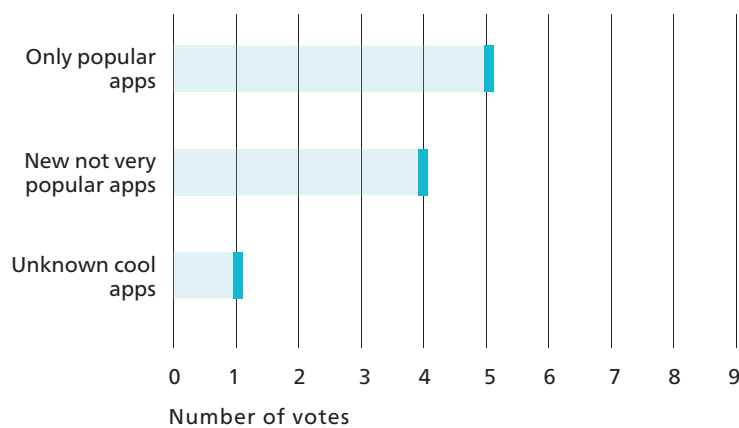
Five of the participants chose 'I Only download popular apps that I know for sure I will like' as the option that represented them the most. Only one participant chose 'I like to download unknown cool apps' as his preference.

levels of use of their smartphones is presented in figure 6. Interestingly, over half of the participants consider themselves as 'Medium to heavy users' or 'Heavy users'. Participants mentioned emails, text messaging and social networking apps as the features that they use the most on their mobile phones (Figure 7). Other features such as browsing the internet, using Facebook (over other social networks), listening to music and playing games where mentioned but with a lower intensity.

When choosing from a description of 'type of app user' that represented them the most, the majority of the participants selected the option 'I only download very popular apps that I know for sure I will like' (Figure 8). Whilst four participants were willing to download less popular apps, only one participant was identified by the description 'I like to have cool apps that nobody knows'. Surprisingly, even if people considered themselves to be medium to heavy users, they are heavy users but only within their limits. They do not seem to be very open to come out of their comfort zone and try new things.

3.5.2 The task

Eleven users succeeded in finding the book and only one gave up. The average time to do the task was 8:12 minutes, however only four participants took longer than eight minutes to finish it. The longest task lasted for 14:00 minutes and the shortest 4:25. From the eleven participants who accomplished the task, five of them asked for help at the information desks.

For further analysis, the researcher divided the process of searching for a book in the library in four stages: Catalogue search, floor search, shelf search and book search. These four stages were evaluated according to the participants' performance and comments as straightforward, difficult or not executed.

1. Eight participants out of twelve did not have problems accomplishing the first stage of searching for the book in the catalogue. The computers were visible and available plus the catalogue interface was considered to be useful and clear enough for the task.

2. Ten participants found the second floor easily and without struggles by using the stairs or the lifts.

3. The first two stages therefore were executed fluently, however the third stage, finding the shelf, was the most problematic of all. Only four participants were able to perform it confidently (Figure 9). The other eight participants were confused by floor sections such as Reference, Folio, Bulmershe collection, etc. and spent time searching for the required book in wrong shelves. From the eight participants who struggled to find the right shelf whilst being on the second floor, five decided to ask

Figure 9: Performance of the task by stages
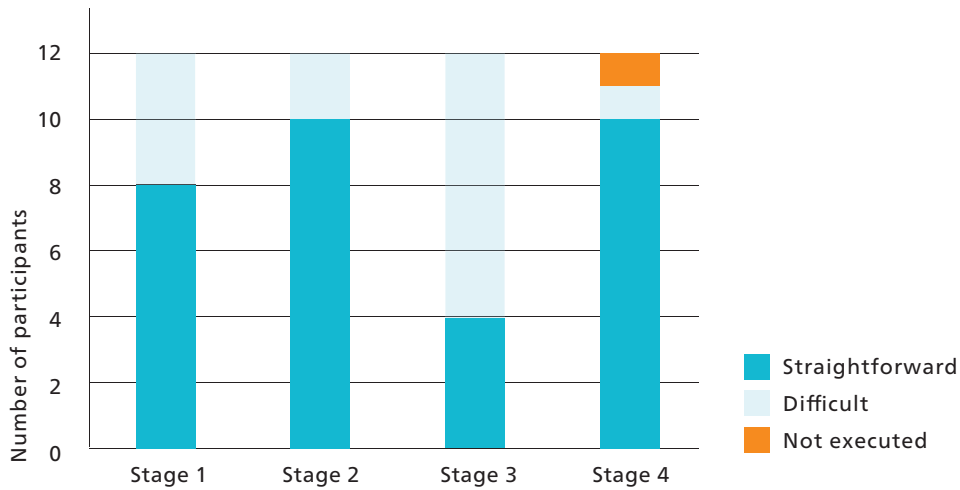
Stage one is the computer catalogue search, stage two floor search, stage three shelf search and stage four book search. The most straightforward stages were the floor search and the book search (once in the correct shelf). Only one participant did not execute the last stage and gave up during the shelf search, which was the most difficult stage in general.

Figure 10: Evaluation of the task's difficulty
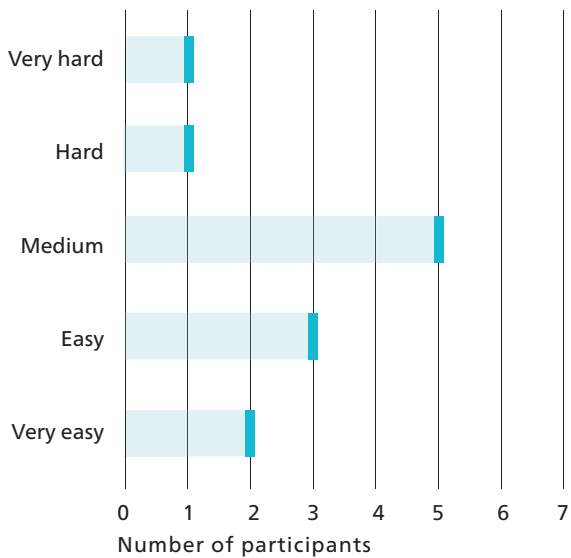
After performing the task, the participants evaluated the difficulty of it. Most participants (five) chose 'Medium', and other five chose between 'Easy' and 'Very easy'. Only two participants chose 'Hard' and 'Very hard'.

for help after feeling that they had failed in their attempt to do it by themselves.

4. With respect to the last stage, ten out of twelve participants found the book with no apparent effort after finding the correct shelf. One person had difficulties finding the book at this point and another did not perform this stage and gave up after not finding the shelf and being misguided by the help desk who directed her to the location of the first volume of the book.

After searching for the book, all of the participants evaluated the level of difficulty of the task (Figure 10). 'Medium' was the most chosen option being selected by five participants, however the average shows a slightly lower result of 2.666, being 1 'Very easy' and 5 'Very hard'. Only the participant who was not able to finish the task rated it as 'Very hard'.

In the next chapter these results will be analysed based on the journeys of the participants. Emphasis will be placed on the patterns, unexpected results and the implications of this for the specific field of library wayfinding and mobile wayfinding technologies.

Ground Floor

Second Floor

Participants: 1 2 3 4 5 6 7 8 9 10 11 12
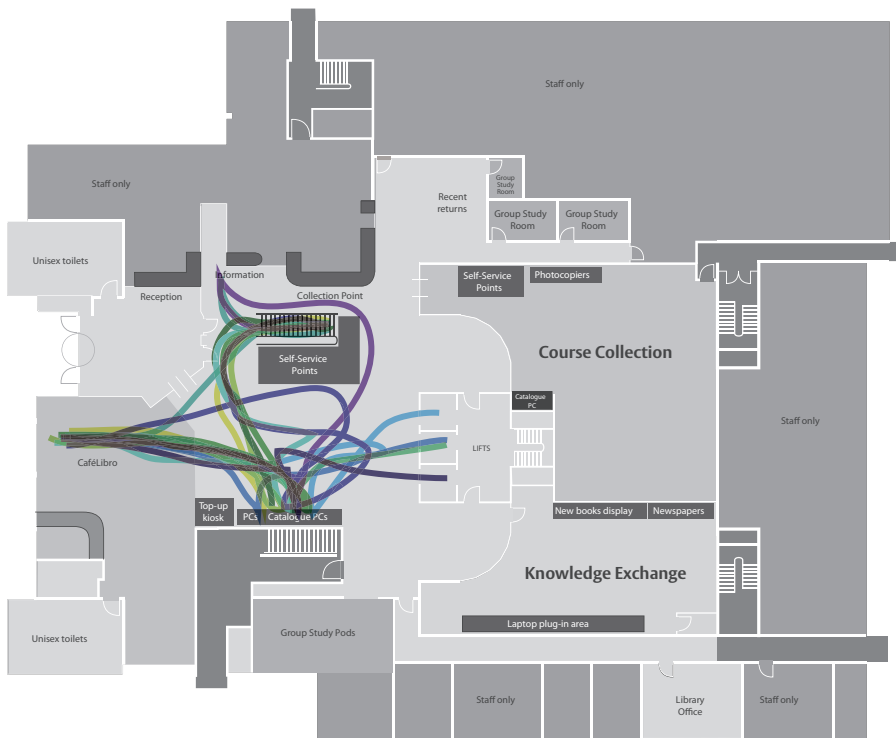
Figure 11: Routes
(Both maps to the left)

The route maps to the left show the paths taken by all the participants during the performance of the task. Every participant is represented with one colour. The location of the book on the second floor is indicated with a white 'X' in a black circle. The coloured paths give an idea of how difficult or straightforward the process was for the participants, and how it changed when for instance, one took the lifts and another took the stairs.
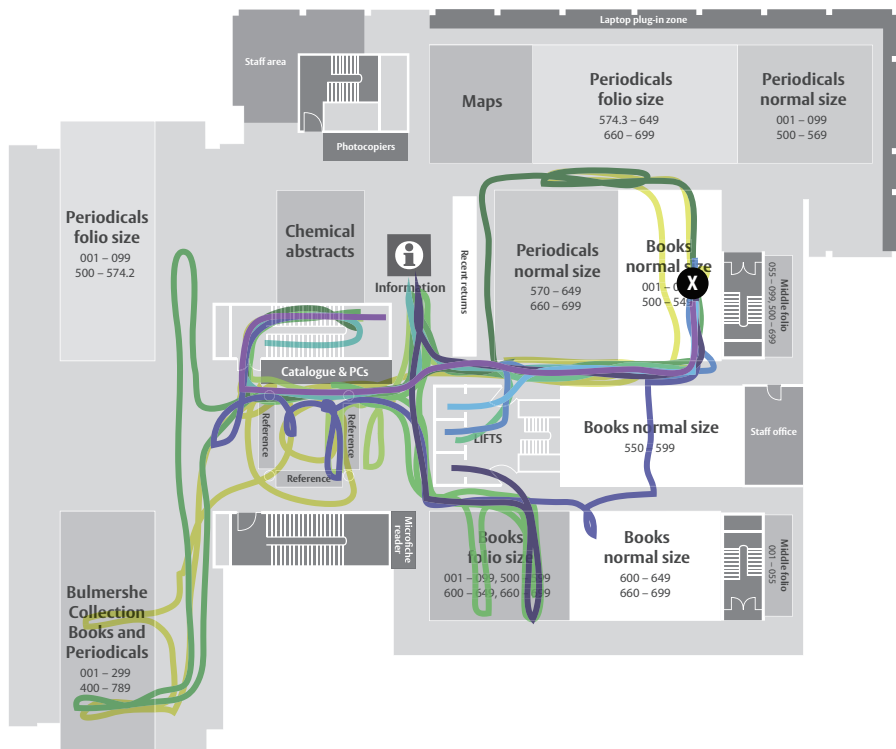
4 Analysis

This last chapter will analyse the results of the test based on the visualisation of routes, signage tools used during the test and decision points. Additionally, users' journeys models and an experience map will be used in order to obtain more insights from the tests. Finally, key points will be discussed relating to wayfinding in academic libraries and the implications will be analysed for the field of study of mobile wayfinding in libraries.

4.1 Mapping the experience

Holl (2011, pp. 40-42) states that everything, from lights and shadows to colour, textures and materials, is part of the experience of architecture and even though for practical studies it is common to fragment these elements to be able to study them separately, in reality they all merge. It is that holistic understanding of one's experience while using the library that needs to be the aim of these field tests.

The visualisation of the results for the analysis should also be in accordance with the previous point. In order to reveal what the experience is for a novice user of the library, all the elements involved in the experience and their relationships should be shown in the results. In addition to the number of times that the participants accomplished a task, it should also be relevant to compare the routes taken, the decision points and in that context, the signage used.

Only evaluating the signage as a case of success or failure, such as in the study of Hahn and Zitron (2011) can be ambiguous if the signs are taken out of their physical context. Building these results that relate many elements visually instead, can allow the researchers to see the interconnections of the experience and to gain further insights about the service and its touch points over time and space (Risdon, 2011).

4.2 Routes, signage and decision points

Figure 11 shows the paths taken by the participants whilst performing the task. Each colour represents one of the participants, to create an idea of how they used the space on both the ground floor and the second floor. Later, figure 12 will show the most common decision points and figure 13 will present all the signage used by the participants.

Ground Floor

CaféLibro
Reception
Information
Collection Point
Self-Service Points
A→
B
Top-up kiosk
PCs
Catalogue PCs
PC
LIFTS

Figure 12: Decision points
(Both maps to the left)

The decision points map indicates
which were the most important
places where the participants
made decisions that affected
the rest of the process. Some of
them (A and B) did not represent
a major challenge for them,
but others (C and D) had a clear
influence on their performances
and represent the moments when
participants were more confused.

Second Floor

Photocopiers
Maps
Periodicals folio size
574.3 – 649
660 – 699
Periodicals normal size
001 – 099
500 – 569
Periodicals folio size
001 – 099
500 – 574.2
Chemical abstracts
Information
Recent returns
Periodicals normal size
570 – 649
660 – 699
Books normal size
001 – ...
500 – 549
X
Middle folio
055 – 099, 500 – 699
Catalogue & PCs
C
Reference
Reference
Reference
E
D →
LIFTS
F
Books normal size
550 – 599
Bulmershe Collection Books and Periodicals
001 – 299
400 – 789
Microfiche reader
Books folio size
001 – 099, 500 – 599
600 – 649, 660 – 699
Books normal size
600 – 649
660 – 699

4.2.1 Routes

By looking at the routes overlaid on the second floor; it is worth noting that many participants coming from the stairs were trapped in the reference section. This section is shaped as an 'U' with the open side facing the floor door. Four out of eight participants coming from the stairs did not hesitate to believe that the book they were looking for was there. In other circumstances the 'Section signs' were read, however the 'Reference books' sign was ignored most of the time. The inviting layout of the shelves and the fact of finding similar call numbers to the one they were looking for in that section kept the participants for a long time questioning how the book was not where it was 'supposed to be'.

In addition, it is interesting to note the high number of participants who asked for the librarian's help. From the five out of twelve participants who found the shelf with human help, four were coming from the stairs and only one came from the lifts. On the contrary, from the four out of twelve people who found the correct shelf easily by themselves, one came from the stairs whereas three came from the lifts.

There seems to be an effect of the medium used the get to the second floor on the results. By looking at the route map it is possible to see that the lifts are closer to the location of the book than the stairs, which could explain why people found the book more easily from there. However taking the lifts for a person who has never used the library building before can be even more confusing because there are more decision points to face (see figure 12), such as choosing the left or the right door to enter the second floor room.

4.2.2 Decision points

On the ground floor the decision points were:

(A) Coming from the library cafe and looking for the computer catalogues.

(B) After performing the computer search, deciding how to go to the second floor, either using the stairs or the lifts .

In both cases, the participants did not hesitate and went straight to one of the options. It is noteworthy that users did not stop to evaluate the decision of taking the lifts or the stairs. Although most of them were not familiar with the building and thus did not have a clear reason to choose one over the other, the results suggest that in this particular building and for this particular task, it was more difficult to perform the task by taking the stairs than the lifts.

Ground Floor

Second Floor
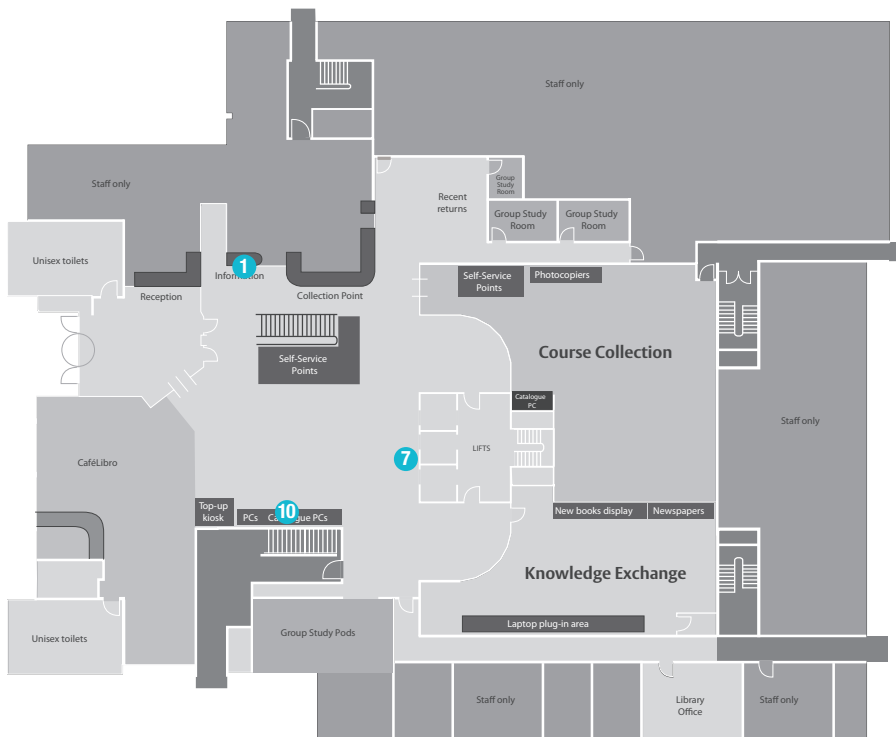
Figure 13: Signage used (Both maps to the left)

The signage map shows the guidance tools used by the participants in order to accomplish the task.

1. Help/Information desk

2. Floor map

3. Floor subject sign

4. Section sign (Folio, Normal, etc)

5. Shelf numbers

6. Call number / Book spines

7. Floor directory

8. Floor sign

9. Information boards

10. Computer catalogue
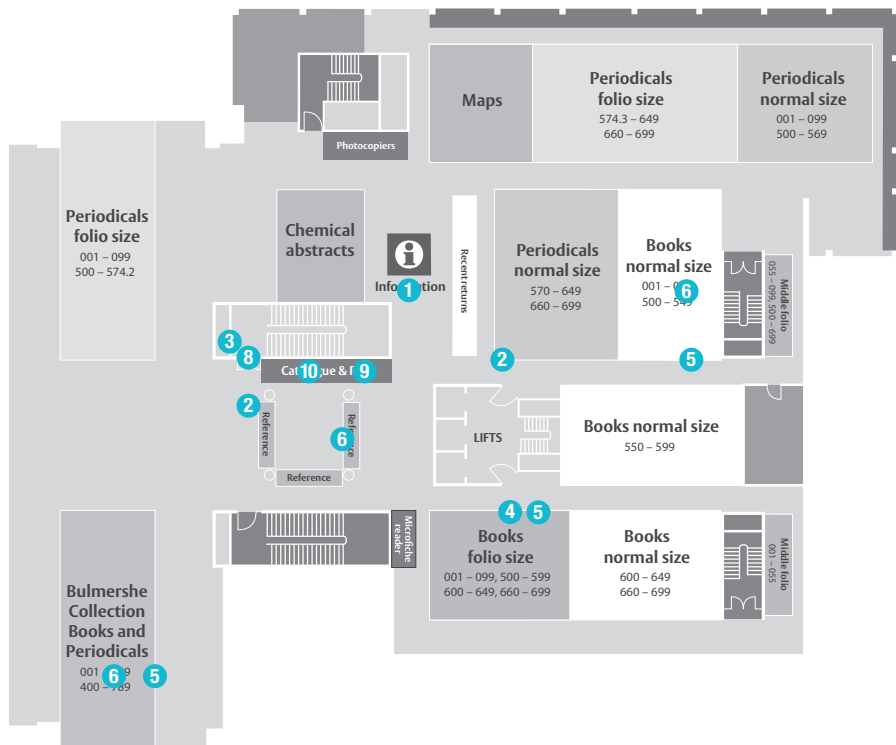
On the second floor the decision points were the following:

(C) Going through the floor door after arriving to the second floor from the stairs.

(D) Coming out of the lifts and deciding which door to take, the left or the right.

(E) Coming into the second floor room by the lifts after choosing a door.

(F) Choosing the shelf by reading the shelf numbers.

Decision point 'C' in figure 12 was one of the most complicated parts of the task. As figure 11 shows, the participants who took the stairs spread to many directions from that point. Only two of the eight persons who used the stairs went to the correct direction (left) at once, whereas all the others were misguided by the library distribution, layout of the shelves or confused by the floor map.

When using the lifts as the medium to go to the second floor, the participants faced decision point 'D'. After the lift doors open on the second floor, users need to decide whether to take the left door or the right door (Figure 14). This decision may be influenced by the exact lift used (right, middle or left) because that will determine the person's proximity to one of the doors. As the route map shows (Figure 11), from the four participants who took the lifts, three used the left and middle lifts and took the left door. But the person who used the right lift, decided to go for the right door after hesitating because of not knowing how to decide. In that exact point, there is no relevant information to help the decision of which door to take, even though one leads straight to 'normal size book' section and the other to 'Folio' section.

4.2.3 Signage used

The type of signage used by the participants during the task can be seen in figure 13. As it was previously mentioned, the help desk (number 1 in figure 13) was highly used, being effective five out of six times. In most cases, the librarian explained the classification system and the library sections to the participant and showed him the right direction to go. In a few cases, the librarian joined the participants and helped them find the book from the shelf. However in one test, the librarian decided to search for the book in the catalogue and mistook the first volume of the book with the second, suggesting the participant to go to the fourth floor. Neither the participant nor the librarian noted this mistake but the participant doubted and searched again on another computer, finding the same information that she originally had. This participant was the only one who did not accomplish the task and gave up.

Figure 14: Decision points 'D' (Above)

The picture above shows the decision point 'D' after taking the lifts. In this case, from the three lifts the person took the right side one. Once the lift doors are opened, people need to decide whether to take the right or the left door to get into the floor room, but there is not much guidance about it.
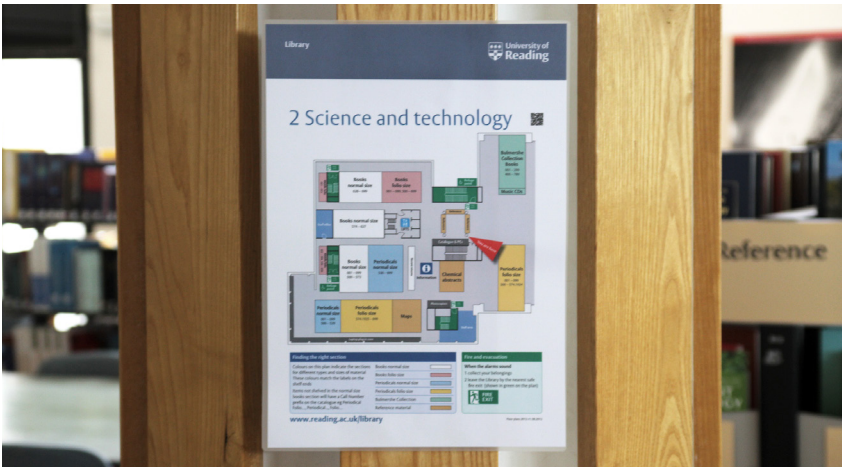
Figure 15: Floor map on second floor (to the left)

The image to the left shows the floor map located at the entrance of the second floor. This floor map tries to address the decision point 'C', however many of the participants did not see it or found it after getting lost for a few minutes.
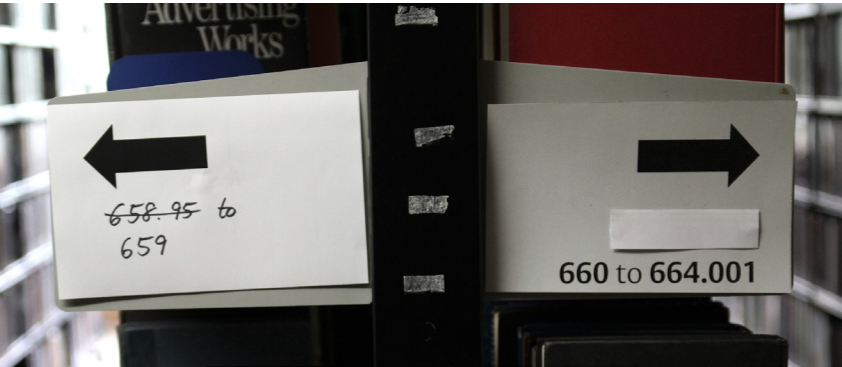
Figure 16: Shelf numbers (to the left)

The image to the left shows an example of shelf signs in the University of Reading's library. Whilst there are some signs printed, there are also hand-written signs or crossed out and re-written signs.

From the type of guidance tools used, another fundamental one was the floor map (number 2 on figure 13). As it was mentioned earlier, one of the critical decision points is located at the entrance of the second floor by the stairs ('C' in figure 12). A floor map is located there in front of the door to assist and help orientate people. The floor map is placed to address the possible confusion that one can feel when entering the room by showing the current position and the different sections on that floor (Figure 15). However from the eight participants who took the stairs five did not see the floor map in the first place and struggled to find the right shelf. From the three participants who did see the floor map immediately, two were orientated and found the right shelf rather easily, but one of them misunderstood the distribution and ended up trying to find the book in the wrong section.

Shelf numbers were also critical when the participants tried to find the correct corridor. In most cases people were feeling insecure in that part of the process and they needed clear information to support their decisions. However the shelves' signs instead of clearly guiding the users; augmented the uncertainty because of the 'unofficial' look and feel (see figure 16). The signs on the shelves were handwritten many times and occasionally the text was crossed out and re-written. These signs may affect the feeling of trust from the users to the library service. In the conversation with the liaison librarian (Appendix 1), he mentioned that library patrons tend to blame themselves or blame the library or librarian in different parts of the process. For instance, users feel that is their own responsibility to be able to search effectively in the computer catalogue. If they fail to find a specific book in the catalogue they question their performance, whereas when users struggle or do not find a book on the shelves, they think that is the library or the librarian's fault and thus they deserve to be assisted in that process. Therefore there might be a relation between the end look of the guidance tool and how trustworthy it is perceived to be.

4.3 Journey models and experience map

As it was mentioned earlier in the literature review and in accordance with Risdon (2011), one of the aims of journey models is to illuminate the transition from phase to phase and relation between the different channels involved. Journey models illustrate all the steps of a journey, emphasise the channels (more and less popular) and may show parts of the experience that have not been considered enough and are hindering the use of the service. The model is complemented by qualitative insights which represent the user's 'thinking' and 'feelings' whilst using the service. In the 'thinking' row the notes are mostly based in the user's question whereas in the 'feelings' row the notes are on the user's responses such as feeling frustrated or confident. Figure 17 is an example of this description.

Figure 17: Library journey of participant one

Stages

| Catalogue search | Floor search | Shelf search | Book search |

Doing

Using
- Library computer
- Hand written notes
- Stairs
- Floor subject
- Section signs
- Re-search catalogue
- Floor map
- Shelf numbers
- Books spines

Thinking
- The name of the book is probably easy to find.
- Which book from the list should I choose?
- I wonder which is the important information here... I'll write down the call number.
- It's only on the second floor so I could take the stairs.
- I'm on the second floor... where should I go now?
- Here the numbers are very similar to my call number but the book is not here.
- Maybe someone took it, because it should be here.
- Apparently I'm in the right section now, the numbers are similar to the one I'm looking for.
- Indeed, here is the book.

Feeling
- Finding the book will be easy.
- Although the description of the catalogue makes me feel a little confused.
- Finding the book will be easy, it's been straightforward until now.
- I feel a bit lost and confused on this big floor.
- I really don't want to ask for help, but it is getting really frustrating to find the book.
- Without the floor map I couldn't have done it!
- This was harder than I expected.

Figure 18: Overlapped journeys

Stages

| Catalogue search | Floor search | Shelf search | Book search |

Doing

Using
- Library computers
- Hand written notes
- Stairs
- Lifts
- Floor sign
- Floor subject sign
- Sections signs
- Floor map
- Help desk
- Shelf numbers
- Books spines
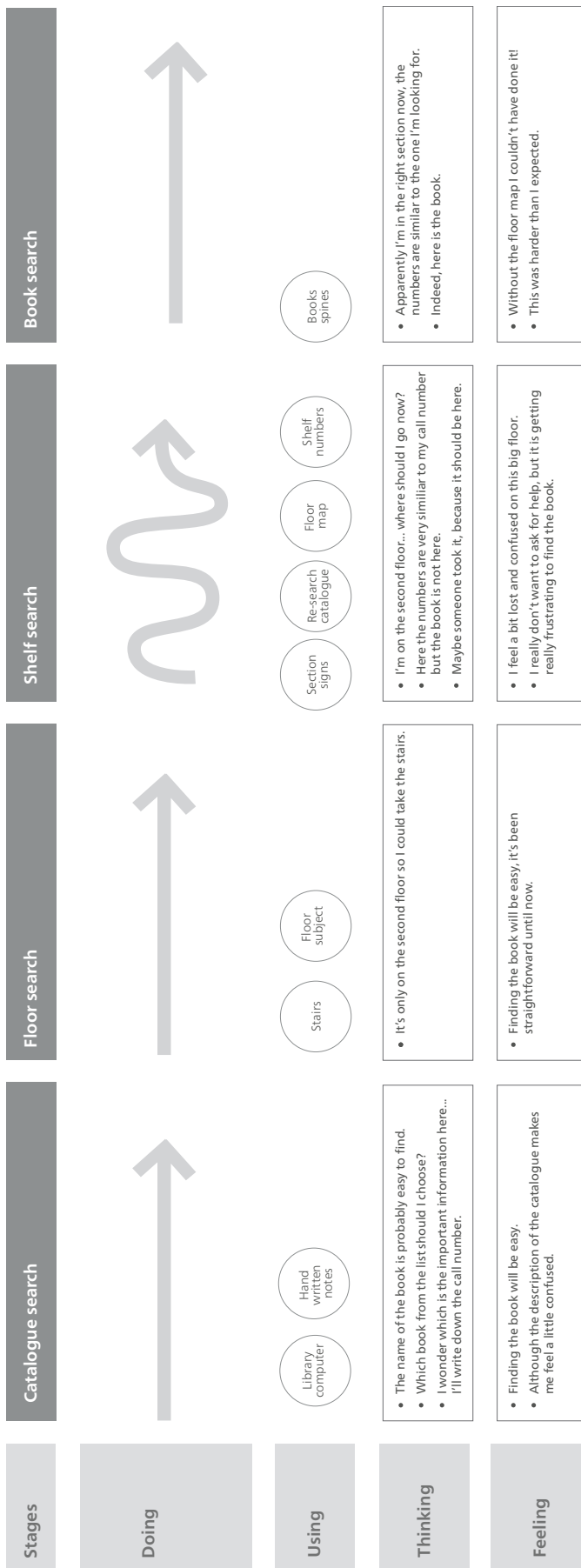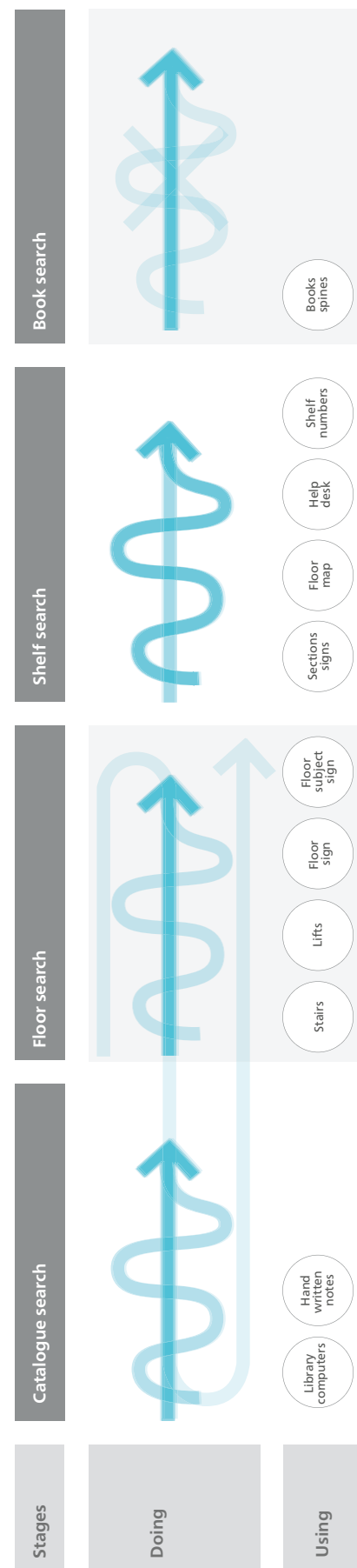
The use of Risdon's journey models and experience maps represents an innovation for academic research in libraries. These thinking tools are rather new for non-academic studies and presumably they have not been used for academic research before. Thus, they might provide novel insights related to the test carried out and additionally they could help to reveal opportunities or ideas of how to improve current interactions in the field of mobile and regular wayfinding in libraries.

4.3.1 Journey model

In order to continue analysing the results, journey models were created for every participants' task performed during the test (Appendix 4). Figure 17 shows an example of a journey model. In that particular case, the processes of 'Catalogue search', 'Floor search' and 'Book search' were straightforward but searching for the right shelf while being on the correct floor was complicated and confusing. Interestingly, that participant took notes of the call number, but not the floor nor the type of loan/book. By reading the thinking and feelings notes it is possible to see how in different stages the participant was feeling confident and in some other stages confused and lost.

The types of arrows represent how simple or problematic the performance of every stage was, a straight arrow being 'Easy' or 'Straightforward' and a curved arrow 'Difficult'.

Figure 18 shows an overlapped vision of all the journeys together, with the arrows at 15% opacity. A pattern thus emerges in the way participants carried out the task. Even though all the stages were problematic for at least one of the participants, generally the most difficult was the shelf search stage. During this, people felt insecure and even if they intended to solve the task by themselves, many had to ask for help after trying and failing to find the shelf. The participants expressed feelings of being overwhelmed by the entrance to the second floor and having to decide where to go from there.

4.3.2 The overall map of the experience

The experience map of the library (Figure 19) shows a general user journey when using the library. It summarises the experience based on the participants' performance but representing general issues. It is interesting to see, for instance, the compared experiences of people who use the lifts versus people who take the stairs. Whilst more novice users make a fast decision and choose the stairs over the lifts to go to the second floor, it is harder to find the book coming from the stairs. That decision has a direct effect on the rest of the journey.

Figure 19: Experience map of the library

Decision point: A

Decision point: B

Decision point: C, D, E, F

Stages	Catalogue search	Floor search	Shelf search	Book search

Doing

- Catalogue search: Library computer → Hand written notes
- Floor search: Lifts → Floor subject sign; Stairs → Floor sign → Floor subject sign
- Shelf search: Floor maps → Help desk → Shelf numbers; Sections signs → Floor maps → Help desk → Shelf numbers
- Book search: Books spines

Thinking

Catalogue search:
- I don't really know the book, so I better search in the catalogue to find it.
- How much information should I write down?
- I know what to do next: go to second floor.

Floor search:
- I could either take the stairs or the lifts.

Shelf search:
- Ok, so I'm on the second floor... where should I go now?
- There are numbers similar to mine in more than one place.

Book search:
- Finding the book should be easy now.

Feeling

Catalogue search:
- Have I chosen the right book?
- What is all this information about?
- I hope I'm not missing anything relevant.
- I hope I don't have to ask for help later on.

Floor search:
- I hope I find the book easily.
- I feel confident now.

Shelf search:
- I feel a little lost on this floor.
- I really don't want to ask for help, but if I don't find it soon I will to have to do it.
- The different types of books are hard to understand.

Book search:
- I feel confindent, I know what to do here.

Guidance tool

Problematic process

Straightforward process

Figure 17: Library journey of participant 1 (page 46)

Figure 17 is based on Risdon's definition of a journey model (2011). It shows the journey of one participant of the test in the library whilst performing the task. It is an example to show how the results were visualised. The journeys of all the participants can be found in appendix 4.

Figure 18: Overlapped journeys (page 46)

Overlapping the journeys shows a pattern in the performance of the participants. Even though all the stages were problematic for at least one of the participants, the shelf search was remarkably more difficult to accomplish than the other stages.

Figure 19: Experience map of the library (to the left)

Figure 19 is based on Risdon's definition of an experience map. The sections; 'stages', 'doing', 'thinking' and 'feeling' help to create an idea of how a novice user experiences the library, what he uses and how he feels whilst searching for a book. This model also emphasises the decision points in the overall journey to see how they affect the search process.

All the decision points that were mentioned earlier (Figure 13) can be now seen located on the course of the journey (coloured blocks). Thus, it is possible to see the influence of these decision points on the experience. During the stage of finding the shelf, for example, people face about three decision points while trying to accomplish their goal. Many times in this stage, participants gave up to the original idea of finding the book independently, and had to ask for help.

By looking at the experience as a sequential line it is easy to note that the stress of the experience is located in the third stage 'Shelf search'. Here there are more decision points, more possible routes to take and more guidance tools to use. Compared to the first two stages, there are many more things to do. So it is reasonable to ask if some of the guidance tools could answer some of these issues earlier in the search process. For instance, if the floor map which was highly used by both the people who took the stairs and people who took the elevator, could be placed in a way that users see it before entering the second floor, then the overwhelming feeling could perhaps be reduced.

4.4 Discussion

Mapping the novice users' journey in an academic library allowed the researcher to suggest changes in the way the service works, although many suggestions may not be necessarily related to mobile technology but to other ways of addressing the same problems. Additionally, by using mixed techniques to represent the results, such as route, signage and decision points maps plus journey and experience maps helped to interconnect the experience of use of the library, gaining a more complete view about it and more insights. The most relevant points will be discussed in the following segment.

4.4.1 Clarifying the sections and book types

In general, participants seemed to be confused when they tried to understand the different sections of the library. Many of the participants mentioned that it could have been easier to understand the sections if the colours from the floor map were remarkably visible on the shelves, walls or carpet. So visually emphasising the sections could be one way to improve the experience, but it is also interesting to note a particular case that occurred in the test. One participant after reading the section sign 'Folio' noticed that he did not check this information in the computer therefore he did not know which type of book he was looking for. After this, he felt that it would be impossible for him to find the book, thus he needed to ask for help.

A probable reason why he did not read the book type in the catalogue is because this information is not expressed in a clear way. When searching for a 'Normal size book', the catalogue only shows information about the 'Loan type' which in this case is called 'Standard'. It is not clear that 'Standard' also means 'Normal size book'. Additionally, in other cases, when searching for a journal the catalogue will call them 'Journal' in the filters, but 'Periodical' in the 'Loan type' and later on the shelf signs. Consistency in the use of specific terms can be crucial to guide people, especially new users. Additionally, separating the information into 'Loan type' and 'Floor section' could help to avoid future confusions.

Computer interfaces could perhaps improve the experience of use of the library if they accentuate the information that needs to be remembered or written down. Notes could also be included to explain the importance of the sections on every floor, in order to anticipate users' needs and teach them how the library is organised. Interfaces for mobile devices on the other hand, could have less emphasis on the sections and more on the target and on the user's position. Sections could be secondary because people would only need them to reinforce their current position, but the rest of the guidance would be on the mobile.

4.4.2 The role and responsibility of human help

Help desks seem to be fundamental to orientate people in the library building, especially novice users. This has been shown in past studies (Hahn and Zitron, 2011) and it has also been suggested in the results of this dissertation. However, it is interesting to question the feeling of respect that users have for librarians and the big influence that the librarians' suggestions have on the people who ask for help.

In this study for instance, it was unexpected that participants failed the task. However there was one case in which a participant could not continue after being misguided by the librarian on the help desk. This participant technically did everything right, wrote all the key information from the computer (call number of the book, floor and loan/book type) and used the floor map immediately after arriving on the second floor. After failing to find the book, she decided to ask for help. But the librarian confused the first volume of the book with the second, suggesting the participant go to the fourth floor, with a completely different call number. The participant doubted the previous computer search, so re-searched again in the catalogue and found the same information that she previously had, not the information pointed out by the librarian. The participant decided that there was an error in the library, so the book was probably not available and she decided to give up.

In this study librarians were effective the majority of the times they were needed by the users. The help desk will probably continue being one of the most popular ways of solving novice users' problems, but it is important to realise that people trust them and expect to have from them the final and correct solution to their problem, to the point that they would not question their suggestions. This could mean, therefore, that it is an absolute failure if librarians misguide or provide wrong information.

Past studies relating to mobile tools for wayfinding in libraries mention that apart from indicating the position of the user, it would be important to highlight where the information desks are on the map, so the users can always know where to go in case they need help. Additionally, it should be considered that the mobile tool could improve the communication between the user and the librarian by showing the precise book that the user is trying to find. Thus, the mobile tool could avoid confusions such as the one experienced by the only participant who did not accomplish the task in this study.

4.4.3 Decision processes

The decision to take the lifts or the stairs was most of the time underestimated by the users of the library. While second floor sounds like a walkable distance, this study suggests that taking stairs affected the performance of the participants, when looking for normal size book (the most common task). The lifts and the stairs leave the users in two different parts of the floor. One participant stated "I don't know how to use the library using the stairs, I need to use the lifts". Even though lifts and stairs are part of the building architecture and they can not be changed, the problems regarding the building layout could be reduced if there was more emphasis on guiding the users to make them understand the consequences of using one or the other option. For instance, lifts are better when looking for certain sections in certain floors.

Another crucial decision point occurs after taking the stairs, when people enter the second floor. In that situation, the layout of the shelves can be one of the reasons why people feel confused when searching for normal size books. When coming from the stairs, to the left (the correct direction) there are massive shelves with poor lighting which do not invite people to try to search there. On the contrary, to the right there is open space, with many shelves but the distance between them is greater. The windows bring more light to that section and makes it 'less intimidating' and more inviting. Less direct guidance such as lighting and layout may affect the decision of users, therefore it also needs to be considered as a relevant part of the experience of use of the library.

For decision processes in library buildings, mobile wayfinding tools could represent a significant solution. Hahn, Twindale, Gutierrez and Farivar (2010) mention that their mobile application could direct to a specific room, then to a section of the room, later to a bookshelf in that section and finally, directly to a particular section of that bookshelf. In this case, it would not be required for the user to understand the sections of the library to find the item that he is looking for. Additionally, the mobile guidance should be able to suggest the shortest way to get to the target according to the current position of the user.

4.4.4 Innovating with guidance tools

Having a mobile guidance tool could improve the process of finding a shelf and using the shelf signs (especially when they are hand written). People may trust the formal look of a mobile interface more than a written paper. However, according to the initial questions of the test, people are not very interested in downloading 'unpopular apps' yet. Users consider themselves as medium to heavy users, nevertheless they are not willing to try many new things. Popularity is still a dominant factor for decision. This situation could perhaps improve if librarians promoted the mobile application as a required tool for students instead of being only an experimental application for early adopters.

The floor layout seems to be one of the most relevant features to teach new users in order to allow them to search for books without human help. Even though this is also what the mobile wayfinding applications for libraries suggest, the route from the computer catalogue to the desired book could be part of the information provided by the computer system instead of only being part of a mobile interface. For the users, the need to understand where they are and where they are going is important from the beginning, not only when they arrive to a new floor. Having a map on the computer after the catalogue search could help them to have an easier transfer from the digital space to the physical one around them.

The interface of the maps should emphasise different things depending on the screen where they are displayed. For instance, the computer-based map could highlight memorable elements such as stairs, doors and other landmarks. Thus, the user could take notes or remember those key objects in order to find the book more easily, considering that he will not have access to that map during the rest of the task. The map based on a mobile device, instead, could reinforce the route with written or audio messages such as 'turn right after the help desk' similar to the GPS guidance for car drivers. That way the use of mobile devices as a wayfinding tool would not only be an improvement for the basic problems of finding books in the library, but could also be a tool for better accessibility.

4.5 Research limitation and further studies

The starting point of the test carried out for this study may have had an effect on the way people performed the first stage of the task (catalogue search). The entrance of the ground floor faces the stairs and that could have caused confusion for the participants, but since they started in the library cafe, which is inside the library, they were closer to the computers.

For further studies, it could be interesting to have a similar task, but to ask half of the participants to take the stairs and the other half to take the lifts. If all the participants are novice users, the results could suggest a stronger influence of the medium used in the results, for that particular library.

It could also be relevant to research about the users' preferences in libraries where they have access to the catalogue on their mobile phone. It seems by the results of this study, that even though users have access from their phones to the online catalogue, they prefer to use the computers of the library for that purpose. If so, apart from developing mobile tools, there should be a bigger concern relating to what computer catalogues can do to improve the whole experience in the library building, not only browsing the online catalogue.

Finally, further research should also be done, after the mobile wayfinding tool is released in the University of Illinois, to measure its performance, the interest of users and how the experience has been affected by the new guidance tool.

5 Conclusion

This dissertation studied in depth the context of novice user experience in academic libraries. Past studies were revised relating to user experience and mobile wayfinding in libraries. Later, a test was conducted in the library of the University of Reading, with the aim of revealing all the elements involved in a novice user journey when looking for a specific book.

The results were visualised as journey models and experience maps and were analysed in order to suggest ways to improve the search process of academic libraries, considering mobile technology capabilities. The use of journey models and experience maps represented an innovation for academic research regarding libraries. As thinking tools, they provided novel insights and ideas of how to improve current interactions in the field of mobile and regular wayfinding in libraries.

The main findings were the following:

1. Clarifying the sections of the library such as 'Normal size book' and 'Folio' by emphasising this information in the computer catalogue, and consistently reinforcing the sections in the physical space. The emphasis in mobile devices for wayfinding instead, should be in showing the current position of the user and the target.

2. Librarians in help desks have a delicate role, considering that most people expect from them the final and correct solution to their problem. It is important to consider then, that it could be an absolute failure if librarians misguide or provide wrong information. Thus, mobile devices apart from indicating the location of the help desks, could also improve the communication between librarians and library patrons by showing the exact book that the user is trying to find on the mobile screen.

3. Mobile wayfinding tools could represent a significant solution for decision processes in library buildings, by guiding step by step and suggesting the shortest route to find the specific book (stairs versus lifts for example).

4. Bringing to the beginning of the task some of the guidance elements such as floor maps, that are originally only used when the user arrives to a new floor. A computer-based map after searching for a book in the catalogue could highlight memorable elements such as landmarks so the user can take notes or remember the route from his current position towards the book. The map based on a mobile

device instead, could reinforce the route with written or audio messages such as 'turn right after the help desk'. Thus, the use of the mobile device as a wayfinding guidance tool could also provide better accessibility.

Further study could be done in order to test the influence on the results of the medium, lifts or stairs, used to get from one floor to another. It could also be interesting to research about the users' preferences in academic libraries, when they have access to the catalogue in both, library computers and on their mobile phones. This could help reveal if users prefer to use one tool over the other. Finally, research should also be done after the mobile wayfinding tool is released in the University of Illinois to measure its performance, the interest of users and how the experience is changed by the new wayfinding tool.

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7 Appendix

7.1 Notes of the conversation with a liason librarian of the University of Reading

> » Have you noticed a pattern in how new students use the library for the first time?

When they arrive the sections are confusing (journals, large books. etc) people go first to staff (there is not always staff, though), others go to floor plan.

People sometimes write down the numbers and not the letters of the call number. It is perhaps a bit shocking the change from the computer search to the building navigation. There is a video for that on the website that shows how to find a book. It shows the catalogue and the library. This video is highlighted on the library's website at the beginning of the year and it seems to be used by students, looking at the stats.

> » Do you think international students have more problems to find their way in the library than the British students?

Yes. Especially when they use different numerical systems. Alphabetical order, additionally, is not easy for everybody. There is a plan to order the books by numbers in the floors, instead of subjects per floors.

> » Does the University library have a general strategy, for instance, 'We want students to move freely and be independent in the use of the library'?

The university library is trying to build independence. When students ask staff for help, the librarians try to make students understand how to solve the problem, not just to give them the answer.

> » How does the library manage the amount of students that arrive all together at the beginning of the year?

The annual cycle is organised with different activities. At the beginning of the academic year there are sessions for students (30 students per group), where they search for dummy books that are placed in the real location of the original book. Additionally, the website has information with tips and recommendations. During the year, they stimulate people to join workshops with similar activities.

> » Which do you think are the most important tools that guide users when they search for a book in the library building?

The catalogue is the most important one, it should help them find what they need and it provides information such as in which floor the book is and the type of book loan. The call number should help the student with rest of the process.

The floor plan (close to the elevator) is relevant too because is where students learn where to go. The shelves are more difficult to understand but they are "as good as they can be right now". It can be hard to understand the way in which they are organised.

> » What do you think about mobile tools that guide people inside buildings? Is that something that this library is considering for the future?

Right now you can use the catalogue online on your mobile. Mobile guidance could work. RFID is what we use to tag books for security and to re-organise them. This tool has the potential to be used for users of the library too, in the future.

> » In which way the new catalogue helps the users to find books better? Does it give more information about the actual location of the book in the building?

It uses a different type of relevancy ranking. There are many facets on the left side that help if you start with a broad topic, to something specific. It is better with misspellings too. It doesn't give more information about the book location in the building.

> » Which one of this parts of the process do you think is the easiest? And the hardest?

Easiest: **Computer search** / Find floor / Find shelve / Find the book

Hardest: Computer search / Find floor / **Find shelve** / Find the book

> » Why?

It depends on the user a lot. Some people are scared of technology and that will affect their experience in the library. The catalogue was not developed in here, it is from an external company. The library just populated it and had some opinions on how it should look and work. It was tested in terms of usability.

Finding the shelve is where most people give up and they usually blame the library about that, whereas when they search in the computer they tend to blame them selves.

7.2 Email conversation with Jim Hahn

From: k.exss@student.reading.ac.uk [k.exss@student.reading.ac.uk]
Sent: Friday, July 27, 2012 1:12 PM
To: Hahn, James F
Subject: Digital wayfinding software article

Dear Jim

I'm Katherine Exss, a masters student of Information Design at the University of Reading, in the UK. I'm currently doing my dissertation on physical and digital wayfinding systems and I am interested in knowing more about the wayfinding software that you presented in your article 'Methods for Applied Mobile Digital Library Research: a Framework for Extensible Wayfinding Systems'. More specifically, I would like to know which is the current status of this project and if students are using it nowadays. I would really appreciate if you could tell me more about this project.

Sincerely yours,

Katherine Exss

Thanks for getting in touch. There have been two iterations of the service since that paper was written. This was the first prototype here: https://play.google.com/store/apps/details?id=uiuc.library.helper&hl=en

We made a refinement, (locator module in minrva) but are still trying to work out the WiFi approximation and hope to incorporate that in the 1.1 release of Minrva (currently in 1.0 release): https://play.google.com/store/apps/details?id=edu.illinois.ugl.minrva

Let me know if you have additional questions.

Thanks,

Jim

Dear Jim

Thank you very much for sharing those links with me.

My only additional questions are if students are using the app and how popular it is? Have you got any feedback from real users, outside testing?

Thanks again for your time.

Kind regards,

Greetings,

the primary way we gather feedback is to iterate designs based on user studies, this is one example:

https://www.ideals.illinois.edu/handle/2142/24001

In terms of downloads, each app has more than 50 but less than 100, is what our stats tell us. These are experimental prototypes and aren't part of the library's production systems yet. We haven't collected informal feedback on the app, but we're still working on marketing and promotion efforts. Mobile wayfinding remains an evolving project -- we'll know more after this Fall, since that would be the first semester that the Minrva app would be available to new students.

Let me know if you have additional questions.

- Jim

Dear Jim

Thank you again for the information. It was very useful for my study.

Best wishes and I'm looking forward to read your future studies, after the official release of Minrva.

7.3 Material used for the test

(See next page)

Initial questions | About the user

Participant number:

Time:

Sense of direction

Rate your sense of direction
(1 to 5, were 1 is really poor and 5 really good)

Rate your ability to read maps
(1 to 5, were 1 is really poor and 5 really good)

When you are going somewhere and you feel lost, what do you usually do:

- I try to solve it by my self by looking at signs around me
- I try to solve it by my self by using GPS or other technologies
- I ask somebody around who seems to know better
- I search for maps to understand where I am and where to go

Technological skills

Rate your technological skills
(1 to 5, were 1 is really poor and 5 really good)

Do you own a smartphone?

Yes   No

If yes, rate your level of use of your smartphone
(1 to 5, were 1 is basic user and 5 is heavy user)

Which are the features that you use the most in your smartphone?

Which of the following descriptions identify you the most:

- I only download very popular apps that I know for sure I will like
- I like to try new apps even if they are not very popular
- I like to have cool apps that nobody knows

Library familiarity

Rate your level of familiarity with the University library
(1 to 5, were 1 is really low and 5 really high)

Rate your ability to use libraries in general
(1 to 5, were 1 is really poor and 5 really good)

Other notes

Ground floor

Staff only

Group Study Room
Group Study Room
Group Study Room
Group Study Room

Self-Service Photocopiers Points

Recent Returns

Course Collection

Catalogue PC

LIFTS

New books display

Newspapers

Knowledge Exchange

Laptop plug-in a

Library Office

Staff only

Staff only

Staff only

Collection Point

Information

Self-Service Points

Reception

Staff only

Unisex toilets

CaféLibro

Top-up kiosk

PCs

Catalogue PCs

Group Study Pods

Unisex toilets

First floor

PCs

PCs

Print release station
Laptop plug-in area

PCs

PCs

PCs

Print release station

103
Study Advice and Maths Support

Laptop plug-in area

Multimedia zone

104

107
Training Room with PCs

Print release station

108
Training Room with PCs

109
Quiet Study Room with PCs

106
Training Room

105
Training Room with PCs

LIFTS

110
Group Study Room

111
Group Study Room

Quick Access PCs

102
Training Room

ITS Help and Multimedia loans

Maths Support Centre

Assistive technology

Periodicals normal size
001 — 099
500 — 569

Periodicals folio size
574.3 — 649
660 — 699

Maps

Laptop plug-in zone

Middle folio
055 — 099, 500 — 699

Books normal size
001 — 099
500 — 549

Periodicals normal size
570 — 649
660 — 699

Staff office

Books normal size
550 — 599

LIFTS

Middle folio
001 — 055

Books normal size
600 — 649
660 — 699

Books folio size
001 — 099, 500 — 599
600 — 649, 660 — 699

Staff area

Photocopiers

Chemical abstracts

Recent returns

Information

Catalogue & PCs

Reference

Reference

Reference

Microfiche reader

Periodicals folio size
001 — 099
500 — 574.2

Bulmershe Collection Books and Periodicals
001 — 299
400 — 789

Final questions | About the experience

Rank how hard you found the experience of searching for a book in this library
(1 to 5, were 1 is really easy and 5 is really hard)

Other notes

What do you think of the amount of information provided by the catalogue?

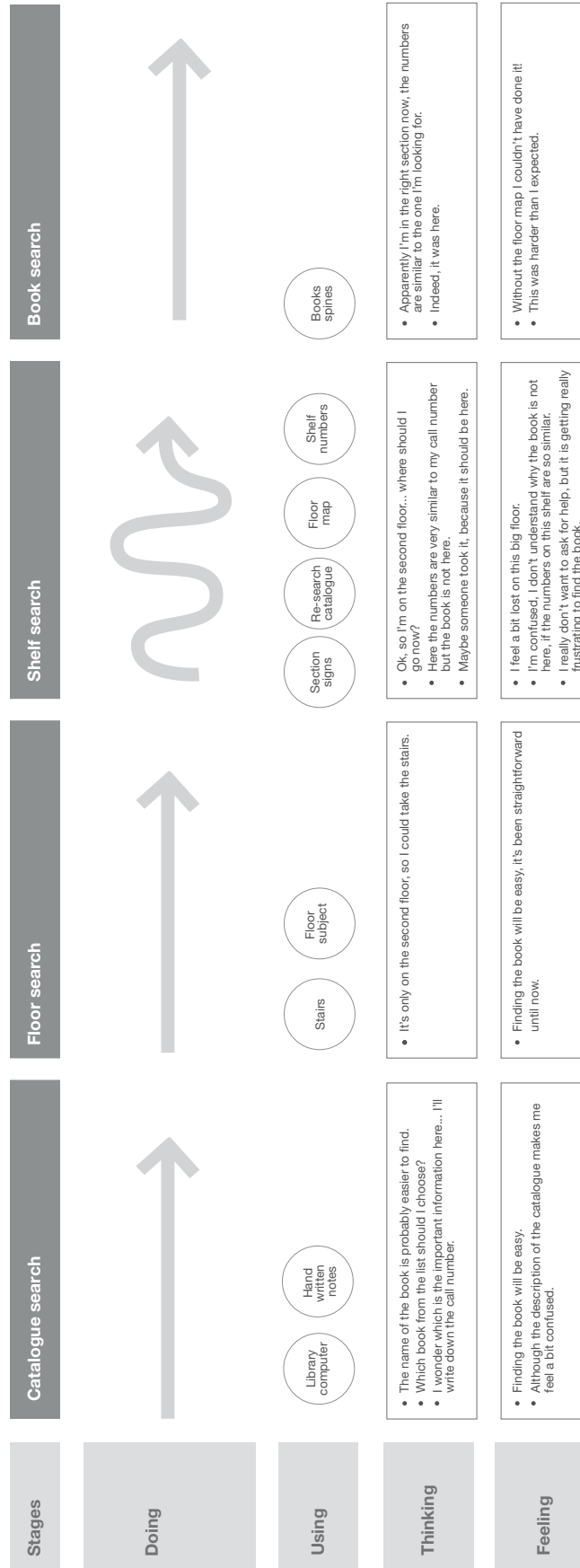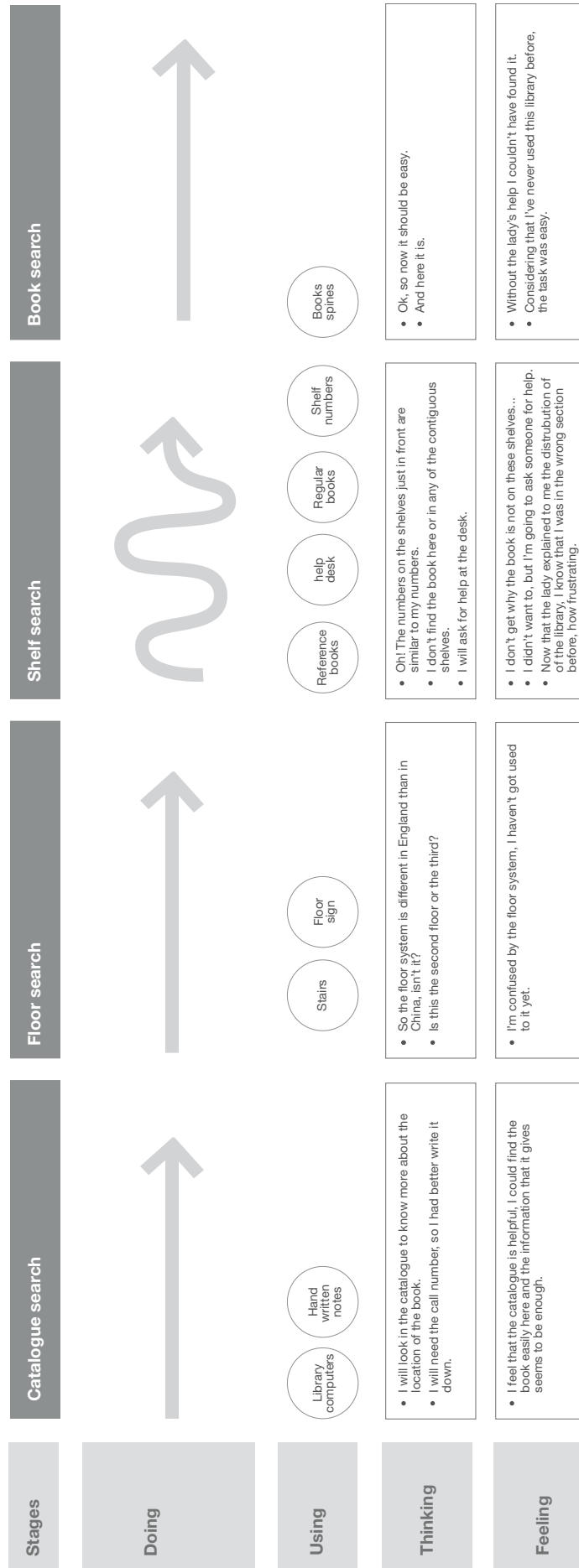Comment on the guidance provided in the building itself when you where looking for the book (maps, signs, etc).

7.4 Journey models per participant

Library Journey | Participant 1

Stages	Catalogue search	Floor search	Shelf search	Book search
Doing				
Using	Library computer / Hand written notes	Stairs / Floor subject	Section signs / Re-search catalogue / Floor map / Shelf numbers	Books spines
Thinking	• The name of the book is probably easier to find. • Which book from the list should I choose? • I wonder which is the important information here... I'll write down the call number.	• It's only on the second floor, so I could take the stairs.	• Ok, so I'm on the second floor... where should I go now? • Here the numbers are very similar to my call number but the book is not here. • Maybe someone took it, because it should be here.	• Apparently I'm in the right section now, the numbers are similar to the one I'm looking for. • Indeed, it was here.
Feeling	• Finding the book will be easy. • Although the description of the catalogue makes me feel a bit confused.	• Finding the book will be easy, it's been straightforward until now.	• I feel a bit lost on this big floor. • I'm confused, I don't understand why the book is not here, if the numbers on this shelf are so similar. • I really don't want to ask for help, but it is getting really frustrating to find the book.	• Without the floor map I couldn't have done it! • This was harder than I expected.

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Library Journey | Participant 2

Stages		Floor search	Shelf search	Book search

Catalogue search | **Floor search** | **Shelf search** | **Book search**

Doing

Using

Catalogue search:
- Library computers
- Hand written notes

Floor search:
- Stairs
- Floor sign

Shelf search:
- Reference books
- help desk
- Regular books
- Shelf numbers

Book search:
- Books spines

Thinking

Catalogue search:
- I will look in the catalogue to know more about the location of the book.
- I will need the call number, so I had better write it down.

Floor search:
- So the floor system is different in England than in China, isn't it?
- Is this the second floor or the third?

Shelf search:
- Oh! The numbers on the shelves just in front are similar to my numbers.
- I don't find the book here or in any of the contiguous shelves.
- I will ask for help at the desk.

Book search:
- Ok, so now it should be easy.
- And here it is.

Feeling

Catalogue search:
- I feel that the catalogue is helpful, I could find the book easily here and the information that it gives seems to be enough.

Floor search:
- I'm confused by the floor system, I haven't got used to it yet.

Shelf search:
- I don't get why the book is not on these shelves...
- I didn't want to, but I'm going to ask someone for help.
- Now that the lady explained to me the distrubution of of the library, I know that I was in the wrong section before, how frustrating.

Book search:
- Without the lady's help I couldn't have found it.
- Considering that I've never used this library before, the task was easy.

Library Journey | Participant 3

Stages	Catalogue search	Floor search	Shelf search	Book search
Doing	→	→	→	✕
Using	Library computers / Hand written notes	Stairs	Floor map / Folio size book / catalogue re-search / help desk	
Thinking	• The online catalogue will give me more information. • Probably the information that I will need will be the call number, the floor where it is located and type of book loan (standard), so I will take notes of these.	• I can take the stairs since I'm going to the second floor.	• The floor map just in front of the entrance is helpful. • I think I'm in the right place, but the book isn't here. • When I asked for help I was told to go to the 4th floor. • If I check again in the catalogue my information seems to be right, I don't understand!	
Feeling	• The catalogue is pretty easy to use.	• I feel confident, it has been easy until now.	• The floor map made me feel confident about what I was doing, but then I was really confused because I could not find the book. • I'm disappointed because I couldn't find the book, and that I got wrong information from the help desk.	

Library Journey | Participant 4

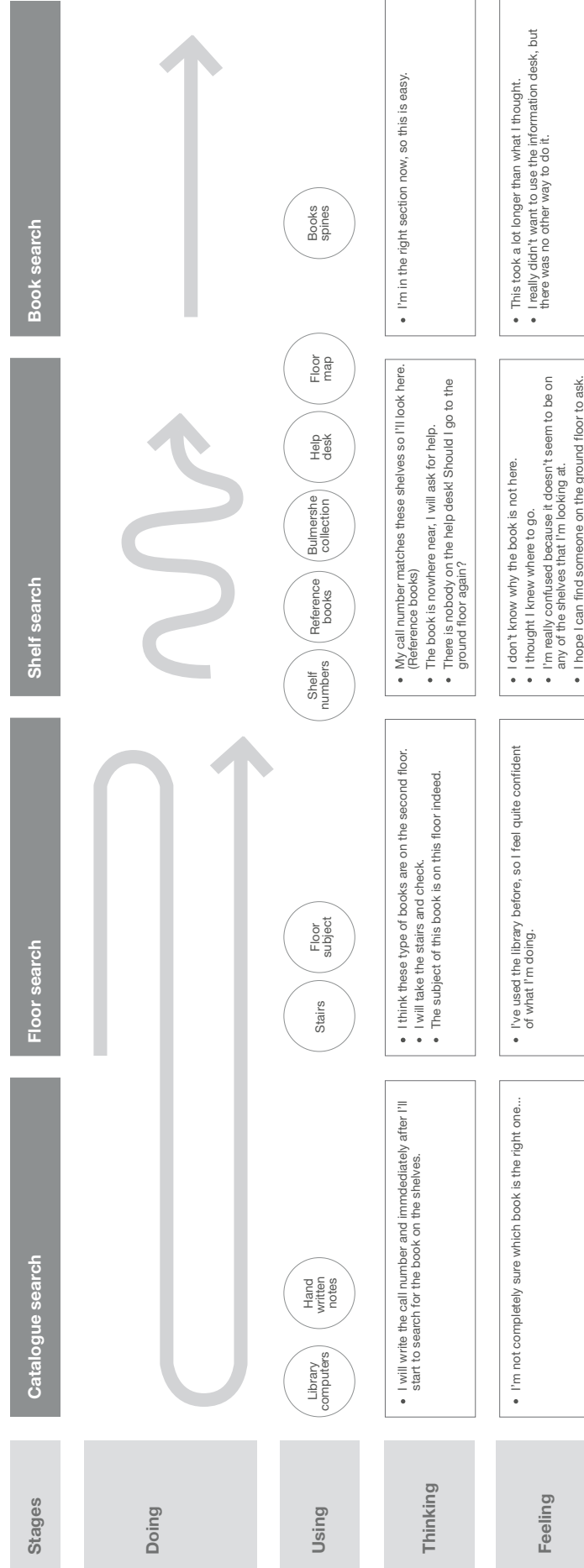| Stages	Catalogue search	Floor search	Shelf search	Book search

Doing

Using

Catalogue search: Library computers, Hand written notes

Floor search: Stairs, Floor sign

Shelf search: Shelf numbers, Bulmershe collection, Information boards, Help desk, Floor map

Book search: Books spines

Thinking

Catalogue search:
- I will search by both the name of the book and the name of the author.
- I will write the call number and the floor on paper.

Floor search:
- I will take the stairs.

Shelf search:
- I will try to find a match of the first 3 numbers of the call number, on the shelves (519)
- I think I'm in the right place, but I can't find the book.
- All the signs on the board give information for catalogue search not the floor search. I'll ask for help.

Book search:
- I will briefly check the shelf to understand where the book is supossed to be.
- Found it!

Feeling

Catalogue search:
- I'm not completely sure of the book that I'm selecting in the catalogue (volume 1 or 2).

Floor search:
- The sign on top of the door confirms that I'm on the second floor.

Shelf search:
- I feel confident, I think I will find the book here (Bulmershe collection)
- I don't know what else to do, the information board has no useful information.
- I'm not good at finding things.

Book search:
- This part I know I can do it.
- I feel I should have had a lot more information at the beginning to understand the call number better.

Library Journey | Participant 5

Stages	Catalogue search	Floor seach	Shelf seach	Book seach

Doing → → → →

Using
- Library computers
- Hand written notes
- Stairs
- Floor map
- Floor map (other)
- Periodicals normal-size
- Shelf numbers
- Books spines

Thinking

Catalogue search:
- Oh, the library catalogue changed!
- I will search by the name of the book.
- I guess the two editions will be together on the shelves so it doesn't really matter which one I choose now.
- I will write the call number and the floor.

Floor seach:
- I will take the stairs.

Shelf seach:
- I will check the floor map to see where I should go.
- I think I need to re-check on this other floor map.
- Am I in the normal size books? Oh no, I think I'm in the periodicals.

Book seach:
- Now it is only about reading the call numbers.

Feeling

Catalogue search:
- I'm a bit confused by the new catalogue, I hope I can use it easily.

Shelf seach:
- I get lost so easily that I always need to check the floor maps many times.
- It confuses me that the maps only show the sections and not the subject areas.

Book seach:
- I know I can do this part well.

Library Journey | Participant 6

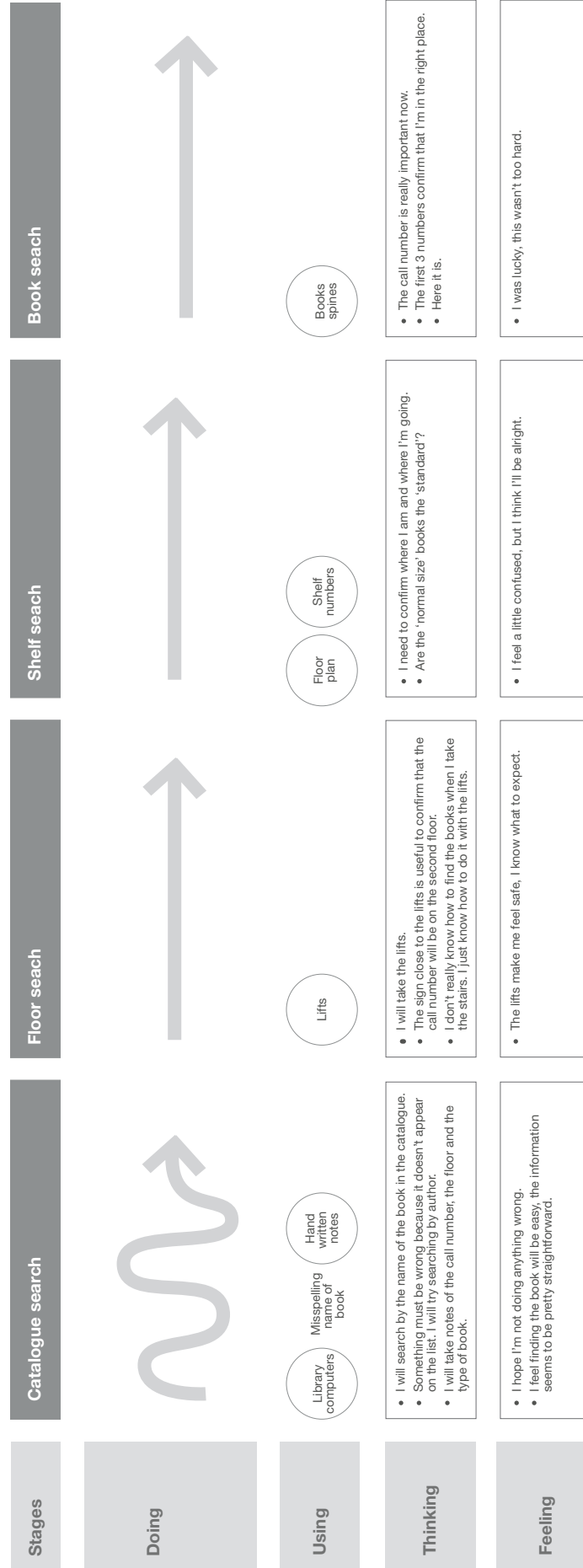| Stages	Catalogue search	Floor search	Shelf search	Book search
Doing				
Using	Library computers / Hand written notes	Lifts	Floor map / Shelf numbers	Books spines
Thinking	• I will search by the name of the book.	• I will take the lifts.	• I will check the floor map to see where are the books with this call number. • Floor maps are never in the right place!	• It's a bit hard to scan the numbers on the spines of books so high and then so low on the shelf. • I was forgetting to include the last part of the code (HAB). • The book wasn't in the exact place where it should be.
Feeling	• I'm a bit confused by the new catalogue, I hope I can use it easily.		• I know this is a normal size book, so I'm in the right section.	• This can take a while, it is such a big shelf! • I don't know why it's so hard to find because I'm sure I'm in the right place. • It wasn't totally my fault because the book was 3 spots to the left, and that confused me.

Library Journey | Participant 7

Stages	Catalogue search	Floor search	Shelf search	Book search

Doing

Using

Catalogue search: Library computers, Hand written notes

Floor search: Stairs, Floor subject

Shelf search: Shelf numbers, Reference books, Bulmershe collection, Help desk, Floor map

Book search: Books spines

Thinking

- I will write the call number and immediately after I'll start to search for the book on the shelves.

- I think these type of books are on the second floor.
- I will take the stairs and check.
- The subject of this book is on this floor indeed.

- My call number matches these shelves so I'll look here. (Reference books)
- The book is nowhere near, I will ask for help.
- There is nobody on the help desk! Should I go to the ground floor again?

- I'm in the right section now, so this is easy.

Feeling

- I'm not completely sure which book is the right one...

- I've used the library before, so I feel quite confident of what I'm doing.

- I don't know why the book is not here.
- I thought I knew where to go.
- I'm really confused because it doesn't seem to be on any of the shelves that I'm looking at.
- I hope I can find someone on the ground floor to ask.

- This took a lot longer than what I thought.
- I really didn't want to use the information desk, but there was no other way to do it.

Library Journey | Participant 8

Stages	Catalogue search	Floor search	Shelf search	Book search
Doing				
Using	Library computers, Hand written notes	Lifts	Shelf numbers	Books spines
Thinking	• So where are the computers to search? • I don't want to get the wrong book. • I will take notes of the call number and the floor.	• I will take the lifts.	• The shelf should be somewhere near here.	• I will scan the call numbers from the beginning of the shelf to find where the book should be. • There it is.
Feeling	• I feel a little confused on the ground floor. • After searching, I'm still not sure if I found the right book in the catalogue.	• I don't feel very comfortable, I'm not sure about what I'm doing.	• I think I'm doing ok, but still feel a little doubtful.	• I prefer to move slowly but accurately.

Library Journey | Participant 9

Stages	Catalogue search	Floor seach	Shelf seach	Book seach
Doing				
Using	Library computers / Misspelling name of book / Hand written notes	Lifts	Floor plan / Shelf numbers	Books spines
Thinking	• I will search by the name of the book in the catalogue. • Something must be wrong because it doesn't appear on the list. I will try searching by author. • I will take notes of the call number; the floor and the type of book.	• I will take the lifts. • The sign close to the lifts is useful to confirm that the call number will be on the second floor. • I don't really know how to find the books when I take the stairs. I just know how to do it with the lifts.	• I need to confirm where I am and where I'm going. • Are the 'normal size' books the 'standard'?	• The call number is really important now. • The first 3 numbers confirm that I'm in the right place. • Here it is.
Feeling	• I hope I'm not doing anything wrong. • I feel finding the book will be easy, the information seems to be pretty straightforward.	• The lifts make me feel safe, I know what to expect.	• I feel a little confused, but I think I'll be alright.	• I was lucky, this wasn't too hard.

Library Journey | Participant 10

Stages	Catalogue search	Floor search	Shelf search	Book search

Doing →

Using

- Catalogue search: Library computers, Hand written notes
- Floor search: Lifts?, Stairs, Floor sign
- Shelf search: Shelf numbers, Book spines, Librarian help
- Book search: Books spines

Thinking

Catalogue search:
- Why do only some of the computers here have the sign 'catalogue'?
- I think the name of the book will be easier to find.
- The call number and the floor are important to write down.

Floor search:
- Should I take the lifts or the stairs…?
- I will go by the stairs.
- The sign on top of the door on the second floor is useful.

Shelf search:
- I will start by looking at the numbers on the closer shelves (Reference books).
- The books have similar numbers here, but I can't find the book that I'm looking for.
- I'll walk around to find some help.

Feeling

Catalogue search:
- The space is a little confusing on this floor.
- I'm not sure if this book is on loan or not… I just couldn't find that information in the catalogue.

Floor search:
- I don't know what is more convenient to go to the second floor.

Shelf search:
- I'm not stressed finding the book here, because I know I can ask somebody whenever I need to.
- People are very nice, so I'd better ask a librarian.

Book search:
- The librarian helped me a lot, that's great.
- Here's the book!
- I'm glad that I asked for help.

Library Journey | Participant 11

Stages	Catalogue search	Floor search	Shelf search	Book search
Doing				
Using	Library computers, Hand written notes	Stairs	Large size sign, Shelf numbers, information desk	Librarian
Thinking	• I'll search in the catalogue to find more information about the book. • I will need to write down the call number and the floor.	• I don't know what is better, the stairs or the lifts. • I'll take the lifts, they are closer.	• Should I take this door? • The sign on those shelves says 'Large size', what does it mean? • I think I missed the size of the book when I searched in the catalogue.	• The librarian was really helpful! • He found the book for me.
Feeling	• I think this part is not too hard.	• I feel a little insecure.	• I'm confused by the sections of the library. • I don't think I'll be able to find it on my own.	• I'm glad that the librarian was so nice.

Library Journey | Participant 12

Stages	Catalogue search	Floor search	Shelf search	Book search
Doing				
Using	Library computers (all un use), Information desk, Stairs, Library computers (first floor)	Lifts?, Stairs	Floor map 1, Floor map 2, Shelf numbers	Books spines
Thinking	• I'll search in the catalogue. • Since all the computers are in use, I'll ask at the desk for more computers. • I'll use the computers on the first floor and find the catalogue on the university website.	• I want to take the lifts. • I couldn't find them, so I'll take the stairs instead. • The stairs were quite hard to find too! (1st floor).	• I need to understand where to go, so I'll use the map. • I will double check with this other floor map to confirm that I am walking in the right direction. • Yes, I'm going the right way.	• Finding the book now should be easy. • Here it is.
			• I prefer to take some time to understand the floor map than to feel lost on this floor. • I know I'm good with maps, so I'll find the way.	
Feeling	• I don't really know where to go.	• This building confuses me. • I feel lost.		• I feel confident.