

Imagining the future of library services at University of Cambridge.



The Tracker project

Investigating micro-level space issues and navigation in
Cambridge libraries

Futurelib and Modern Human – May 2017

THE FUTURELIB PROGRAMME

Futurelib is an innovation programme exploring the future role of academic libraries within the University of Cambridge. It employs ethnographic research methods and human-centred design techniques to examine the current user experience of libraries and draws on the skills of librarians from around the institution to test new service concepts. It is funded by Cambridge University Library and supported by design and innovation consultancy Modern Human.

ACKNOWLEDGEMENTS

Futurelib Programme

David Marshall, Andy Priestner

Modern Human

Paul-Jervis Heath, Jenny Willatt, Pete Hotchkin, Chloe Heath and the rest of the team

Staff in participating libraries and who otherwise facilitated our work

Marjolein Allen (Reader Services, UL), Clair Castle (Chemistry Library), Federica Della Grotta (MML Library), Kasia Drabek (MML Library), H  l  ne Fernandes (MML Library), Rose Giles (Reader Services, UL), Nevenka Huntic (Rayleigh (Physics) Library), Patricia Killiard (Academic Services, UL), Kate O'Neill (MML Library), Steffi Palek (MML Library), Tuan Pham (Digital Initiatives and Strategy, UL), Mark Purcell, (Research Collections, UL) Libby Tilley (Arts and Humanities Schools Librarian), Mike Todd-Jones (Chemistry Library), Niamh Tumelty (Science, Technology, Engineering and Medicine Schools Librarian), Chris Young (Acting University Librarian)

Research and support

Sonya Adams, Christine Alexander, Liam Austin, Rosie Austin, Piotr Czosnyka, Jack Dixon, Martin French, Julian Fuller, Mary Kattuman, Megan Kelly, Kirsten Lamb, Natalie Kent, Jenni Lecky-Thompson, Heather Morton, Pri Pais, Katherine Sendall, Bethany Sherwood, Elaine Skidmore, Helen Snelling, Kotryna Stepanova, Tom Sykes, Celia Vartholomaïou, Meg Westbury, Louise Williams

Table of Contents

1. Introduction	1
2. The Tracker Project	2
3. Participating Libraries	3
4. Methodology	5
4.1 Eyetracking, shadowing and interviews	5
4.2 Observation	5
4.3 Prototyping design interventions	5
4.4 Testing and refining prototypes	5
5. Usability Testing	7
6. Analysis of Baseline Research	8
7. Key Findings	9
7.1 People arrive at libraries with expectations of how they will work	9
7.2 When unable to find resources people blame themselves	9
7.3 Library-specific terminology and signage causes confusion	10
7.4 Classmarks are confusing and are seen as a code to crack	11
7.5 People use micro-level signage for macro-level navigation	13
7.6 Scientists are more like to browse by topic	13
7.7 Inexperienced users are more cautious of library systems	14
7.8 Catalogues and signage are used more in larger libraries	15
7.9 Multiple classmark runs and separate collections cause confusion	16

7.10	Usability issues with iDiscover affect the task of finding resources	17
7.11	There is a hierarchy present in the navigation process	18
7.12	Context is extremely important	19
8.	Design Suggestions	20
9.	Signage Designs	22
10.	Signage Testing Results	29
10.	Assistance at the Point of Need	32
11.	Conclusion	36

1. INTRODUCTION

The Futurelib Programme has been involved in the user-centred research and design of library services at the University of Cambridge since August 2014. Beginning in November 2015, alongside other work, the Programme has conducted targeted user experience research in order to provide an evidence base for evaluating and redesigning physical library spaces at the University. This work began with the Protolib project (<http://bit.ly/protolibreport>), which was conducted between November 2015 and April 2016. The focus of the project was to explore what types of physical library spaces might be necessary to support current user needs and behaviours at Cambridge. This involved prototyping spaces based on the findings of co-design workshops conducted with library users, then conducting further research with the prototypes in place. Key methods included immersive observations of the prototype spaces and talking to people using them about which activities the environments best supported and why. Insights into library user behaviour gained through this research led to concrete suggestions for the design of individual library spaces and the relationships between these. The Protolib project should be seen as both a precursor to, and an essential part of the research, findings and suggestions for design which are outlined here and we would strongly advise the reader to revisit the Protolib report before reading this document.

After the completion of the Protolib project there were still some important unanswered questions: *How might we best design a suitable, user-centred network of the spaces we had designed at a macro level; across University sites? How might we aid users in navigating these spaces?* These issues were explored in the Protolib II and Tracker projects respectively, in order to arrive at a holistic concept for the design of library spaces. Protolib had given us the insights necessary to effectively design individual spaces, we now needed to zoom both out and in to fully understand what this meant in terms of site-level space design and implementation.

These micro- and macro-level issues were investigated through different research methods. The micro-level issues of how users navigate physical library spaces were explored through shadowing, observation and interviews, and through employing precise digital eyetracking glasses in order to see exactly where people looked when in need of assistance. The macro-level issues were primarily addressed by conducting a digital diary study with students from across different University disciplines and colleges and at different levels of study, followed by in-depth interviews with diary study participants.

The macro-level research and design will be detailed in a separate report. A full set of the design patterns arrived at over the course of the first Protolib project and our more recent research will also be published in a stand-alone document.

2. THE TRACKER PROJECT

Looking primarily at micro-level space design and navigation, the Tracker project employed the use of a number of research methods to arrive at a set of designs and recommendations to aid the processes of navigation and orientation in libraries. Initially an open approach was taken, in order to identify which areas of navigation people using the libraries under study were struggling with and which were in need of improvement. A strong emergent theme of the research was that the location of print material inside Cambridge libraries was by far the most important task for their users; this indicated the area of the user experience which was most in need of improvement and further research.



[Above: a student tasked to find a book during our eyetracking and shadowing research]

This open, user-centred approach to research is a defining factor of the work conducted by the Futurelib Programme. The users of our services dictate the areas which we scrutinise and work to improve. In this case, rather than assuming that core operations such as locating and using print material were not important and/or not in need of improvement, we observed and listened to our users in order to find out what was truly important to them and let that inform the direction of our research.

3. PARTICIPATING LIBRARIES

Main University Library (UL)

- The main Cambridge University Library building
- Supporting research at the University, primarily in the Arts, Humanities and Social Sciences
- 45,000 registered borrowers
- 13,250 circulating items issued per month
- Large, multi-storey building with over 2,000,000 books and journal volumes on open shelves



Chemistry Department Library

- Science department library with occasional collection use
- Primarily used as a between-lecture workspace and valued as a workspace by students and staff within the Department
- 1000 registered borrowers
- 100 circulating items issued per month
- Open plan library with print collections at the sides and workspaces in the centre



Modern and Medieval Languages (MML) Faculty Library

- Humanities library with very frequent collection use
- Used as a between-lecture workspace, a longer-term workspace and as a source of resources
- 1363 registered borrowers
- 4,300 circulating items issued per month
- 3-storey library with large open shelf collection



Rayleigh (Physics Department) Library

- Science library with moderate collection use
- Used as a between-lecture workspace, longer term workspace and as a source of resources by students and researchers in the Physics Department
- 686 registered borrowers
- 220 circulating items issued per month
- Small library with collections near the entrance and different types of workspaces



4. METHODOLOGY

4.1 Eyetracking, shadowing and interviews

- Library users were asked to complete tasks within libraries while wearing digital eyetracking glasses, which allowed us to see precisely where they looked for guidance and assistance.
- Each participant was shadowed closely and observed as they completed their task.
- Participants were interviewed after each task. This allowed us to gain a deeper understanding of the processes they went through and the difficulties and barriers they encountered along the way.
- Eyetracking data was collected from 31 participants across the 4 libraries under study.
- The eyetracking provided us with visual data (heatmaps and gazetrails) that provided evidence which acted as the basis for our prototype design interventions.

4.2 Observation

- Observations were conducted in entrance areas, 'landing zones' and collection-housing spaces within libraries, in order to allow us to further understand people's use of and behaviour in these spaces.

4.3 Prototyping design interventions

- A set of spatial navigation tools were prototyped for each participating library based on the findings of our baseline research; specifically the approach users took to navigating the space and completing tasks and the areas of difficulty they experienced.
- Prototypes included maps, signs, classmark slips and other navigational tools designed to assist people conducting tasks in the libraries. These were low-fidelity (printed in-house on standard A4 paper) and the prototypes for all the libraries under study were completed over a 2 week period.

4.4 Testing and refining prototypes

- After our interventions we conducted the eyetracking, shadowing and interview sessions again with the prototypes in place.
- We refined and iterated upon each prototype based on its effectiveness in assisting participants in completing their tasks.
- The prototypes went through multiple rounds of testing until we arrived at the optimal solution.



[Above and below: 2 examples of prototype signage being refined and iterated during our research. The sign above was unsuccessful in redirecting people before the addition of the small map and the map pictured below was not used until it was labelled with the word 'map']



5. USABILITY TESTING

Classic usability testing

Usability testing has long been a key component of UX (User eXperience) in software development. Traditionally, participants are given a task to complete using a digital platform and are observed by a researcher while navigating the platform in order to identify points of uncertainty, confusion or failure during their attempt. The participant is then debriefed after completing or attempting to complete the task, to further explore areas of difficulty and to identify opportunities for intervention and improvement. With the advent of digital eyetracking technology it has been possible to find out exactly where people's eyes fall in these situations, which has been invaluable in designing website 'UIs' (User Interfaces); where to place 'help' buttons, where to place advertising banners so that they are most effective, and so on. More information about usability testing can be found here:

<https://www.usability.gov/how-to-and-tools/methods/usability-testing.html>



[Image credit: Luca Mascaro via Flickr CC - <https://flic.kr/p/85aPPV>]

Usability testing in physical environments

Working with Modern Human, who have extensive experience of UX in design, we applied the principles of usability testing (including eyetracking) to the physical library spaces under study. We set participants tasks to complete in the space. These included locating a light switch, printer or photocopier, specific book or journal. Due to the difficulty participants had locating printed resources this became the primary focus of our research. We closely shadowed and observed each participant, using eyetracking to find out exactly where they looked for guidance and assistance with their task. This observation, alongside interviews with participants after their tasks, helped us to identify points of uncertainty and confusion, and to design interventions and improvements to the physical environment.

6. ANALYSIS OF BASELINE RESEARCH

In order to arrive at user-centred design interventions it was necessary to go through a stage of analysing the data gathered during the pre-intervention ‘baseline’ period of research. In the libraries under study there arose very different approaches to similar tasks and also different areas of difficulty and causes of confusion. Some issues were present in all the libraries we studied, but it is important to note how the differences in both the individual library spaces and the mental models of people trying to navigate them affected approaches to our tasks. Some examples of those differences are outlined below and all directly informed our design interventions.

Main University Library

- Participants did not understand that areas of the library were split into sections, with the separation of books and journals (‘periodicals’ in the Library’s terminology).
- Participants were confused by the classmark system, which was counter-intuitive as reading from left to right was not helpful in finding resources.

MML Library

- Participants used micro-level navigational tools such as spine labels to complete macro-level navigational tasks such as locating the right area of the Library.
- Participants often approached the physical Library and their task without any definite strategy.

Chemistry Library

- Participants approached this relatively small, open plan library with a false sense of confidence and a ‘book shop’ approach, i.e. trying to browse the shelves without using the catalogue and without having the classmark for the book or journal they had been tasked to find.
- Participants were confused by classmark runs which stopped and then continued in another section of the Library.

Rayleigh Library

- Although not all participants completed their tasks immediately, the success rate was so high at this library that we decided to focus on designing interventions and improvements to test in the other libraries under study. This may have been due to a number of factors, including the fact that people using the library seemed quite experienced in finding books and journals there, that Physics as a discipline relies more on the use of printed monographs than other sciences and that the physical space and collections could be navigated reasonably intuitively.

-

7. KEY FINDINGS

7.1 People arrive at libraries with expectations of how they expect them to work

When using a library for the first time, people will often start their search for a book or journal by using their previous experience of libraries and knowledge of their area of research or study, coupled with their own individual tactics and approach. This, along with cues from the physical environment, forms an expectation of how easy or difficult it will be to find the item they need.

People with limited experience of searching for books or journals in smaller academic libraries often attempt to approach the task like they would in a book shop or small public library; browsing the shelves by topic and author to find the resource they are looking for. Others base their search on experiences gained from using a different library with a completely different classification scheme and layout. In cases where the layout of a physical library space and its collections is not intuitive and does not match the existing mental models of its users, it is likely to cause confusion and lead to feelings of failure and inadequacy.

7.2 When unable to find resources people blame themselves

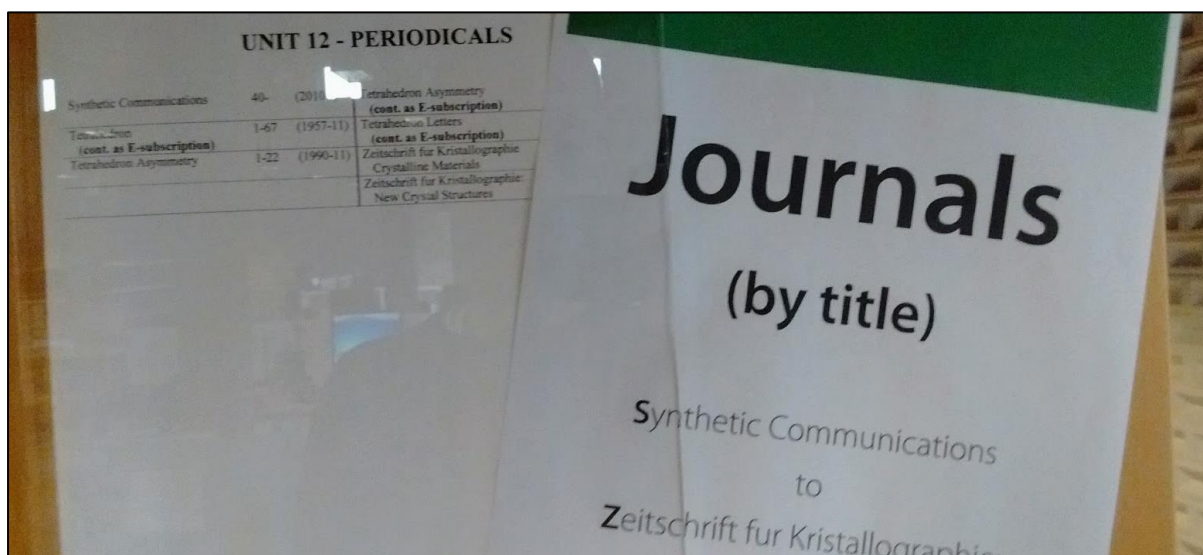
In cases where a library system does not match the mental model of a user, that person is likely to blame themselves. These can often lead to people losing confidence in their ability to navigate and 'succeed at' libraries. During our research, a large number of people who failed to find a book made self-deprecating comments about how bad they were 'at libraries' or at finding the resources they needed. The failure to find a book or journal during their task reinforced their feelings of self-doubt and inadequacy. As people tend to avoid experiences which they know will make them feel incompetent, there is a concern that those who struggle to navigate libraries on their first visit will be reluctant to return. Participants during our research commented:

- "It has to be here somewhere. Either it's been taken out of the Library, someone has it on their desk or I'm a complete moron." (4th year NatSci student in the Chemistry Library)
- "I'm not a very logical person." (2nd year MML student in the MML Library)
- "I'm no good at libraries." (3rd year NatSci student in the Chemistry Library)

7.3 Library-specific terminology and signage causes confusion

During our research we found that library-specific terminology, signage and instruction did not assist people in navigating libraries and collections. In fact, it often confused people and the large majority of participants ignored terminology that was unfamiliar to them. When looking at catalogue records before trying to find a physical resource, participants didn't realise that terms such as 'Reference only', 'Student Library' and 'Blue Book Collection' were included to help them find the item they needed. Library terminology such as 'periodical', 'series' and 'bay' also confused a large number of users.

- "But isn't that where I am right now?" (2nd year NatSci student in the Rayleigh Library, assuming that 'Student Library' referred to the Library as a whole)
- "What does this even mean?" (3rd year NatSci student looking at a record for a book in the 'Blue Books Collection at the Chemistry Library)



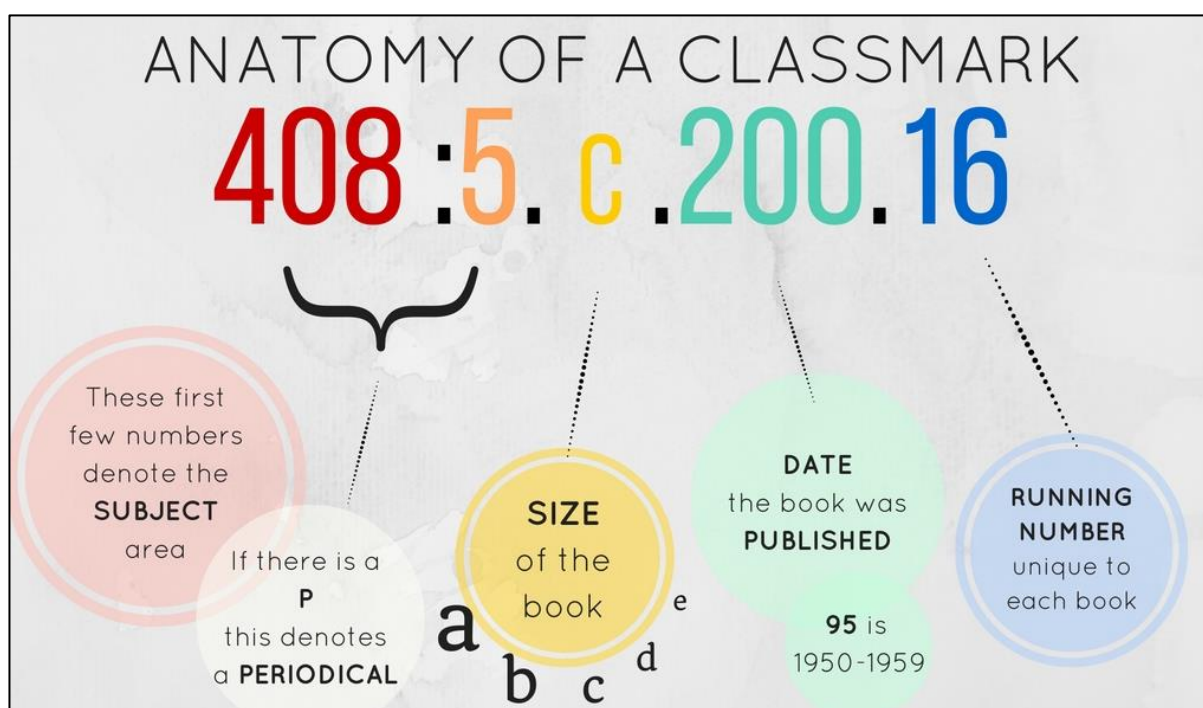
[Above: Replacing a sign with library-specific terminology with a prototype designed to be intuitive to users]

Having to understand library-specific terms adds another layer of complexity to a task which people already find confusing and difficult to complete. Terminology in place to assist library users should be intuitive, in order to minimise the effort needed to translate their digital experience to the physical environment and find a resource. For example most library users now refer to 'journals', rather than 'periodicals'; this should be reflected in the library catalogue, library signage and any other related instruction and help. Terms such as 'Student Library' and 'Blue Book Collection' could be replaced with information either providing the location of the resource in the physical library, or if this is not possible more comprehensible designators could be used, such as 'Undergraduate books'.

7.4 Classmarks are confusing and are seen as a code to crack

During our research participants struggled to decipher classmarks, particularly those which were long and unintuitive. For a library user, classmarks can seem to be composed of a random selection of letters and numbers with no discernible meaning. Participants in our research tried to be logical and wanted to understand how the system worked. They often thought they had formed their own decoding system, as they did not understand the way in which the classification system worked. Library users who had learnt what different elements of classmarks meant and how they needed to be used to find resources had often done so over a long period of time.

- “This code means jack all to me!” (3rd year NatSci student)
- “I’ve developed my own system for finding a book. First you check if it’s a book or periodical, then you look at the letter in the middle, then you look at the classmark.” (3rd year History student talking about the counter-intuitive classmark system at the main University Library, in which reading the elements from left to right does not assist with finding books)
- “It took me ages to realise that there’s a list within a list and that the letter is important.” (3rd year English student shadowed at the main University Library)
- “I made sure to write the code down at home because I knew it would be too stressful.” (2nd year MML student at the main University Library)



[Above: an infographic developed by Reader Services staff at the main University Library, explaining the complexities of the classmark system and what each element means]

When library users do not understand a classmark system they don't understand why they succeed or fail in finding physical resources. They often arrive at their own assumptions and superstitions to explain the observed effect. At the main University Library one of our participants who was looking for a book with a friend said "It will be in the overflow, let's look in the overflow!" when she couldn't find the book, which had no relevance to the search she was undertaking.

People who don't understand the classmark system of a particular library often approach the task of finding a book with a 'best match' attitude. During our research participants walked around libraries with the classmark of the item they needed written down on paper or visible on their mobile phone screen, their eyes moving between this and the classmarks on the shelves, trying to find the closest possible match. At the main University Library this approach led a lot of people who were looking for books into the periodicals section, as they disregarded the 'P' at the beginning of the classmarks on the shelves and spine labels and instead looked for the numbers that corresponded with those of the classmark they had in their hands.

The prototype slip below was designed to help users of the main University Library use the classmark system to successfully navigate its collections. The slip went through various iterations based on insights gained during shadowing people using them to find resources in the Library.

Quickly find your books

Example

AREA	FLOOR	SUBJECT	SIZE	DATE CODE	RUNNING NUMBER								
N	W	2	P	408	:500	.	0	2	0	0	1	6	0

Write your classmarks in the boxes below

N	W	1	P	0	0	0	:	0	0	0	.	S	0	0	0	.	0	0	0
N	W	1	P	0	0	0	:	0	0	0	.	S	0	0	0	.	0	0	0
N	W	1	P	0	0	0	:	0	0	0	.	S	0	0	0	.	0	0	0
N	W	1	P	0	0	0	:	0	0	0	.	S	0	0	0	.	0	0	0
N	W	1	P	0	0	0	:	0	0	0	.	S	0	0	0	.	0	0	0

To find your book, start by finding the correct **area and floor** (1) in the library. Check whether it's a **periodical** or journal (2), then find the shelves for the right **size** (3). Next, look for **subject** (4). Finally locate the **date code & running number** (5).

7.5 People use micro-level signage for macro-level navigation

During our research we repeatedly observed participants attempting to use spine labels and shelf level signage to find the right section of a library; for example by looking for classmarks beginning with E on spine labels to find the Spanish section of the MML Library. This was common across all of the libraries under study and was due to a lack of visual aids zoning the building and allowing people to scan the space at a higher level in order to successfully navigate it. This method of navigating collections adds a lot of time and mental effort to the process, as people have to focus on small shelf-level details for the duration of their search.



[Above: a screenshot of eyetracking footage during our baseline research, showing a participant using spine labels to navigate the MML Library]

7.6 Scientists are more likely to browse by topic

In science libraries, users often expect to be able to use knowledge of their field to find resources. They often start looking for specific known items by browsing the shelves by topic. During our research many users of the two science libraries under study approached their task as if they were in a book shop. They looked for books on the same topic as the one they were tasked to find and then attempted to narrow their search using title and author information.

- “It’s a book about polymers so it should be here in this section with the heterocyclic chemistry books.” (PhD student shadowed at the Chemistry Library)
- “If you know the field of Physics and the author then you can easily find the book using only the signs. For example, Statistical Mechanics is number 31, so you find 31 on the sign here and then

the first letter of the author's name which is W, so you find 31 W on the shelf and then the book will be here somewhere." (Postdoc researcher shadowed at the Rayleigh Library)

Scientists shadowed during our study were observed browsing physical library collections as part of the process of solving a research problem. This is evidence that open shelved, browsable collections are still important in terms of supporting academic work. Physical library collections, particularly in subject libraries, should therefore continue to support the serendipitous discovery of resources, as this can assist users in finding information related to their area of research.

7.7 Inexperienced users are more cautious of library systems

Library users studying and working in disciplines which are less reliant on print material are less familiar with library-specific objects and systems. They are more likely to be using libraries as a workspace than as a place to find resources. As previously mentioned, many scientists during our research approached the task of finding a book or journal as they would in a book shop. Surprisingly, many participants did not even use the library catalogue as part of their search process and did not seem to think that it would help them with the task they had been given.

- "Oh no, I wouldn't use one of those. I don't know how it works." (2nd year NatSci student talking about a catalogue PC in one of the participating libraries)

When the book shop approach fails, some library users would rather leave the library without the resource they need than attempt to use the catalogue to assist them, since they are so unfamiliar with the processes involved. This could be partly due to a fear of failure and resulting feelings of incompetence. A Physics student discussing his use of the Betty and Gordon Moore Library told us that he asks library staff at the front desk to point him in the direction of the topic he is looking for in order to save time. He commented; "It's better to outsource to someone who knows what they're doing."

This lack of familiarity with academic libraries leads to the inexperience those working in the sciences have with classmarks. When they were encouraged to use the catalogue, scientists observed during our research were often baffled by the classmarks in the records and didn't know how to apply them to their search. One student almost wrote down the ISBN for a book they were looking for because the catalogue record referred to it as the 'Identifier'.

7.8 Catalogues and signage are used more in larger libraries

In larger libraries with multiple floors people are a lot less likely to use the 'book shop' browsing approach to finding resources. They are quick to acknowledge the level of difficulty that multiple floors will add to their search and turn to visual clues and aids for help. At the MML Library and the main University Library participants almost always started by using the catalogue. Some people we spoke to at the main University Library had arrived with the classmarks for the resources they needed already written down, as they had anticipated that the search process would be complicated and difficult.

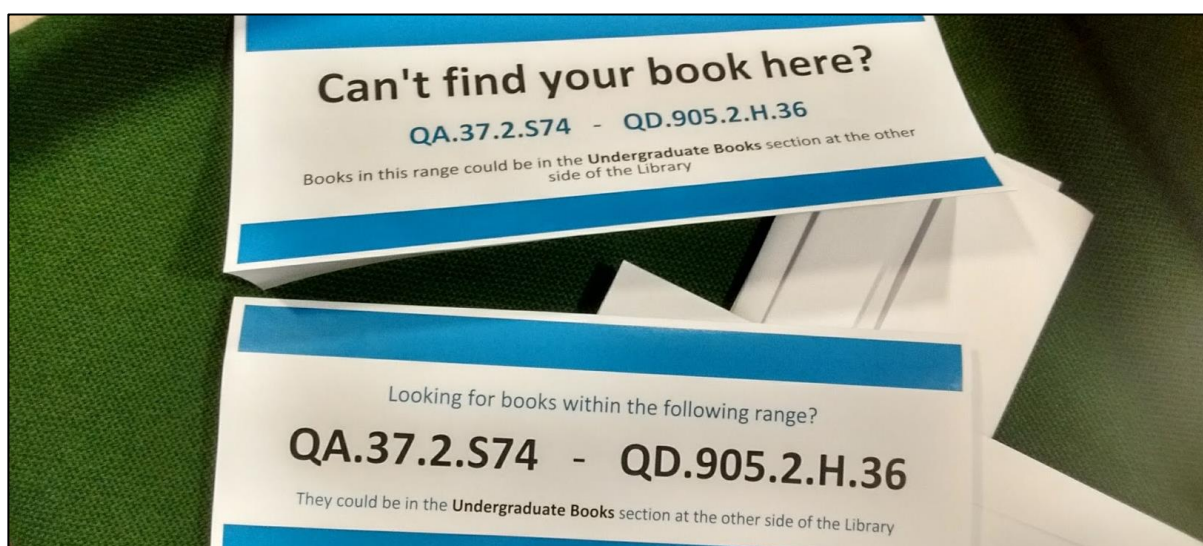


[Above: a student using a floor plan in the MML Library to assist him in finding a book]

During our eyetracking at the larger libraries under study, once participants had found the classmark the next step was often to look for visual aids in the environment such as maps, floor guides and other signage. This was in direct contrast to the behaviour we witnessed in smaller libraries, where maps and signage were rarely noticed, despite being placed in prominent locations in the space. This could in part be due to the fact that small libraries seem to inspire a sense of confidence in people which is often misplaced. The physical environment appears to be simple enough to browse easily, whereas in fact there are thousands of books on the shelves and trying to find one without using classmarks, signage or other tools and cues would be an incredibly laborious process.

7.9 Multiple classmark runs and separate collections cause confusion

Careful consideration should be given to whether curating separate collections of physical resources within a library space helps or hinders the users of that library. Librarians often curate collections for specific user groups; in academic libraries often those studying a particular course or at a certain level of study. If library users are aware that this collection exists and has been curated for them it can be a valuable resource. If, however, users are not aware that separate collections exist in the same library using the same classification system it can prohibit them from finding the resources they need. An example would be an undergraduate student who has not attended a library induction, who may not be aware that a collection of books has been curated specifically for them.



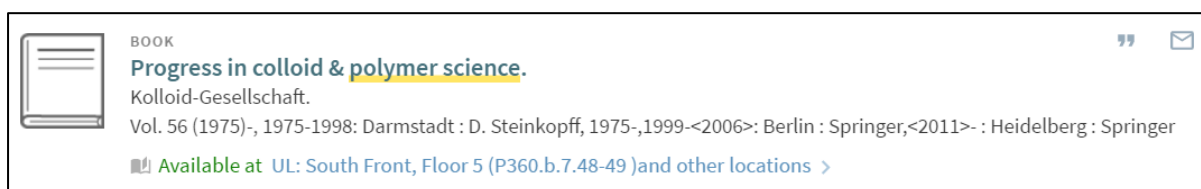
[Above: Two iterations of a prototype sign attempting to redirect people to another section of the Chemistry library]

If somebody is looking for a book or journal for the first time in a library where similar classmarks are split across different collections in different areas of the space, they will need to learn this before being able to search effectively in the library. When people do successfully find a resource in a library of this nature they believe they have perfected the search process for that library. If they reapply the same logic and approach to their next search it will only be successful if the resource is housed in the same collection as the one they had searched for previously. If it is not in that section they may assume that the book is being used by someone else and will be very likely to give up on the search. From their point of view, there is no logical reason why the book or journal they need would be anywhere else. It is difficult to intervene with signage in such cases, as the person conducting the search has given up and is no longer looking for visual cues or aids.

7.10 Usability issues with iDiscover affect the task of finding resources

iDiscover is the name of the online library catalogue currently in use at the University of Cambridge, a user interface for the Ex Libris 'Primo Discovery and Delivery' service. During our research we found that a number of issues with iDiscover resulted in people struggling to find resources in the libraries under study.

iDiscover is an important tool for people attempting to navigate Cambridge libraries and is often the first port of call in the process of finding resources. Usability issues with iDiscover have an effect on how easy it is to locate resources and on the length of time it takes someone to do so. A key issue is that iDiscover does not prioritise results in terms of showing the holdings for the library people are physically in first. If a book is held at the main University Library and in other Cambridge libraries the initial search results screen shows listings similar to this:



The item listed above is actually also available at the Rayleigh Library, but if you search from one of the catalogue terminals in that library you will see the same listing as you would if searching from the main University Library, or anywhere else.

There is an expectation amongst library users that search results in iDiscover will be context and location sensitive. During our research one student tried to find a book in the Chemistry Library using the classmark that first appeared on iDiscover, which was actually for the copy of the same book at the main University Library. A student in the Rayleigh Library only noticed results for the main University Library and the Betty and Gordon Moore Library and assumed the item he needed was not held at the Rayleigh Library. He was about to travel to the Betty and Gordon Moore Library to look for the book, before we told him there was a copy in the library he was already in.

People assume that iDiscover will have similar functionality to that of search engines such as Google. This leads them to apply the same approach to iDiscover as they would to Google. One student searched for a book title which only returned locations that were not the Chemistry Library. He adjusted his search by adding "Chemistry Library" which returned no results.

iDiscover is unforgiving of typing errors. We observed a number of people making mistakes when entering the title of the resource they needed and not notice that they had done so. There is again an expectation that iDiscover will have the functionality that search engines do and use fuzzy logic to suggest near matches, rather than to only look for exact matches and return no results. On many occasions during our research, people were convinced at this stage that the item they needed did not exist and without our intervention would have given up on their search.

Terminology used in iDiscover is sometime inconsistent with terminology used in physical library spaces; on signs, maps and other navigational aids. An example during our research was a Rayleigh Library book that was labelled on the catalogue as 'Student Library', but in the physical library space was labelled as being in the 'Undergraduate student library'.

Information about which collection an item is in is often disregarded by library users. People don't think that terms such as 'Blue Book Collection' or 'Reference only' in catalogue records will be useful in the task of locating resources. During our research they didn't seem to notice them on the screen, or write them down in order to help them find the book. This is possibly due to the way records are displayed, and having this information shown separately in a 'Information you should use to find this book' section would increase the usability of the platform.

7.11 There is a hierarchy present in the navigation process

After arriving at a library, people approach the task of searching for a book or journal in stages. In most cases the first step is to check the library catalogue. After this, people need to find the correct section of the library, then the correct book case, then the correct shelf, and finally the item they are looking for. During these steps in the process different information is needed. When searching at a higher level in the hierarchy, i.e. when finding the right zone in a library, in most cases it is only necessary to use some of the information which when considered together gives the exact location of the item needed. For example, a classmark for a German language book in the MML Library is 'G7.HORV.202', with the 'G' designating that it is in the German section, the '7' designating the sub-section within this, the 'HORV' referring to the author of the title and '202' being the running number. At the stage of the search process in which someone is looking for the right area of the Library the 'G' is the only aspect of the classmark they need to use. They will then need to use different elements of the classmark as they work through the stages of the search hierarchy.



[Above: Prototype signage introducing information at different points in the search process]

This hierarchy present in the process of searching for resources was a key factor in the design of our prototype interventions. In order to minimise the mental load involved in a search it was important that we introduced the different elements of classmarks gradually to users, adding more information at the point they needed it, rather than overloading them with unnecessary information at the start of the process. The photos above show prototype signage in the MML Library. A similar approach was used in the other libraries under study, for example in the main University Library, where the lower case letter in the middle of a classmark is required at a higher stage in the search process than the string of numbers that come before and after it.

7.12 Context is extremely important

Different library spaces and different ways of classifying and ordering books and journals naturally encourage different approaches to the processes of navigation and finding resources. Alongside this, users with different levels of experience using academic libraries also have their own individual approaches to these tasks. During our research we uncovered various user tactics in the libraries under study. The importance of this cannot be underestimated; signage and other navigational tools and aids should always be based on the dominant behaviours and approaches of their intended users.

8. DESIGN SUGGESTIONS

The designs in this document have been realised through research conducted in specific Cambridge libraries, so are necessarily centred around the characteristics and nuances of those libraries and their users. We have, however, also uncovered key insights which can be used to inform the design of signage and other navigational tools in many other libraries.

- Wherever possible, classmarks should be intuitive and easy to learn. We understand that in established libraries this may not be possible, but when the opportunity to re-classify collections or choose a classification scheme arises the scheme should be user-centred and use elements that intuitively reflect what they represent and how they should be used to find resources. Local, common sense classifications schemes are more intuitive for users than established schemes such as Dewey and Library of Congress.
- Consistent terminology should be used at all stages of the navigational process. The same words should be used on the library catalogue, maps, signs, labels and any other instructional objects and tools. This will help ease the transition from the digital to the physical environment and reassure users throughout the process of searching for a resource.
- Library-specific terminology and any terminology not used in the searching process should not be present in the digital or physical environment. For example, case labels showing 'Bay 12' or 'Case 4' should not be used if these elements are not part of the system in place to help library users locate resources.
- User-friendly, intuitive, common sense terminology should be used in digital and physical navigational tools and instruction wherever possible. Examples include using 'journal' rather than 'periodical', 'book case' rather than 'bay' or 'stack', and so on.
- Information should be provided in stages and only when it is needed. This includes introducing elements of classmarks only when necessary and placing emphasis on the part of the classmark which is most important at that stage in the process of finding a resource.
- Signage which is only in place to assist library staff should be removed. Having case numbers and in-depth explanations of classification schemes visible to users when they are not assisting with their search can be confusing and detract from the usability of the library space.
- Colour coding should be used to zone areas and to assist with navigation in library spaces. This should remain consistent and where possible be present in both digital and physical instruction and cues.

- Clear topic signage should be included alongside colour coding and classification signage. Our research showed that different people approach the process of navigation and searching for physical resources in different ways. Where possible these approaches should be catered for by signs which include the different aspects of information people use during the search process.
- The beginning and end of distinct parts of collections should be signposted. It is important that people know when they are moving from one section of the physical library space and its collections to another; at points when this occurs it should be clearly visible.
- Maps should be provided at various points in the physical library. This gives users the ability to reassure themselves that they are in the right area and to easily navigate to new areas.
- The orientation of maps should reflect the physical layout of the building. During our research participants were confused by library floorplans where the plan for the first floor of the library was above the plan for the second floor. Second floor plans should always be placed above first floor plans, to echo the physical layout of the library they represent.
- 'You are here' signs are important features of maps used for navigation and dramatically reduce the cognitive effort needed to use and interpret these maps. These should always be present on maps and floor plans used as navigational tools in libraries.
- Physical library and collection layouts should be logical, intuitive and learnable. Collections that are split across bays or that continue where users do not expect can cause confusion and be prohibitive to the discovery of resources. Where necessary, physical collections should be moved so that navigating them is seamless and intuitive.
- The physical environment should instruct users so that in-person instruction is not essential. In ideal circumstances time should be spent with each user of a physical library space to explain how to best interpret and navigate it. As this is not always possible, cues in the physical space should be designed and implemented so that the collections can be navigated by users without in-person assistance from library staff.
- Journals should be located away from main book collections. As printed journal volumes are used increasingly less frequently their presence should not interfere with the main printed stock in a library, as this can detract from the ability to easily navigate the main collection(s).
- All signage and navigational tools should be prototyped and tested in context. The principles listed above should be used to inform design related to signage and navigation, however these tools must be designed in a user-centred way. As different users will approach library spaces in different ways it is important to test navigational tools in context before full implementation.

9. SIGNAGE DESIGNS

Examples of the designs for micro- and macro-level signage arrived at from our research can be found in this section, along with the justification for each of their separate elements. For the purposes of this document the designs have been outlined in grey, however these outlines would not be present in the signs themselves, as can be seen in the photographs in this section.

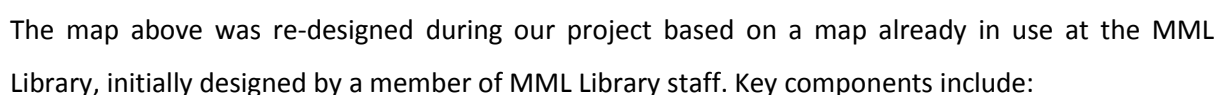
Macro-level signage

Macro-level signage directs users to the right floor, room, zone or general subject area in a library space. During our study, the addition of macro-level signage significantly improved the process of finding books by making it easier, quicker and less mentally demanding. People were able to quickly identify the subject area or zone of the library they were looking for, beginning by using protruding signage on the end of the book cases. The repeating blocks of colour and simple, bold elements of texts on these signs enabled people to identify distinct zones through high-level scanning of the library space. After the implementation of these signs library users began to head confidently towards the area of the library they needed. This was in direct comparison to the shelf-by-shelf browsing we had witnessed before our interventions.



[Above: Prototype macro-level signage zoning the space at the MML Library]

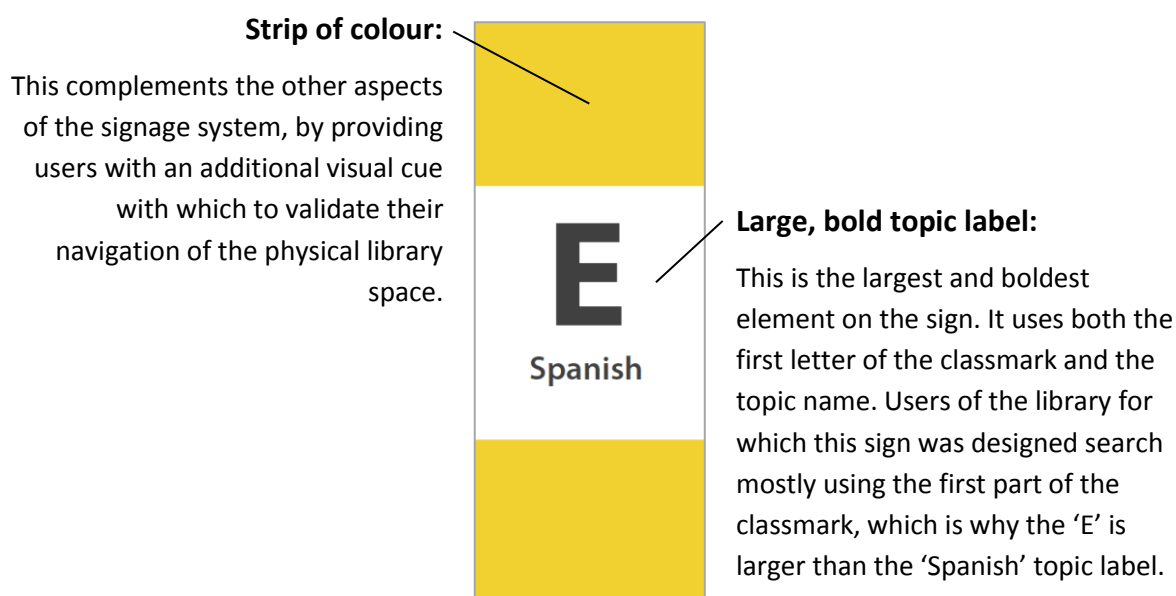
In larger libraries with multiple floors, maps of the different areas within a library help users orientate themselves, make sense of the physical space and identify the location which is of interest to them, for example the floor or area of the building they need to navigate to.



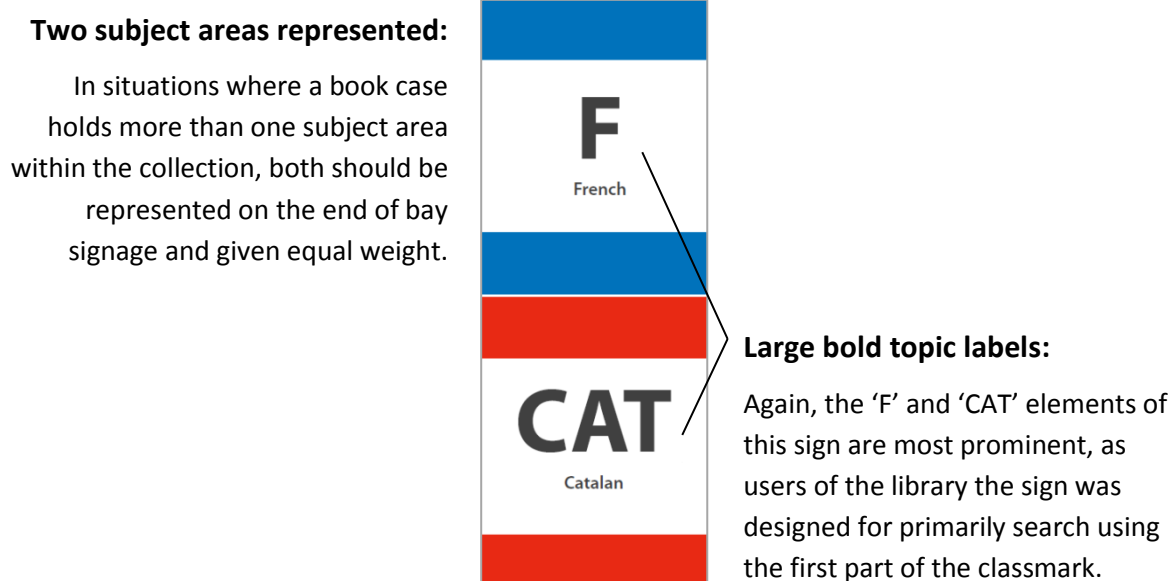
- Cambridge University Library © May 2017

Macro-level signage: protruding end of bay signage, one subject area

These signs were designed to protrude from the ends of bookcases. The prototypes were printed on A4 paper and folded in half lengthways. Both signs were designed for the MML Library.



Macro-level signage: protruding end of bay signage, two subject areas



Micro-level signage

Micro-level signage helps library users find the specific book stack, bay and shelf on which the resource they need is located. We found during our research that without clear micro-level signage in place, people will resort to scanning individual book spines and classmark labels in order to navigate the library space and collections. This can result in people scanning books on several different cases before finding the one they need, which takes an unnecessary amount of time and effort.



[Above: The final iteration of a prototype micro-level directional sign in place during our research]

Micro-level signage includes:

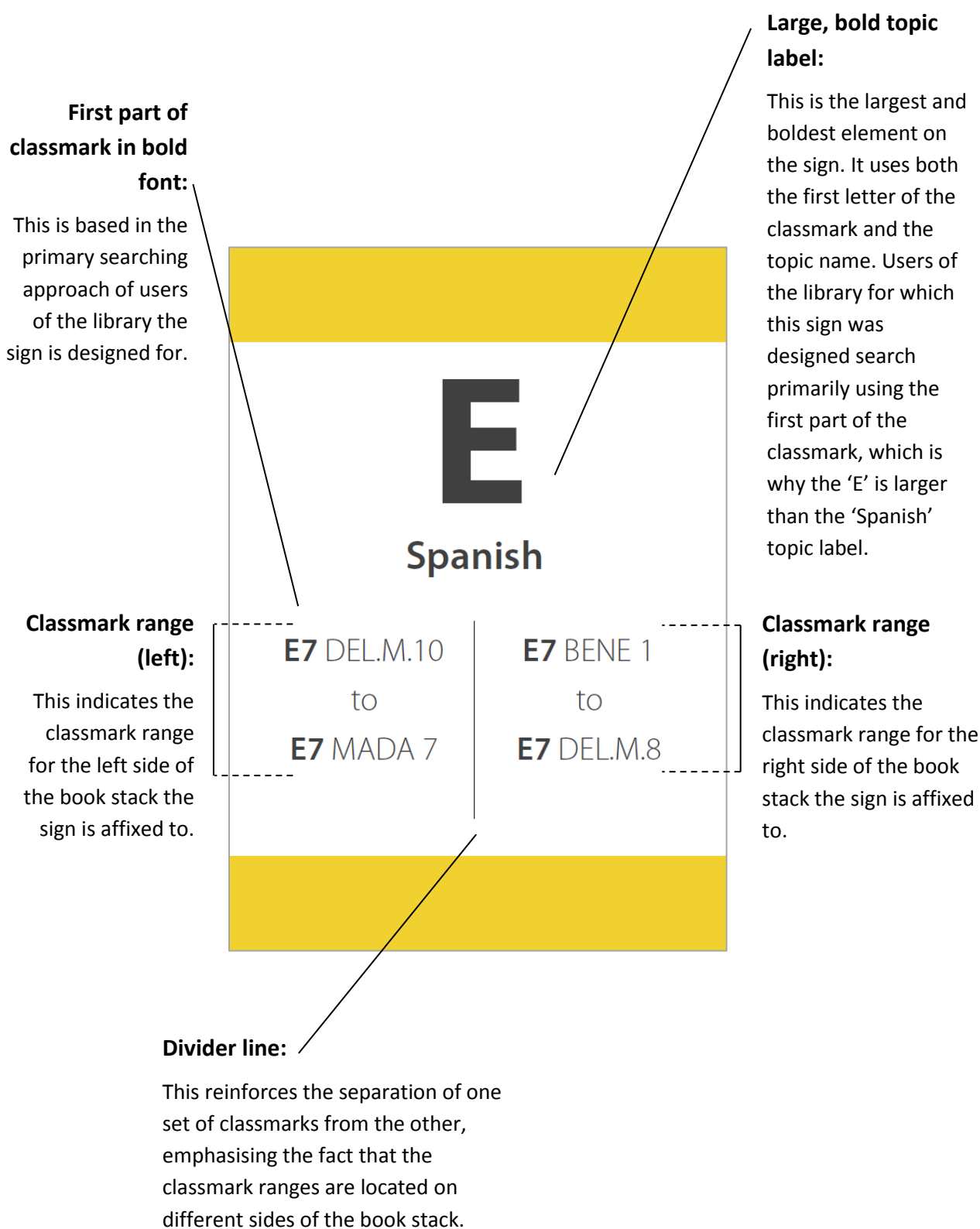
Classmark range signage: This should be placed on the end of each book stack, indicating the range of classmarks located within. This is the first step in the transition from macro- to micro-level signage and enables library users to narrow their search from a zone in the library to a specific book stack within that zone.

Shelf labels: These help users to quickly identify classmark ranges and subject areas within a book stack.

Shelf-level directional signage: This helps direct people to the next part of a collection and classmark run. This is needed in cases where classmark runs are split and where the location of the next part of the run is not intuitively understood.

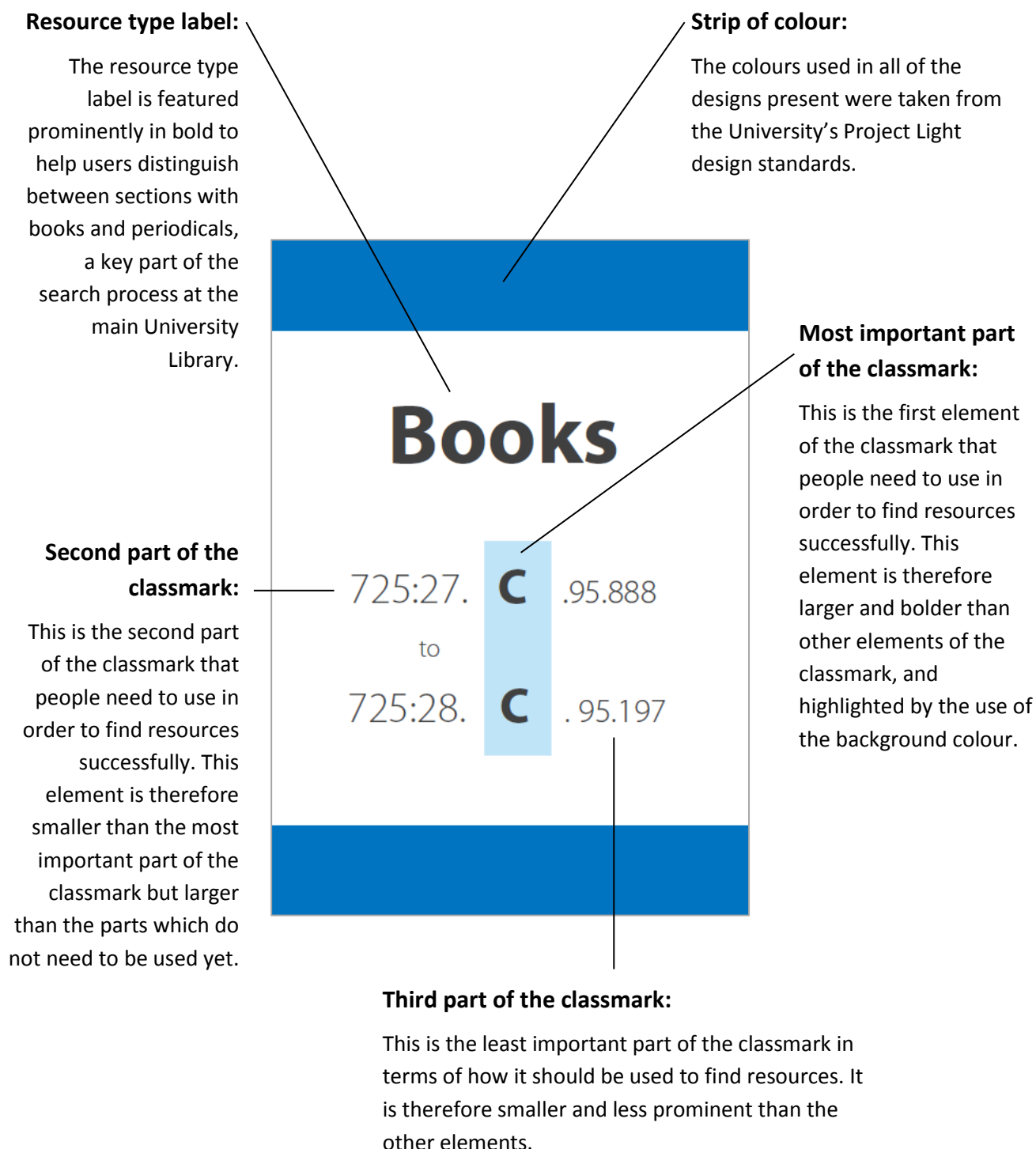
Micro-level signage: end of bay classmark range signage

The A4 size sign below was designed for the MML Library



Micro-level signage: end of bay classmark range signage (cont.)

The A4 size sign below was designed for the main University Library.

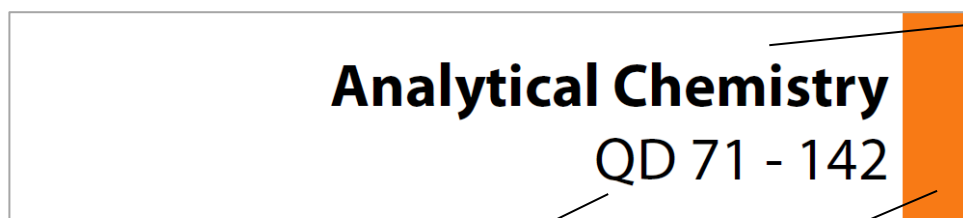


Micro-level signage: protruding topic labels

The sign below was designed for the Chemistry Library.

Large, bold topic label:

This is the largest and boldest element of the sign. Users of the library this sign has been designed for search primarily by topic, so the topic label element of the sign is more prominent than the classmark element.



Classmark range:

Strip of colour

Users of the library that this sign has been designed for search primarily by topic, however some do use classmarks to find resources. The classmark range is therefore less prominent than the topic element.

Micro-level signage: specific directional signage

The sign below was designed for the MML Library and was used to direct users to a continuation of the classmark run which was not intuitively understood. The sequence on the shelves was interrupted by reference books with different classmarks, which caused confusion. The sign was required to direct people to the bookcase which contained the next books in the classmark run.



Large, bold classmark:

Directional map:

Users of this library search by using classmarks and are therefore looking for related visual clues in the environment. Directional signage such as this should include a large, bold classmark which will be similar to the one a person is looking for.

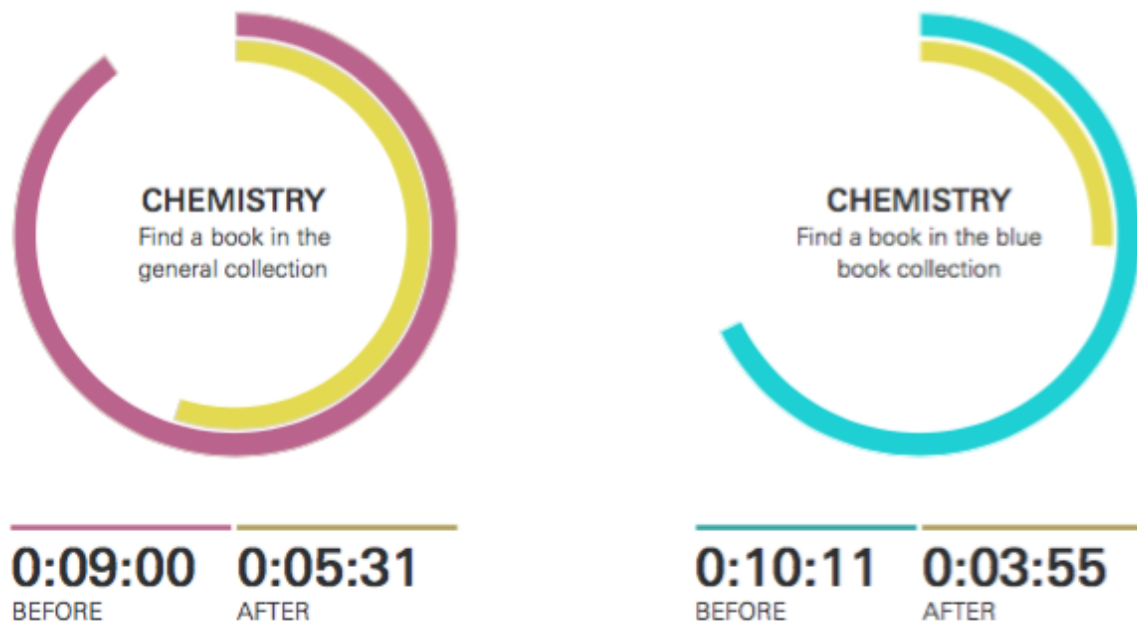
In situations where the next step in the resource finding process is not obvious or intuitive, signage should include a small map to help direct users to the right place.

10. SIGNAGE TESTING RESULTS

We recorded quantitative data during our eyetracking sessions, before and after our interventions. This included the time taken for each task we set library users. The results of these measurements for the participating libraries can be seen below, along with feedback from participants.

Chemistry Library

Time on Task:



Eyetracking participants at the Chemistry Library were asked to find a book either in the general collection or in the 'Blue Book' undergraduate books collection. Across participants and both tasks the time taken to find resources dropped dramatically. On average the time taken to find a resource either in the general collection or the Blue Book collection fell by around 30%.

Our prototype signage also reduced cognitive load and confusion. It improved the learnability of the environment and made people feel more confident in using the Library and its physical collections. This increased the chance of them recovering from errors without intervention.

MML Library

Time on Task:



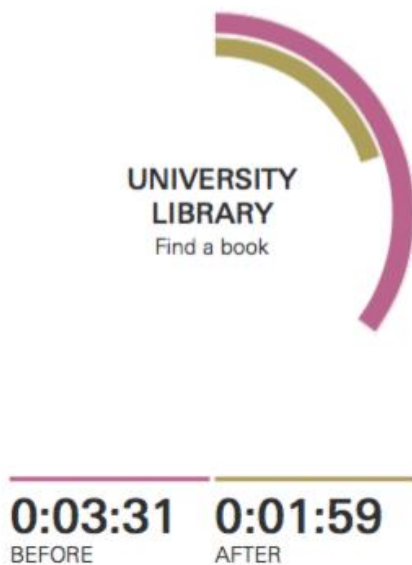
Eyetracking participants at the MML Library were asked to find a book either in the German section or in the Catalan section. Across participants and both tasks the time taken to find resources dropped dramatically. On average the time taken to find a book either in the German section or the Catalan section dropped by around 60%.

Our prototype signage made items easier to find. Sections which were split unintuitively were navigated much more easily once the signs were in place. On average, the time taken to find a book in the German section fell from around 6 ½ minutes to less than 1 minute. Comments from library users in favour of the new signage included:

- “The signs with ‘German’, ‘Catalan’, ‘Spanish’ on them really helped.” (2nd year MML student)
- “My method was to work was to look at the signs and work out the order.” (2nd year MML student)
- I love the new signs. They make everything clearer and the colours really help.” (4th year MML student)

Main University Library

Time on Task:



Participants at the main University Library were asked to find a book in a specific section of the Library. We deliberately chose a section with no overflow stock, as in the future these areas will no longer be present. Due to the time taken to travel around the library building we started the eyetracking sessions at the moment the participant entered the section of the library where the resource they were looking for was held. Across participants, the time taken to find a resource dropped dramatically. On average the time taken fell by around 40%.

Our prototype signage at the main University Library also reduced cognitive load and confusion. As with the MML Library, the signage increased the chance of people recovering from errors they had made. One participant had entered the periodicals section when looking for a book. Our signage helped them to realise and correct their error and move to the correct section. Participants commented:

- "The letters are normally just on the side [of the book cases], but these are better because they are bolder and more obvious." (3rd year History student)
- "I like that they're all different colours. I'm quite visual in learning, so for example if all the 'A' books were the same colour for the whole Library then that would be helpful, as you'd just identify them with the colour." (3rd year Geography student)
- "If 'C' books are here then I'm just going to keep walking, as 'D' books will be along here somewhere." (3rd year Economics student)

11. ASSISTANCE AT THE POINT OF NEED

In addition to signage, there are many other ways of providing assistance to library users at the point they need it. This includes offering help with tasks such as navigating library spaces and finding physical resources in library collections. During our research we trialled different models of providing in-person assistance at the main University Library, as its multi-storey building, large open shelf collection and bespoke classmark system often confused and intimidated library users.

The different models of offering assistance with tasks such as finding resources were:

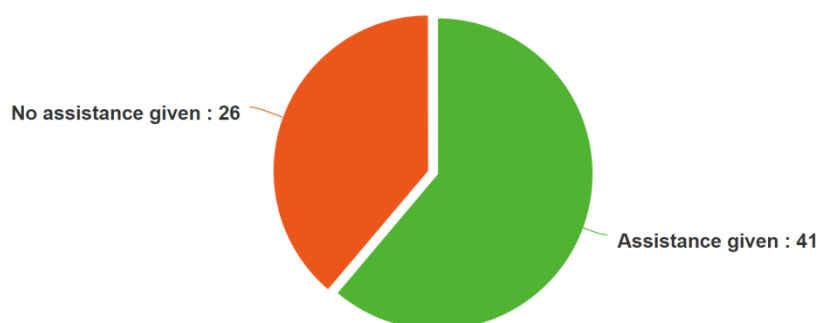
- Dedicated staff moving around the open shelf areas of the Library, wearing 'Here to Help' T-shirts and actively approaching Library users to offer assistance.
- Staff who were already conducting other duties in the open shelf areas of the Library wearing 'Here to Help' t-shirts, but not looking for people to offer assistance to any more than they normally would.
- Staff at the Reader Services (circulation and help) Desk in the Entrance Hall of the Library asking Library users when they were leaving: "Did you find every book you were looking for?" and offering to help users if they responded in the negative.

Trying these approaches concurrently with different library users allowed us to test the hypotheses that people would be more likely to respond positively to offers of assistance if approached at the point of need, rather than when leaving the library. As shown on the following page, the 'hit rate' when assistance was actively offered at the point of need in the open library was very positive, with 41 out of 67 (61%) library users approached during the trial being helped by staff. This approach was trialled over 2 weeks for 9 1-hour sessions at peak periods, by Futurelib and members of Reader Services staff at the main UL.

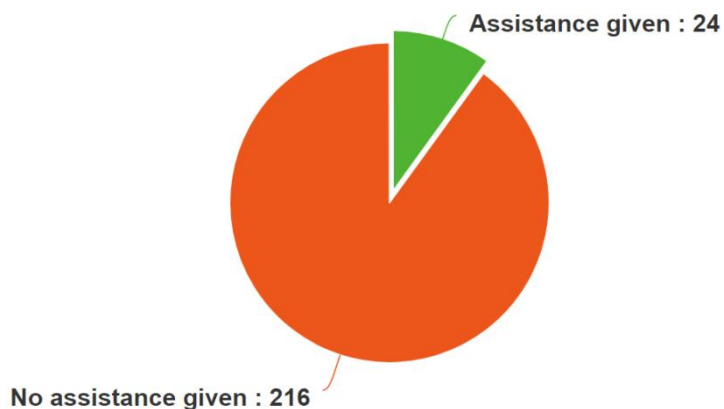
The rate of success when users were approached when leaving the library and checking out books was dramatically lower, with only 14 out of 227 (6%) people receiving help from a member of staff. Another 6 people said that they hadn't found all of the resources they needed, but left the Library without going back to the shelves with a member of staff. Perhaps the most surprising difference was between the success rates of staff actively approaching users, and staff wearing identifiable 'Here to Help' t-shirts but not actively approaching any more than usual, with only 24 out of 240 (10%) users in the open-shelved areas during the trial recorded approaching identifiable staff for assistance.

Rates of success of different models:

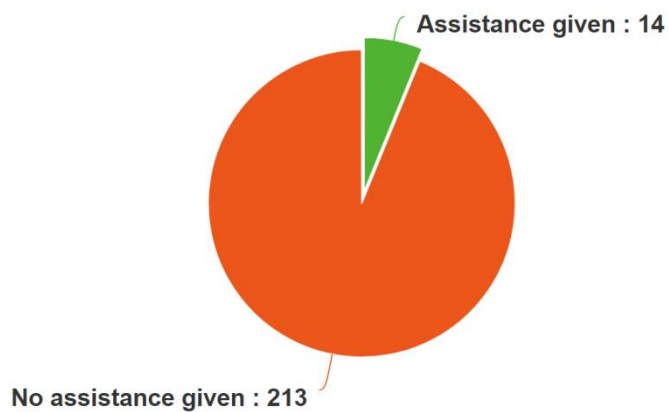
Dedicated staff wearing 'Here to Help' T-shirts, actively looking for and approaching users:



Staff wearing 'Here to Help' T-shirts but not looking for or approaching users more than they usually would:



Staff at the circulation and help desk in the entrance area of the Library asking users leaving: "Did you find every book you were looking for?" and offering to help users with this if they responded in the negative:



Findings

- Library users did not want to ask for help and would not approach staff; staff needed to actively approach people in order to provide assistance. People didn't want to be seen to not understand the Library or the shelving system, instead blaming themselves for not understanding or apologising for not 'succeeding' in their task. Comments such as the following were common: "I know my way around, I just can't find this particular book." "I've had a really good look around for it – I've properly searched!" "I might have been ages looking if you hadn't asked..."
- Almost all questions received in the open library were about classmarks and finding books.
- Library users were confused by material being split between books and periodicals and about the fact that books in the Library are stored in order of size, which led to difficulties in finding what they needed.

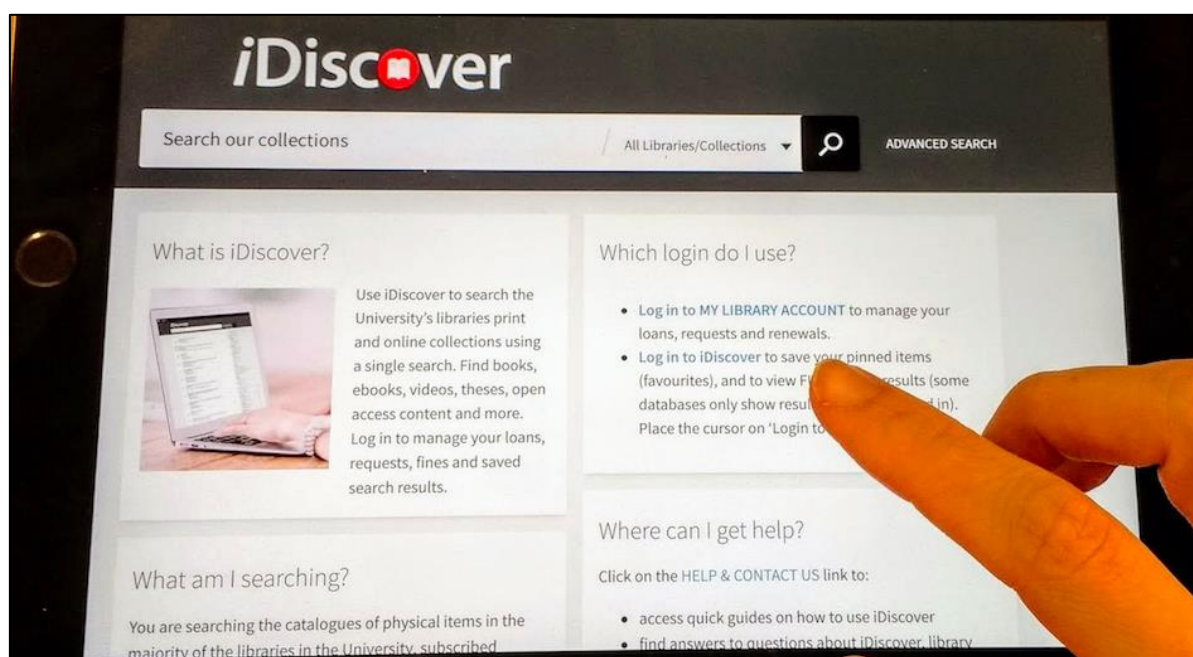


- The overuse of signs and cluttering of areas confused library users rather than assisting them.
- There seemed to be a sense of pride in deciphering the classmark system and 'cracking' the Library.
- People were occasionally searching for books by subject and without a classmark, which was surprising in a library as large as the main UL.
- The extent to which users would ask for assistance depended on the presence of other people, for example if there were more workstations in an open area people were less likely to accept help from a member of staff.

- People would often leave the Library without finding the book(s) they needed, rather than ask for assistance.

Due to the timescale and scope of the project we were unable to trial other ways of providing assistance at the point of need, particularly in large multi-storey libraries, but there are a large range of physical, digital and in-person options that could potentially be tested. The following ideas were discussed during the project:

- Digital 'touch points' present in areas of libraries where users commonly encounter difficulty (e.g. in open shelf areas). These could be programmed with answers to common questions and library users could navigate to the specific problem they needed to solve at the time.



- A live chat service where staff could be contacted from various points around the library. This could be facilitated through signposted telephones linked to a help desk, through PC terminals or tablets available at the point of need, or through the promotion of a 'text for assistance' service which could be either manned in person or potentially by a text bot.
- Handouts available at information desks and other points in the building explaining the classmark system and how the building and collections should be navigated.
- Posters or other visual information at various points around the library explaining how the classmark system should be interpreted and how the different floors of the open shelf library are laid out.

12. CONCLUSION

The Tracker project provided Futurelib with a refreshing opportunity to research and improve the user experience of a core aspect of Cambridge library services. At a time when the definition of what a 'library' or 'library service' consists of is constantly being reevaluated, the importance of intuitive, seamless access to print resources was reaffirmed by our users as an integral part of their experience of Cambridge's libraries. Although aspects of local context cannot be underestimated, we believe that we have arrived at a set of principles and patterns which can be used to inform the design of signage and navigational tools in many other libraries. We would always advise prototyping and testing in context with library users, as we have done during this project.

We would not have been able to embark on this work in the same way without the user-centred design expertise of Modern Human. They brought knowledge and experience of visual design principles which was vital in informing the designs presented in this report. We also, as always, relied heavily on the support of library staff from across the University, without which we would not have been able to begin to tackle a project with this scope and breadth. Special thanks to staff at the MML Library, Chemistry Library, Rayleigh Library and main University Library for welcoming us, facilitating our work and being interested and engaged with the research throughout.

We believe that the methodology, findings and design outlined in this document add a necessary level of depth to the body of work arrived at during the first Protolib project. The outcomes, combined with those of our concurrent research into macro-level, site space planning and design (the Protolib II project) form an evidence-based set of building blocks which can be used to inform the planning of physical library spaces at the University of Cambridge.

David Marshall

Futurelib Programme

Cambridge University Library

May 2017

Contact Futurelib:

Email: futurelib@lib.cam.ac.uk

Web: <http://www.lib.cam.ac.uk/futurelib>

Blog: <https://futurelib.wordpress.com>

Twitter: <http://twitter.com/futurelib>

Image credits

Page 3, photo of main UL building credit: Cambridge University Library

Page 7, photo of usability testing in progress (cropped) credit: Luca Mascaro via Flickr creative commons - <https://flic.kr/p/85aPPV>

This document is licensed under a Creative Commons Attribution (CC-BY 4.0) license. This license means you and others are free to share and adapt this work for any purpose. That allows you to copy and redistribute the material in any medium or format. It allows you to remix, transform, and build upon the material. If you do, you must attribute Cambridge University Library. You must give appropriate credit, provide a link to the license, and indicate if changes were made. You may do so in any reasonable manner, but not in any way that suggests Cambridge University Library endorses you or your use. Logos, icons and photographs used in this document remain the copyright of the original copyright holder.