

eLibrary

Final Report Project 4.4

CRC TiME Knowledge Hub (e-library and Search Engine)

January 2022

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PROJECT PARTNERS:





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Executive Summary

The CRC TiME Knowledge Hub (e-library/search platform) project was designed to deliver an interactive web-based platform for storing, accessing and engaging with various assets (documents, videos, audio files, images, web links and other forms of data) that span multiple, inter-related topics within the context of mine closure and post-mine transitions.

This project provides a public facing platform for various audiences interested in all aspects of the context, including but not limited to: regional economic development; risk, evaluation and planning; and operational solutions to mine closures. Importantly, the project aimed to reveal new links between the CRC programs and projects and provide a platform to share complex information in one location.

The project delivered both research and operational outputs, a documented governance process, research reports and other publications. The project team anticipate that the portal will result in a content rich environment that will form the grounding for further research such as text mining, web data analytics and content analyses. The outcome is an evidenced-based method for collating and delivering knowledge from myriad sources to the CRC, partner organisations, research, mining and wider community to develop and utilise during the life of the CRC and potentially beyond.

The final recommendations focus on scalability of the search engine and online audience and stakeholder engagement into the future.

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1. Project Overview

The CRC TiME Knowledge Hub (e-library/search platform) project was designed to deliver an interactive web-based platform for storing, accessing and engaging with various assets (documents, videos, audio files, images, web links and other forms of data) that span multiple, inter-related topics within the context of mine closure and post-mine transitions. This project provides a public facing platform for various audiences interested in all aspects of the context, including but not limited to: regional economic development; risk, evaluation and planning; and operational solutions to mine closures. Importantly, the project aimed to reveal new links between the CRC programs and projects and provide a platform to share complex information in one location.

The project delivered both research and operational outputs, a documented governance process, research reports and other publications. The project team anticipate that the portal will result in a content rich environment that will form the grounding for further research such as text mining and content analyses. The outcome is an evidenced-based method for collating and delivering knowledge from myriad sources to the CRC, partner organisations, research, mining and wider community to develop and utilise during the life of the CRC and potentially beyond. The project aims, deliverables and research questions are detailed below.

1.1 Project Aims

- To provide CRC stakeholders and the wider community with an interactive knowledge hub for mine closure and post-mining transition information sharing, community engagement and education.
- To develop an evidence-based process for information sharing in a multi-faceted, dynamic and complex research and industry engagement environment, modelled on existing industry practice, and informed by consultation, research and analysis.

1.2 Key Deliverables

- Operational web portal (search engine and database).
- Governance and provenance process documentation.
- Research data set for future audience/stakeholder analysis projects and CRC communication and engagement strategies.
- Final report on outcomes from the project.

1.3 Research Questions

Stage 1: Literature review, situational analysis, initial audience and stakeholder analysis, initial information architecture, prototype and testing

- Who is the key audience for the Knowledge Hub?
 - Has similar work been done in this area or in other large, multi-faceted projects in the past? If yes, by who, when, where and how?
 - What research has been conducted on the efficacy of web portals for information sharing in complex contexts such as mine closure and post-mine transitions?
-

Stage 2a: Formal audience and stakeholder analysis, digital personae development and soft launch

- What are the key content areas that CRC stakeholders need for the portal to be useful?
- What is the most efficacious method for developing ongoing engagement with CRC stakeholders on the development of the portal?

Stage 2b: User experience, information architecture and content strategy

- What are the key search terms that users will employ to find what they are looking for in the Knowledge Hub?
 - How should the information architecture be developed to ensure sustainability and scalability of the portal?
 - What are the core shared values of CRC stakeholders that could inform the content strategy?
 - What are CRC stakeholders hoping to experience when engaging with the portal?
 - What elements of the portal will encourage future audiences to engage with the portal as the first port of call for information on mine closure and post mine transitions?
-

2. Literature Review

2.1 Introduction

This literature review provides a scholarly basis for the design and capabilities of the CRC-TiME Knowledge Hub (e-library and search engine). There are two key parts to the literature review. Firstly, we explore the context to databasing and the need to house organisational information, electronic resources and documents. We argue that databases and document repositories are a useful way for organisations to house electronic resources for their stakeholders to then search and utilise. Secondly, we discuss the academic literature concerning the search and user side of databases.

Successful document repositories and stores of organisational resources and texts need to be easily searched, accessed and used. To enable ease of use, designers need to know enough about their likely users, including their needs and preferences, to create something usable and useful. We explore the dominant theories around search patterns, preferences and needs and explain how these have informed the design of the CRC-TiME Knowledge Hub.

2.2 Defining an E-library and Search Engine

The notion of a digital library, as distinct from a physical library space, reportedly emerged in the 1990s (Xie, 2016). According to Iris Xie, the definition of “digital library” is contested and evolving as technology as well as user needs develop through time. As Xie explains, some researchers evade settling on a concrete definition of “digital library” because the definition will likely be determined by who is speaking and what their needs are.

Nevertheless, qualities that define a digital library tend to span across the technology that enables them, the digital assets or texts they contain and the way they are meant to facilitate broader access to their digital assets as compared to if they were stored or catalogued in another way. Borgman (1999) explores the competing definitions of digital libraries, especially by two main groups, librarians and researchers, and proposes a definition with a focus on the communities in which those definitions are situated. As Xie (2016) sums up of Borgman’s discussion:

Digital libraries are a set of electronic resources and associated technical capabilities for creating, searching and using information [and] Digital libraries are constructed, collected, and organized by (and for) a community of users, and their functional capabilities support the information needs and uses of that community (Xie, 2016 drawing on Borgman, 1999).

What is important in Borgman and Xie’s discussion is the focus on the community in which a digital library is situated. The community of users will have distinct needs and preferences for the information and assets containing within the library.

2.2.1 Database Set-Up and Design

Essentially, the CRC-TiME e-library/search platform is a way to search an existing and evolving database or repository of documents. There are currently documents located in the database and these are being added to by CRC members constantly. The documents to be housed in the database/library have been and will be contributed to and accessed/used by members and stakeholders of the CRC as well as the general public in the future. It is expected that many of the documents will be used for research or information purposes, therefore making the library interface easy to use, search, retrieve from and upload to is of vital importance.

As Russell-Rose and Tate (2013) argue in their discussion of designing for a useful search and searching experience, “By investigating why and how people engage in information seeking, we learn not just about information retrieval but also about how people navigate and make sense of complex digital information environments.”

2.3 The Design Process

The design process followed an evidence-based method that employed several user-centred design procedures to formulate the initial design concepts and then refine the final design. Evidence-Based Design can be described as, “the practice of grounding design solutions and decisions in a researched and documented knowledge base that includes the analysis and interpretation of research” (Stewart-Pollack & Menconi, 2005, p. 226). Evidence gathered in the research, design and prototyping stage helps to substantiate design choices, gives greater credibility to the visual communication strategies and leads to a thoroughly tested and more successful outcome. Evidence-based design works hand in hand with user-centred design since both methods funnel research into multiple iterations that then refine the design.

User-centred design (UCD) is the design philosophy that focuses on the user's wants, needs, and limitations to create the best possible end product for the user (Ritter & Winterbottom, 2017). The main advantage of UCD is that within each step, iterative designs are made based on user feedback and ethnographic data to improve the design.

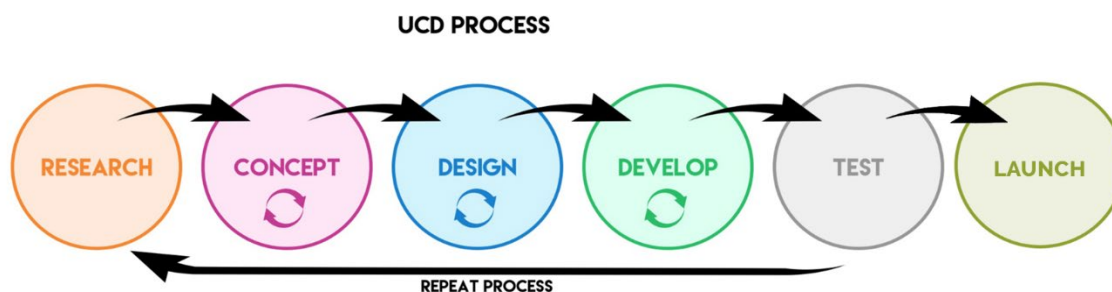


Figure 1: UCD design process adapted from Ritter and Winterbottom (2017)

The project team used each cycle in the UCD Process in the following ways:

Research: into key content areas and impact on user interface and overall design, key audience and stakeholders, competitors design strategies and search engine user interface patterns, literature review of best practice in search engine and user interface patterns.

Concept: the collected data defined the scope, requirements, usability and aesthetic look and feel for the initial concept. Changes were made to the initial concepts based on user feedback.

Design: technical and functional requirements along with user interface elements were rendered in detail to provide a prototype of the concept after implementation. Changes were made to the prototype based on user feedback.

Develop: the prototype was made functional in line with research data, user expectations and usability expectations. Changes were made to the functional prototype based on think-aloud protocol testing and user feedback survey data.

Test: a beta version of the project was launched in a test environment with test data.

Launch: the final product becomes integrated into the existing infrastructure, and maintenance strategies are used to measure and refine the project based on usage trends, technological developments and subsequent user experience improvements.

2.4 Users and User Types

To design the most useful and usable search engine for a particular user or audience group, it is important to discover characteristics of those likely or future users. Russel-Rose and Tate (2013) argue that an understanding of likely users is vital to the success of a design project. In their discussion of users, they highlight the importance of “expertise” in “how people seek information” (p. 4). Expertise, they argue, is applied in terms of whether users have “domain” or “technical” experience or expertise. Domain expertise “defines ones familiarity with a given subject matter” (p. 4) while technical expertise “indicates one’s proficiency at using computers, the Internet, search engines, and the like” (p. 4).

Whether a likely user is a domain expert or novice or alternatively a technical expert or novice (as well as the various combinations of these) will likely determine their ability to “succeed” in a search. As Russel-Rose and Tate emphasise, “users are most likely to succeed when both are present” (p. 4) or in other words when a user has both technical and domain expertise they are most likely to find what they are looking for.

For the CRC TiME search platform, it was important to understand whether the majority of the likely users were experts technically and in domain knowledge, a novice in one and expert in the other or novices in both to further guide the design and usability of the search engine. Russel-Rose and Tate (2013) highlight the importance of understanding the scale of user expertise or novice, though admit that designers must have the range of users in mind during the development of any digital search tool (pp. 8-9).

3. Methodology

The methodology for the CRC TiME Knowledge Hub (e-library and search engine) required multiple steps and approaches. As we were designing and creating the e-library interface we needed input from our key stakeholders at various points for decision-making and design process. As such, the methodology was multi-staged and incorporated different data collection tools.

3.1 Multi-phase Research

To provide input into the process of design at various stages, we conducted data collection at various points. The research was essentially divided into three phases: pre-design, design and prototype. In the first phase, the research team was interested in the needs, preferences and intended uses of the e-library.

As such, we utilised an informal survey of a small sample of CRC TiME stakeholders for an initial insight. This informal survey was then followed by a more formal survey of a wider sample of CRC TiME stakeholders that subsequently informed the design phase of the process.

The third and final phase involved the testing of the e-library prototype. This phase involved two usability tests, one a quantitative survey style of usability test and the second a qualitative usability test via interview with the e-library designer. Each phase informed the design and progress of the e-library tool.

3.1.1 Mixed Methods

The research undertaken for this project utilised a mixed methods approach. Such research draws on both quantitative and qualitative approaches to studying a phenomenon (O’Leary, 2014), in this case the likely users of the e-library. As McKim (2019, p. 202) and O’Leary (2014, pp. 146-148) draw attention to, researchers often need to reflect on what utilising more than one method will add to a project.

Often mixed methods research will combine qualitative and quantitative approaches for both depth and detail (Hurmerinta-Peltomaki and Nummela 2006) as well as numerical and statistical insight. Moreover, mixed methods research can increase the perception of validity of findings by enabling cross-checking of research insights between methods (McKim, 2019; Coyle & Williams 2000).

For the purpose of this project, a mixed method approach was valuable to the research underpinning the e-library as well as the actual design of the e-library. The quantitative survey offered insight into the likely users, their needs and preferences, while the qualitative usability tests offered insight into the ease of use and attitudes to the design interface.

3.2 Ethics

A fundamental aspect of research involving human participants is a robust ethics protocol. As Weerakkody (2015) emphasises, ethical considerations concern all phases of a study (individual, community, social) and all stakeholders including the researcher, participants, and relevant institutions. As this project needed the involvement of CRC stakeholders, we obtained ethics approval from our parent organisation (Murdoch University) to undertake the formal survey (survey 1) as well as the usability testing (both surveys and interviews) (survey 2).

3.2.1 Survey 1

To obtain insights into the likely users of the e-library and to understand the target users, we devised and ran an informal survey in February 2021. The survey was hosted by Qualtrics and disseminated by the CRC through their stakeholder mailing list. Qualtrics is a password-protected survey software that allows the design and compilation of survey questions, hosting the survey questionnaire and compiling the data from results. The survey that was conducted asked some basic demographic questions, the degree of technical and domain expertise, devices that likely users tend to use for searching, preferred search engines and search habits and styles. This survey aimed to quickly obtain key characteristics of CRC TiME stakeholders to inform the initial design phase of the project.

The survey received responses from 23 stakeholders in the CRC. The majority of respondents (44%) were chief investigators followed by 30% who were researchers and three who were project or program leaders. One research assistant and one Turnkey member also completed this survey.

3.2.2 Survey 2

This survey refined and extended the questions and stakeholder participants from the first survey. This second survey was also hosted by Qualtrics and was sent out to a larger stakeholder list via the CRC newsletter in April 2021. The aim of the survey was to confirm our insights from the first survey as well as refine the design of the prototype based on more information about the likely and future users of the e-library. This survey focused on needs, preferences and expectations from a wide range of likely users. There were 41 responses to this survey. When asked about their relationship to CRC TiME 24% of respondents were mine company employees, 20% were researchers, 15% were government employees, 8% were project leaders and 5% were members of the public. Of the 27% respondents who selected “other” they described their relationship to the CRC as “developer”, “consultant”, “METS partner”, “private sector”, “partnership”, “university professional staff”, “research program manager”, “CRC Time participant” and SME.

This survey asked 29 questions of each participant including basic demographic information, their needs, preferences and expectations of the CRC-TiME Knowledge Hub (e-library/search engine). Most of the questions were tickbox, grade-scale or yes/no with a few opportunities for a small descriptive/open-ended response. The survey asked a small number of demographic questions then about previous experiences using search engines, technical expertise generally, how participants use search engines and how they expect to use the e-library/search platform we were creating. The results of this survey enabled the designers to further refine the e-library prototype.

3.5 Usability Testing

After undertaking the survey’s about our likely users and their needs, the project team needed to test the search portal prototype on a sample of this population. According to Rubin and Chisnell (2008) usability testing involves a researcher or designer observing users as they use or undertake a set of tasks. Usability testing can be undertaken on a user with hardware, software or consumer goods and products (Rubin and Chisnell 2008). As Rubin and Chisnell (2008) explain, “The selection and acquisition of participants whose background and abilities are representative of your product's intended user is a crucial element of the testing process” (Chapter 7).

Usability testing is the process of evaluating the functional suitability of a product or feature within a product by observing users trying to actually use the product to perform tasks. Here ‘functional suitability’ refers to what the product/feature does and how it is accomplished. For instance, a designer/developer might have a feature that does not actually work properly, however the designer does not realise this issue until a test user tries using it in a way the designer/developer had not anticipated. Designers aim to avoid the bias of ‘self testing’

everything by undertaking usability testing and in doing so they minimise the chance they will miss potential errors.

A second aspect of usability testing that is important for designers is related to ‘usability’ or the way potential users will navigate or use a digital prototype. As Rubin and Chisnell (2008) state, “usability testing is part of a larger effort to improve the profitability of products. There are many aspects to doing so, which in the end also benefits users greatly: design decisions are informed by data gathered from representative users to expose design issues so they can be remedied, thus minimizing or eliminating frustration for users”. For example, a feature may work, but testing with likely users will reveal it is unintuitive or hard to use. Such a feature could be buried under multiple layers of menus when it is actually needed all the time and available on the first menu.

Alternatively, usability testing might reveal the way a feature is presented as unhelpful or off-putting to users. For example, a user may click on an aspect of a product, piece of software or device and their click does something functionally that prompts them to say ‘I didn’t expect it to do that. Now my files are gone’. These insights are usually discovered by testing with people who are not the developer/designer of the product. With potential users of the product/feature, ideally, usability testing should involve people who have different levels of tech-savviness, and people with different levels of experience with the product including a range from those who have never used it before through to frequent users. The usability testing we undertook in the design of the CRC TiME e-library had two forms: a usability survey and usability testing via interviews with the designer.

3.5.1 Usability Survey

The usability survey involved a small sample of between 10-20 likely users in CRC TiME of the e-library. Each participant was sent a recruitment statement with a link to a short Qualtrics survey. The survey was only expected to take 5 minutes to complete. The survey contained four demographic questions (age, gender, state within Australia or country if outside Australia, role/relationship to CRC TiME) and then two questions that were directly related to the e-library prototype. For this survey there were 10 responses. Four were researchers, three were project leaders, two were chief investigators and one selected the “other” category.

Participants were directed to a testing website to practice using a prototype search engine, specifically to test the functionality of the system. Participants read a scenario and then were asked to complete some guided “search” tasks. Once they tried out the prototype for each task, they returned to the survey and were asked a small number of questions for their feedback about the search experience.

3.5.2 Usability Interviews

The second style of usability test was conducted with the designer (moderator) and 10 participants via MS Teams and in an interview style. Five were researchers, two were project leaders, a CRC TiME employee and two research directors were interviewed. The designer asked participants to share their screens via the Teams interface and use the prototype search engine, again with some guided tasks. Sharing of screens was necessary so the designer could observe firsthand what participants did with the prototype, how they did what they did and ask about their user experience.

A task-based think-aloud usability test was conducted with users to test their experience, expectations, satisfaction and aesthetics of the CRC TiME search platform. A think-aloud protocol requires the user to perform specific tasks whilst thinking-aloud or speaking their thoughts. The think-aloud method is a qualitative research method that allows the interviewer to understand better a range of user experiences (Rosenzweig, 2015).

The participants were tested in relation to these experiences:

- Design: how well the images, user interface, colours and design layout fitted with users' mental models and expectations of search engine use.
- Learnability: did a user understand the perceived affordance and usability of the interface? How easy was it for the user to recognise and/or recall the use of the search engine functionality?
- Efficiency: did users have problems or roadblocks with the search engine user interface that hinder the speed by which users could accomplish tasks?
- User satisfaction: did the user understand and like the aesthetics of the design? Did the images, colour typography and layout appeal to the user whilst being easy to use?
- Errors: how often did a range of users make mistakes or misunderstand the search engine interface?

The think-aloud usability tests were run with a moderator that followed a script that walked the users through a range of simple tasks and questions. The moderator method was employed to set the participants at ease, direct the user quickly and efficiently and ask any additional probing questions to elicit further information.

A range of potential stakeholders and participants were both invited and volunteered to participate in the usability test. These included domain experts such as those with mine closure, biodiversity and social science expertise, key stakeholders from CRC TiME executive and members of the public with an interest in the context. Although the general industry consensus is that a think-aloud test requires five users, a total of ten participants engaged in the usability test (Nielsen, 2000). Figure 2 shows the distribution of users in relation to the dimensions of Expert Knowledge and Technical Expertise (Russell-Rose and Tate, 2013).

The initial Qualtrics user survey for the project indicated that the range of users would likely have above average or little current knowledge of the search engine content. As a result, the tested users were split between expert knowledge and little knowledge quadrants (Figure 2). Significantly few initial survey participants indicated they were not technically proficient.

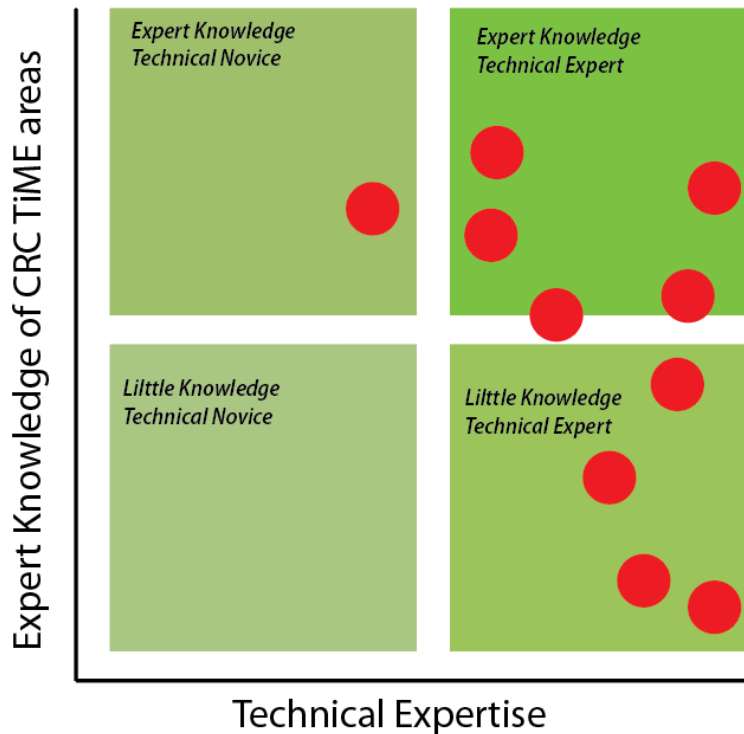


Figure 2: Usability Interview Participants and their Domain and Technical Expertise.

This figure shows the distribution of users in relation to the Two dimensions of expertise: Adapted from Expert Knowledge and Technical Expertise matrix. (Morville and Callender, 2010)

3.6 Content Development

Content development is an ongoing process requiring a multi-layered approach to collect artefacts to add to the CRC TiME database: Connect. Connect then acts as the e-library, searchable by the search engine.

There are four broad areas of content that was collected to launch the search engine, as well as ongoing development of the e-library.

1. Content from CRC Programs (projects and partners).
2. Curated web links (from CRC programs, partners and the wider web).
3. Content from other publicly available databases.
4. Content submitted by the wider public for consideration.

3.6.1 Content Curation

Curation of collected artefacts is a crucial step in the process of filling the Connect database with quality material that can be searched by the CRC TiME search engine. Content will include documents, presentation slide decks, videos, audio and web links to websites and publicly available academic outputs, as a minimum.

To ensure that the artefacts are fit for purpose, appropriate and secure, each item will be curated in relation to:

1. Provenance – determining ownership, copyright and intellectual property.
2. Quality Assurance – determining appropriateness, content production quality, in conjunction with provenance measures.

4. Results

4.1 Results of the Usability Survey for Functional Testing

- 100% of participants could easily complete the first task.
One participant commented that the initial search using author surname didn't work and they had to try alternate search terms.
- 80% of participants completed the second task easily, and the remainder needed to change their search terms.
Some comments indicate uncertainty from testers over what is covered by the main search bar versus the advanced search controls.
- 60% of participants were able to complete the final, most difficult task successfully.
This was a more complex task that needed some user synthesis to convert it into a clear search query.
A name was mentioned in the task which was a red herring, but some participants searched 'by author' for this name.
Those that completed the task indicated it was straightforward.

4.2 Results of the Think Aloud Usability Interviews and the Implications for Design

- 90% of participants were able to complete all tasks successfully.
- 100% of users understood how to sort the search results by date.
- 70% of participants preferred Design Concept 1 (Figure 3) than Design Concept 2 (Figure 4) when shown possible design of the user interface.

4.3 CRC TiME Knowledge Hub Key Outcomes

4.3.1 Aesthetics and User Interface

The majority of participants were positive about Concept 1 (Figure 3). Though many participants also liked areas within Concept 2 (Figure 4). For example, the larger search area within Concept 2 was preferable, as was the amount of contrast between the foreground search bar and the background image.

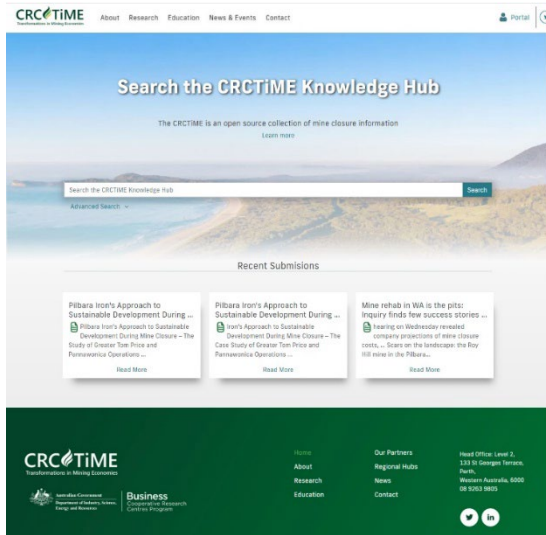


Figure 3: Design Concept 1 of the search engine interface

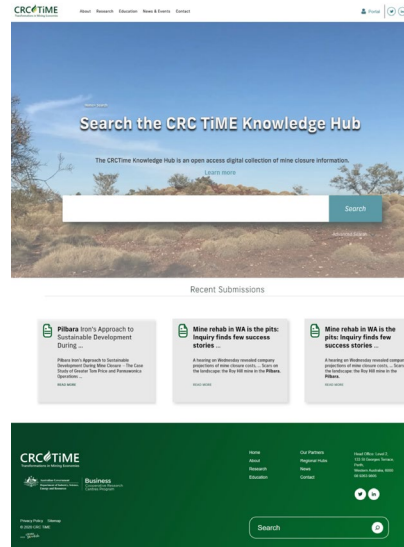


Figure 4: Design Concept 2 of the search engine interface

- 70% of participants noticed the title and landscape image and indicated that they understood the search functionality and call to action.
- 70% of participants quickly recognised the advanced search functionality and understood the majority of functions in the advanced search area.
- 60% of users preferred the horizontal card view (Figure 5) compared to the vertical card view (Figure 6). (Note: A card view was tested because the initial survey suggested the majority of users liked the search results formatted in a list view with a relevant image)

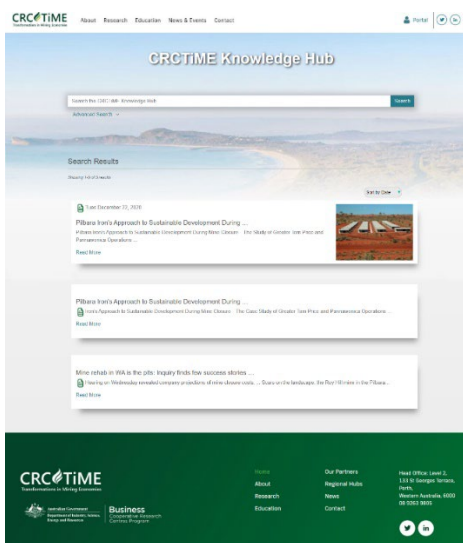


Figure 6: Horizontal card view search results page

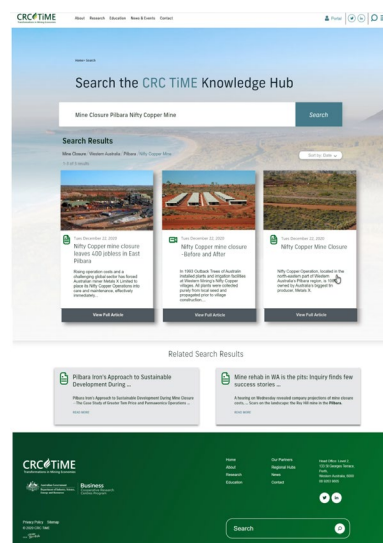


Figure 7: Vertical card view search results page

As a result, several changes were made to the background image of Design Concept 1 to incorporate those favourable aspects of Concept 2 (Figure 4). However, the majority of participants understood the use of Concept 1's (Figure 3) background image in relation to the search engine; the clarity and positioning of the background image also needs to be tightened.

Some participants indicated that the positioning of the advanced search areas could also be tightened to suggest a stronger relationship to the search bar. The first advanced search button should include more categories such as organisation and type. The search result icons related to result type (pdf, image, etc) were not clear and should be emphasised with accompanying text.

4.3.2 Information Architecture

Several participants (usually those who were not knowledge experts) commented on the importance of image relevance in the search results page. Other knowledge experts were indifferent to the image and questioned whether it should be part of the card-based search results.

Overall, 70% of users liked the image in the search results page as this helped with noticeability, emphasis, and overall aesthetics. The majority of users preferred the title of the search result to not be truncated.

A slightly larger search result excerpt was requested by over half of the users. Participants also provided feedback that the author's name should also be included in each search result, along with the date of publication.

Results from the usability survey for functional testing have several implications for information architecture. Whilst the majority of participants had no problems completing the search tasks, some questions were raised regarding what is included in the main 'search bar' vs the advanced search fields. The search algorithm was altered to include all searchable fields in the main search functionality, and allow the advanced search to only search specifically relevant fields.

4.3.1 Final CRC Knowledge Hub

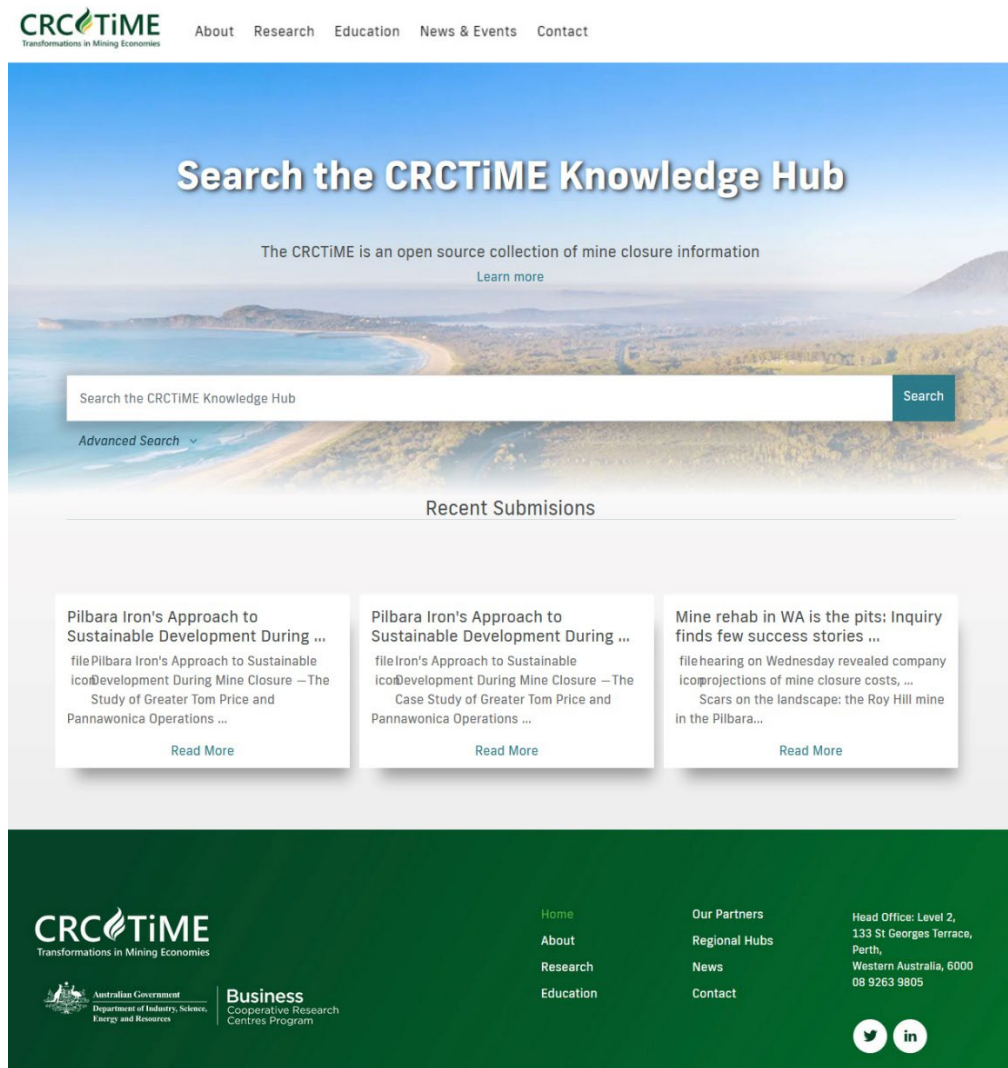


Figure 8: Final Front Page of the Search Engine Interface

The screenshot displays the front page of the CRC TiME Knowledge Hub search engine. At the top left is the CRC TiME logo with the tagline "Transformations in Mining Economies" and a navigation menu with links for "About", "Research", "Education", "News & Events", and "Contact". The main heading is "Search the CRCTiME Knowledge Hub" in large white text against a blue sky background. Below this is a sub-heading: "The CRCTiME is an open source collection of mine closure information" with a "Learn more" link. A search bar contains the placeholder text "Search the CRCTiME Knowledge Hub" and a "Search" button. Below the search bar is an "Advanced Search" dropdown menu. A "Filters" section follows, with the instruction "Use these filters to refine the search". It includes two dropdown menus labeled "Title" and "Contains", a text input field "Enter your information", and buttons for "+ Add" and "- Remove", along with a "Search" button. Below the filters is a "Recent Submissions" section with three article cards. Each card has a title, a truncated description, and a "Read More" link. The footer is a dark green bar containing the CRC TiME logo, the Australian Government Department of Industry, Science, Energy and Resources logo, the Business Cooperative Research Centres Program logo, a navigation menu (Home, About, Research, Education, Our Partners, Regional Hubs, News, Contact), and the head office address: "Head Office: Level 2, 133 St Georges Terrace, Perth, Western Australia, 6000 08 9263 9805". Social media icons for Twitter and LinkedIn are also present.

Figure 9: Final Front Page Search Engine Interface with Advanced Search

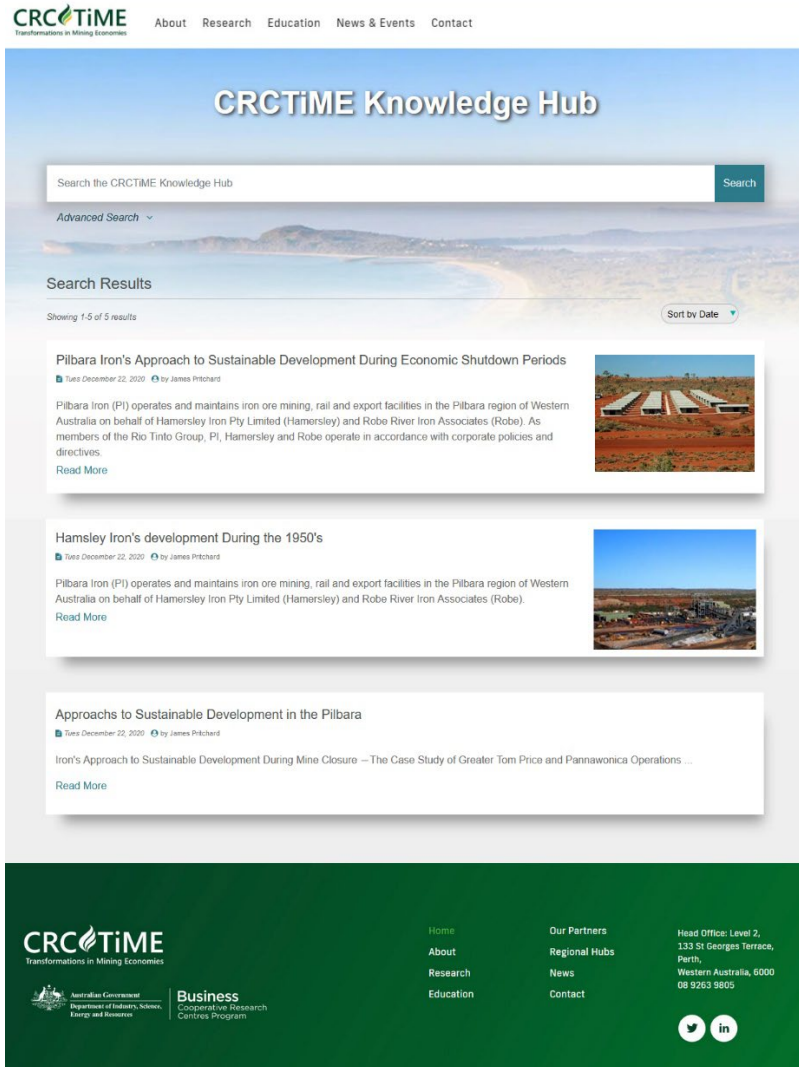


Figure 10: An example screen shot of search results using the optimised Knowledge Hub

5. Recommendations

5.1 Scalability

The system is built such that the web interface is a front end to the search algorithms which take place in a separate system – the search backend. The backend can be hosted anywhere – it could even be hosted on the same hardware as the web interface. This decoupling provides the first scalability factor, that of being able to independently control the resources devoted to the search component over the relatively lightweight web interface. Hosting remotely on a cloud provider or similar allows the backend to be reconfigured with more storage or compute resources. Additionally, the database technology used – Elasticsearch – can be switched to run in a multi-node configuration to provide redundancy and lowest response time in the case where search usage puts the backend under more pressure than it can handle in single-node mode.

The system is capable of importing search data into the backend either from structured file-formats like Zotero, or reading from an external backend such as TurnKey/Salesforce. The latter is set up as a scheduled process which refreshes at regular intervals around the clock. An unavailability of the turnKey backend will not impact search functionality, save that any new records won't be available for searching until connectivity is restored. An unavailability of the entire search backend (server restart, connectivity issues, etc) will make searching unavailable during that period. In this case, users attempting to conduct searches will see a 'temporarily unavailable' message. The system can be configured to send alert emails to a nominated email address in this case.

5.2 Ongoing audience, user and stakeholder engagement

An ongoing audience and stakeholder engagement strategy will be needed to monitor usage and overall engagement with the search interface and encourage users and wider CRC stakeholders to use the search engine as their primary source of information. A staged process to engage internal CRC stakeholders (partners, programs and projects) through to external audiences could be implemented to develop return visits, ongoing referrals and ultimately a highly engaged and enacted online community.

An active audience research program will also be needed to gather ongoing data about user experiences during the follow up period after launch and beyond. This can take many forms including but not limited to surveys, collection and analysis of website data analytics and in-depth interviews. This data could be integrated into audience and stakeholder engagements plans into the future.

5.3 Artefact curation and management

The management and curation of artefacts for the e-library (that interfaces with the search engine) is a critical process. Ensuring that items are fit-for-purposes, meet appropriate copyright and intellectual property conditions and contain appropriate content requires developing a governance, provenance and approval process that can be managed efficiently and sustainably over time. We recommend a two step process initially:

1. Initial artefacts contributed by CRC programs are checked by CRC management to ensure they meet requirements.
2. Over time, stakeholders and members of the community submit artefacts through the Connect interface and are checked through a process of self approval and internal moderation.

The final process will be determined through testing and communicated to stakeholders and audiences.

6. References

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7. Supplementary Information

7.1 Ethics Approvals

Relevant ethics approval numbers from Murdoch University Human Research Ethics Committee are as follows:

1. Survey for “User preferences, needs and expectations of the CRC TiME E-library/Search Platform” (2021/026)
2. Usability Survey and Interviews “Usability Testing of the CRC TiME E-library/Search Platform Prototype” (2021/058).

7.2 Surveys and Interviews

7.2.1 Survey 1 CRC TiME: Initial e-library survey

What is this survey for?

This survey is to learn more about stakeholders and their expectations and needs for the CRC TiME e-library/Knowledge Hub project. The e-library/Knowledge Hub project will allow users to upload, search for and access information, files and resources about mine closure and relinquishment. Your input will inform the design and capabilities of the e-library/Knowledge Hub project. The survey takes between 5-8 minutes to complete. Your participation is voluntary. You may skip questions you don't wish to answer or simply close the browser to cancel your participation. No identifying data about you will be collected when you complete the survey. If you have questions about the survey or wish to provide us with more information about your responses, please contact Dr Lauren O'Mahony: L.omahony@murdoch.edu.au. Thank you for your time.

Q1 My role in the CRC TiME project is:

- Chief Investigator (1)
- Researcher (2)
- Research Assistant (3)
- Other (please specify) (4) _____

Q2 I am a likely user of the e-library (to search for files/information and/or to upload files/information):

- Yes (1)
- No (2)
- Unsure (3)
-
-

Q3 I expect to use the e-library for:

- Uploading information and documents (1)
- Searching and Downloading information and documents (2)
- Other (please specify) (3) _____

Q4 Which computer or mobile device apps do you use the most? (please list all that apply)

- Please enter your response here (1) _____

Q5 Are there any computer and/or phone apps you have tried in the past but decided not to use? (please list all that apply and explain briefly why you stopped using them):

- Please enter your response here (1) _____

Q6 Which computer software programs do you use the most? (please list all that apply)

- Please enter your response here (1) _____

Q7 Are there any computer software programs you have tried in the past but decided not to use? (please list all that apply and explain briefly why you stopped using them):

- Please enter your response here (1) _____

Q8 Technical expertise and domain knowledge The following question relates to your familiarity with the likely content of the e-library and your general technical expertise in terms of using computers, the Internet, search engines and apps.

Please rate your expertise level in terms of the likely content of the e-library and your general proficiency in using computers, the internet, search engines and apps.

- No current knowledge of the likely content of the e-library and no technical (software and/or hardware) experience (double novice level) (1)
- Little current knowledge of the likely content of the e-library with lots of technical (software and/or hardware) experience (novice/expert level) (2)
- Above average knowledge of the likely content of the e-library with little technical (software and/or hardware) experience (expert/novice level) (3)
- Above average knowledge of the likely content of the e-library with lots of technical (software and/or hardware) experience (double expert level) (4)

Q9 Which internet search engines do you use mainly (select all that apply):

- Google (1)
 - Bing (3)
 - Yahoo (4)
 - Aol (5)
 - Ask.com (6)
 - DuckDuckGo (8)
 - Other (please specify) (7) _____
-

Q10 Which internet search engine from the previous question do you think is the best?

- Google (1)
- Bing (3)
- Yahoo (4)
- Aol (5)
- Ask.com (6)
- DuckDuckGo (2)
- Other (please specify) (7) _____

Q11 For the search engine that you selected for the previous question, we are interested in why that one appeals most to you. Please drag and drop the options up and down in the list so that 1 represents the most important to 5 for least important in relation to why you selected that search engine:

- _____ Easy to use (1)
- _____ Gives me the information I am searching for most of the time (2)
- _____ The display of results makes it easy to find what I am looking for (3)
- _____ The ability to customise the results (such as resorting by date or relevance, refining by category) (4)
- _____ I trust the search engine company with any private or personal information I provide (5)

Q12 What are your most common reasons for using a search engine? Please drag and drop the options up and down in the list so that 1 represents the most important to 5 for least important.

- _____ Find a particular web page or website (1)
- _____ Find specific information (2)
- _____ Find information (3)
- _____ Find advice (4)
- _____ Find resources, applications, documents (5)
- _____ Find facts or data (6)

Q13 When you use a search engine, do you usually: (please choose the response that applies most of the time):

- Find one result/source and use that source for all your needs (1)
 - Find a small number of results/sources to address your search needs (2)
 - Find a number of results/sources and cross-check information between them (3)
 - Find and gather information from as many sources and pieces of information as possible (4)
-
-



Q14 When you use a search engine, how often do you:

	None of the time (1)	A little of the time (2)	Some of the time (3)	Most of the time (4)	All of the time (5)
Know exactly what you are looking for (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Have a partial idea of what you are searching for, then use the results to narrow your search (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Use the search engine to browse for information (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Use the search engine to see what other users are looking for (i.e. lists of popular searches or content) (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



Q15 When using a search engine, consider how you devise search terms and phrases. How often do you use:

	None of the time (1)	A little of the time (2)	Some of the time (3)	Most of the time (4)	All of the time (5)
A single word (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
A small number of words (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
A sentence (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
A question (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q16 When you use a search engine, how important is it that:

	None of the time (1)	A little of the time (2)	Some of the time (3)	Most of the time (4)	All of the time (5)
The most useful information is displayed the first time you search, every time you search (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
A limited number of results are shown (such as most relevant) (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
An infinite number of results is shown (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
You can reorder results by relevance, date or other categories (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q17 When you use a search engine, how many results would you prefer were displayed on each page:

- 10 (1)
- 20 (2)
- 50 (3)
- 100 (4)

Q18 When you use a search engine, how do you prefer results to be displayed:

- In a list (1)
 - In a table (2)
 - In separate sections with images (3)
-



Q19 The next question asks about features that may be built into the e-library which we would like your opinion on. How useful would you find the following:

	Not at all useful (1)	Slightly useful (2)	Moderately useful (3)	Very useful (4)	Extremely useful (5)
A list of "top searches" (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
A list of "featured results" (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
A list of "most popular results" (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Predictive text or an auto suggestion function (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Options to filter, categorize, sort or otherwise order search results (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
A display of related searches to the terms or phrases you are searching for (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



Q20 The next questions relate to what you do with search results

	None of the time (1)	A little of the time (2)	Some of the time (3)	Most of the time (4)	All of the time (5)
How often do you use results from searches for yourself only? (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How often do you share results from searches with others? (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How often do you bookmark search results? (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How often do you add results to a wish list or reading list? (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q21 If you do not find what you are looking for when you use a search engine, how often do you:

	None of the time (1)	A little of the time (2)	Some of the time (3)	Most of the time (4)	All of the time (5)
Re-search using different terms or phrases (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Reorganise the search results by date or relevance (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Keep searching using the same search engine until you find what you are looking for (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Use a different search engine or search tool to find the information (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q22 Consider the kinds of files and documents that will most like be housed in the e-library, what are you most likely going to search for? (please select all the apply)

- Archive files (1)
- Audio files (such as MP3, MP4 or .wav) (2)
- E-publications or e-books (3)
- Document files (such as Doc/docx, PDF, RTF) (4)
- Image files (such as Jpeg or .pic) (5)
- Presentation files (such as PPT) (6)
- Excel or spreadsheet files (7)

- Streaming media (such as .m3u8) (8)
- Video/movie files (9)
- Web files (such as HTML) (10)
- other file types (please specify) (11) _____

Q23 Do you own an external database that you would like to be accessible to stakeholders in the e-library?

- No (1)
 - Unsure (2)
 - Yes (If yes, please tell us more about this external database) (3)
-

Q24 If you answered "yes" for the previous question, is the database currently searchable via the web?

- Yes (1)
- No (2)
- Not sure (3)

Q25 If you answered "yes" for the previous question, is the ability to search this database via the web accessible publicly (i.e. does the database require a login or password to use the search function)?

- Yes (1)
- No (2)
- Not sure (3)

Q26 Do you expect to upload documents to the CRC TiME e-library?

- Yes (1)
 - No (2)
 - Unsure (3)
-

Q27 If yes, which formats will the files likely be in? Please select all that apply

- Archive files (1)
- Audio files (such as MP3, MP4 or .wav) (2)
- epub ebooks (3)
- Document files (such as Doc/docx, PDF, RTF) (4)
- Image files (such as Jpeg or .pic) (5)
- Presentation files (such as PPT) (6)
- Spreadsheet files (7)
- Streaming media (such as .m3u8) (8)
- Video/movie files (9)
- Web files (such as HTML) (10)
- Other file types (please specify) (11) _____

Q28 Roughly how many files do you expect to upload to the e-library?

- Between 1-10 (1)
- 10-50 (2)
- 50-100 (3)
- 100+ (4)

Q29 Consider the size of the files you expect to upload to the e-library. Approximately how big will most of the individual files be?



- Less than 1MB (1)
- Between 1MB and 100MB (2)
- Between 100MB to 1GB (3)
- 1GB plus (4)

Thank you for your time.

If you have questions about the survey or wish to provide us with more information about your responses, please contact Dr Lauren O'Mahony: L.omahony@murdoch.edu.au



7.2.2 Survey 2: CRC-TiME E-library Future User Survey

Participant Information and Consent

What is this survey about?

This survey is to learn more about stakeholders and their expectations and needs for the CRC TiME e-library/Knowledge Hub. The e-library/Knowledge Hub is an interface that will allow users to search for and access information, files and resources about mine closure and relinquishment. Your input via completion of this survey will inform the design and capabilities of the e-library/Knowledge Hub interface. As well, results from this survey may be published in a research paper however none of the information you provide will be linked back to you as an individual.

Why have I been invited?

You have been invited to participate in this survey as you are likely to be a user of the CRC-TiME e-library/search once it is up and running. This survey is intended only for likely users of the e-library/search platform. Please only share this link with other likely users of the CRC-TiME e-library/search platform.

Do I have to participate?

Participation in this survey is entirely voluntary. By completing the survey and submitting the results, you are giving your consent to take part in this research study. You are free to withdraw from participating at any time while completing the survey: simply close the browser. Once you have completed the survey, it will not be possible for you to withdraw your responses as all individually completed surveys are anonymous.

What does participation involve?

You are asked to complete a short survey about your preferences, needs and expectations of the CRC-TiME e-library/search engine. The survey contains a small number of demographic questions so that we can understand the likely users of the e-library better and anticipate their needs. You will then be asked questions about your prior use of search engines such as Google and your expectations and needs for the CRC TiME e-library. Completion of the survey should take no more than 10 minutes. All responses collected will be anonymous. Responses and data collected will be stored securely and only accessible to the research team.

What are the risks and benefits of participating?

No risks are anticipated in participating in this survey. While there may be no direct benefit of participation other than sharing your needs, preferences and expectations, your responses will inform the design and capabilities of the CRC-TiME e-library/search.

Questions or issues relating to the survey

If you have questions about the survey or would like more information before you decide to participate please contact Dr Lauren O'Mahony: L.omahony@murdoch.edu.au

If, after reading from the information above, you agree to continue with the survey, please choose "yes" from the options below and proceed. Should you change your mind at any time and decide to withdraw, simply close your browser to automatically exit the survey. Please note that once you click "submit" at the end of the survey,

your responses will be recorded and it will not be possible to withdraw or amend them because we cannot link responses to individual participants.

Thank you for your time.

- Yes, I agree to participate (4)
- No thanks, I don't want to participate (5)

*Skip To: End of Survey If Participant Information and Consent What is this survey about? This survey is to learn more about...
= No thanks, I don't want to participate*

Q1 Please select which age group applies to you:

- 18-30 (1)
- 31-40 (2)
- 41-50 (3)
- 51-60 (4)
- 61-70 (5)
- 71+ (6)

Q2 What is your gender?

- Female (1)
- Male (2)
- Non-binary/third gender (3)
- I prefer not to answer (4)
- Other (5)

Q3 Please select which state or territory you reside in:

- ACT (1)
 - New South Wales (2)
 - Northern Territory (6)
 - Queensland (3)
 - South Australia (5)
 - Tasmania (8)
 - Victoria (7)
 - Western Australia (4)
-

I live outside Australia (please state which country) (9)

Q4 My relationship to the CRC TiME is:

- Chief Investigator (1)
 - Project leader (5)
 - Mine company employee (6)
 - Member of the public/community (7)
 - Government employee (8)
 - Researcher (2)
 - Research Assistant (3)
 - Member of a community group (9)
 - Other (please specify in the box provided) (4)
-

Q5 I expect to use the e-library for:

- Uploading information and documents (1)
- Searching and Downloading information and documents (2)
- Other (please specify) (3) _____

Q6 Technical expertise and domain knowledge The following question relates to your familiarity with the likely content of the e-library and your general technical expertise in terms of using computers, the Internet, search engines and apps.

Please rate your expertise level in terms of the likely content of the e-library and your general proficiency in using computers, the internet, search engines and apps.

- No current knowledge of the likely content of the e-library and no technical (software and/or hardware) experience (double novice level) (1)
- Little current knowledge of the likely content of the e-library with lots of technical (software and/or hardware) experience (novice/expert level) (2)
- Above average knowledge of the likely content of the e-library with little technical (software and/or hardware) experience (expert/novice level) (3)
- Above average knowledge of the likely content of the e-library with lots of technical (software and/or hardware) experience (double expert level) (4)

Q7 Which internet search engines do you use mainly (select all that apply):

- Google (1)
 - Bing (3)
 - Yahoo (4)
 - Aol (5)
 - Ask.com (6)
 - DuckDuckGo (8)
 - Other (please specify) (7) _____
-

Q10 Which internet search engine from the previous question do you think is the best?

- Google (1)
- Bing (3)
- Yahoo (4)
- Aol (5)
- Ask.com (6)
- DuckDuckGo (2)
- Other (please specify) (7) _____

Q8 For the search engine that you selected for the previous question, we are interested in why that one appeals most to you. Please drag and drop the options up and down in the list so that 1 represents the most important to 5 for least important in relation to why you selected that search engine:

- _____ Easy to use (1)
 - _____ Gives me the information I am searching for most of the time (2)
 - _____ The display of results makes it easy to find what I am looking for (3)
 - _____ The ability to customise the results (such as resorting by date or relevance, refining by category) (4)
 - _____ I trust the search engine company with any private or personal information I provide (5)
-

Q9 What are your most common reasons for using a search engine? Please drag and drop the options up and down in the list so that 1 represents the most important to 5 for least important.

- _____ Find a particular web page or website (1)
- _____ Find specific information (2)
- _____ Find general information (3)
- _____ Find advice (4)
- _____ Find resources, applications, documents (5)
- _____ Find facts or data (6)

Q10 On which device do you do most of your internet searching:

- Desktop computer (1)
- Laptop computer (2)
- Mobile phone (3)
- Tablet (such as an Ipad or Surface) (4)
- Other (please write the device in the box provided) (5)

Q11 When you use a search engine, do you usually: (please choose the response that applies most of the time):

- Find one result/source and use that source for all your needs (1)
- Find a small number of results/sources to address your search needs (2)
- Find a number of results/sources and cross-check information between them (3)
- Find and gather information from as many sources and pieces of information as possible (4)



Q12 When you use a search engine, how often do you:

	None of the time (1)	A little of the time (2)	Some of the time (3)	Most of the time (4)	All of the time (5)
Know exactly what you are looking for (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Have a partial idea of what you are searching for, then use the results to narrow your search (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Use the search engine to browse for information (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Use the search engine to see what other users are looking for (i.e. lists of popular searches or content) (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q13 When using a search engine, consider how you devise search terms and phrases. How often do you use:

	None of the time (1)	A little of the time (2)	Some of the time (3)	Most of the time (4)	All of the time (5)
A single word (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
A small number of words (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
A sentence (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
A question (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

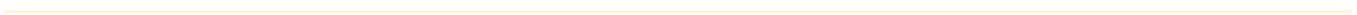


Q14 When you use a search engine, how important is it that:

	None of the time (1)	A little of the time (2)	Some of the time (3)	Most of the time (4)	All of the time (5)
The most useful information is displayed the first time you search, every time you search (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
A limited number of results are shown (such as most relevant) (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
An infinite number of results is shown (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
You can reorder results by relevance, date or other categories (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q15 When you use a search engine, how many results would you prefer were displayed on each page:

- 10 (1)
- 20 (2)
- 50 (3)
- 100 (4)



Q16 When you use a search engine, how do you prefer results to be displayed:

- In a list (1)
- In a table or as cards (2)
- In separate sections with images (3)

Q17 The next question asks about features that may be built into the e-library which we would like your opinion on. How useful would you find the following:

	Not at all useful (1)	Slightly useful (2)	Moderately useful (3)	Very useful (4)	Extremely useful (5)
A list of "top searches" (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
A list of "featured results" (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
A list of "most popular results" (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Predictive text or an auto suggestion function (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Options to filter, categorize, sort or otherwise order search results (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
A display of related searches to the terms or phrases you are searching for (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



Q18 The next questions relate to what you do with the results generated by a search engine:

	None of the time (1)	A little of the time (2)	Some of the time (3)	Most of the time (4)	All of the time (5)
How often do you use results from searches for yourself only? (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How often do you share results from searches with others? (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How often do you bookmark search results? (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How often do you add results to a wish list or reading list? (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



Q19 If you do not find what you are looking for when you use a search engine, how often do you:

	None of the time (1)	A little of the time (2)	Some of the time (3)	Most of the time (4)	All of the time (5)
Re-search using different terms or phrases (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Reorganise the search results by date or relevance (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Keep searching using the same search engine until you find what you are looking for (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Use a different search engine or search tool to find the information (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q20 Consider the kinds of files and documents that will most like be housed in the e-library, what are you most likely going to search for? (please select all the apply)

- Archive files (1)
- Audio files (such as MP3, MP4 or .wav) (2)
- E-publications or e-books (3)
- Document files (such as Doc/docx, PDF, RTF) (4)
- Image files (such as Jpeg or .pic) (5)
- Presentation files (such as PPT) (6)
- Excel or spreadsheet files (7)
- Streaming media (such as .m3u8) (8)
- Video/movie files (9)
- Web files (such as HTML) (10)
- other file types (please specify) (11) _____

Thank you for your time.

If you have questions about the survey or wish to provide us with more information about your responses, please contact Dr Lauren O'Mahony: L.omahony@murdoch.edu.au

7.2.3 Survey 3: CRC TiME Search Prototype Usability Survey

Participant Information and Consent

What is this survey about? This survey comprises a series of short tasks to test the CRC TiME search engine prototype. The survey is designed for stakeholders within the CRC to provide us with information about how you search and whether the search tool can be further refined. The CRC TiME search/Knowledge Hub is an interface that will allow users to search for and access information, files and resources about mine closure and relinquishment. Your input via completion of this survey will inform the design and capabilities of the e-library/Knowledge Hub interface. As well, results from this survey may be published in a research paper however none of the information you provide will be linked back to you as an individual. This survey is part of a research project by Murdoch University in partnership with the CRC TiME (Transition in Mining Economies) and hosted at Murdoch by the Harry Butler Institute. This research is funded by a grant from the CRC TiME.

Why have I been invited? You have been invited to participate in this survey as you are likely to be a user of the CRC-TiME e-library/search once it is up and running. This survey is intended only for likely users of the e-library/search platform. Please only share this link with other likely users of the CRC-TiME e-library/search platform.

Do I have to participate? Participation in this survey is entirely voluntary. By completing the survey and submitting the results, you are giving your consent to take part in this research study. You are free to withdraw from participating at any time while completing the survey: simply close the browser. Once you have completed the survey, it will not be possible for you to withdraw your responses as all individually completed surveys are anonymous.

What does participation involve? You are asked to complete a short survey including some basic demographic details, three short tasks using a prototype of the search tool followed up by some brief questions on your search experience. You will be provided with a link to a prototype of the search tool then given instructions to complete three tasks. The three short tasks provide a scenario and then ask you to search the e-library for a document or file. Completion of the survey should take no more than 5 minutes. All responses collected will be anonymous. Responses and data collected will be stored securely and only accessible to the research team. It is possible that data generated from this survey may be used in research projects related to the functionality and use of the e-library at a later date.

What are the risks and benefits of participating? No risks are anticipated in participating in this survey. While there may be no direct benefit of participation other than sharing your needs, preferences and expectations, your responses will inform the design and capabilities of the CRC-TiME e-library/search.

Questions or issues relating to the survey If you have questions about the survey or would like more information before you decide to participate please contact Dr Lauren O'Mahony: L.omahony@murdoch.edu.au If, after reading from the information above, you agree to continue with the survey, please choose "yes" from the options below and proceed. Should you change your mind at any time and decide to withdraw, simply close your browser to automatically exit the survey. Please note that once you click "submit" at the end of the survey, your responses will be recorded and it will not be possible to withdraw or amend them because we cannot link responses to individual participants. Thank you for your time.

- Yes, I agree to participate (4)
- No thanks, I don't want to participate (5)



*Skip To: End of Survey If Participant Information and Consent What is this survey about?This survey comprises a series of s...
= No thanks, I don't want to participate*

Q1 Please select which age group applies to you:

- 18-29 (1)
- 30-39 (2)
- 40-49 (3)
- 50-59 (4)
- 60-69 (5)
- 70+ (6)

Q2 What is your gender?

- Female (1)
- Male (2)
- Non-binary/third gender (3)
- I prefer not to answer (4)
- Other (5)

Q3 Please select which state or territory you reside in:

- ACT (1)
 - New South Wales (2)
 - Northern Territory (6)
 - Queensland (3)
 - South Australia (5)
 - Tasmania (8)
 - Victoria (7)
-

- Western Australia (4)
 - I live outside Australia (please state which country) (9)
-

Q4 My relationship to the CRC TiME is:

- Chief Investigator (1)
 - Project leader (5)
 - Mine company employee (6)
 - Member of the public/community (7)
 - Government employee (8)
 - Researcher (2)
 - Research Assistant (3)
 - Member of a community group (9)
 - Other (please specify in the box provided) (4)
-

Q5 Please click on and open the following URL [http://13.239.4.105/?CRC_TiME_Search=main] in a separate window or tab. The URL will take you to a prototype version of the search tool that has been specifically designed for user testing, but with the same capabilities and functionality of the current design of the search

tool. You will now be provided with a brief scenario and tasks to guide your searching of the prototype search tool.

Scenario: You attended a recent Sustainable Development Conference. At the conference you took a number of photos during several interesting talks in order to look up the documents later. In front of you is the CRC TiME search engine, and you have your photos.

Task 1: Below is a clear shot of a document that was discussed during a great talk at the conference. Based on the photo, please use the search engine to find the document.



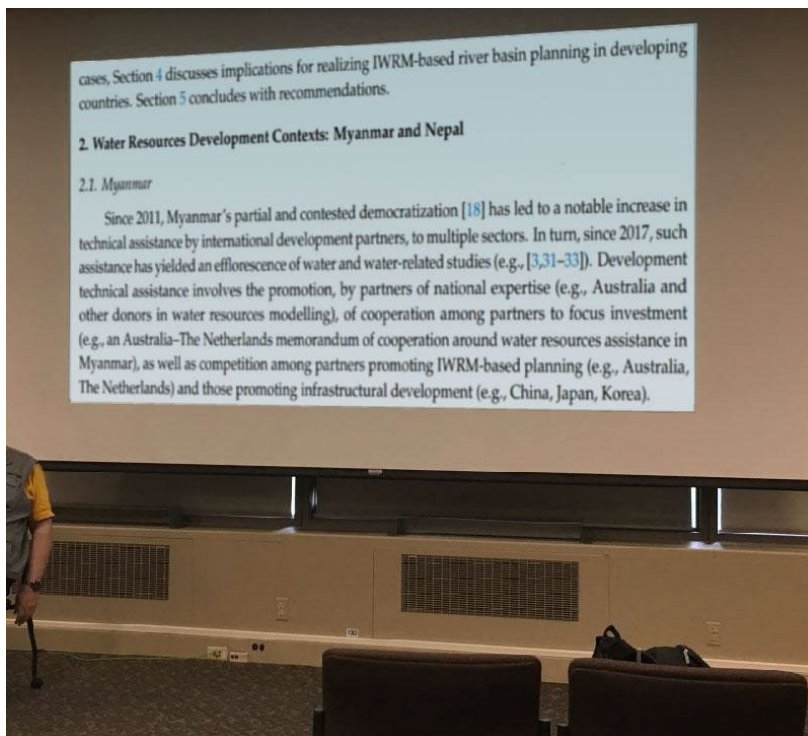
For Task 1, please insert responses to the following prompts in the text box below.

Which exact search terms did you use to find the document? Was there any point where you felt you didn't have information that you needed to successfully find the document? Did solving any task feel more complex than it needed to be?

Q6

Using the same URL for the previous Task above, please read the following scenario and undertake a search accordingly.

Task 2: At the same conference, you took a photo of one of the talks but you didn't get the title page of the presentation, only the second or third slide. You can make out some of the headings though. Using whatever information you can extract from the below photo, please use the search engine to locate one or more documents that will provide more information about the presentation.



For Task 2, please insert responses to the following prompts in the text box below.

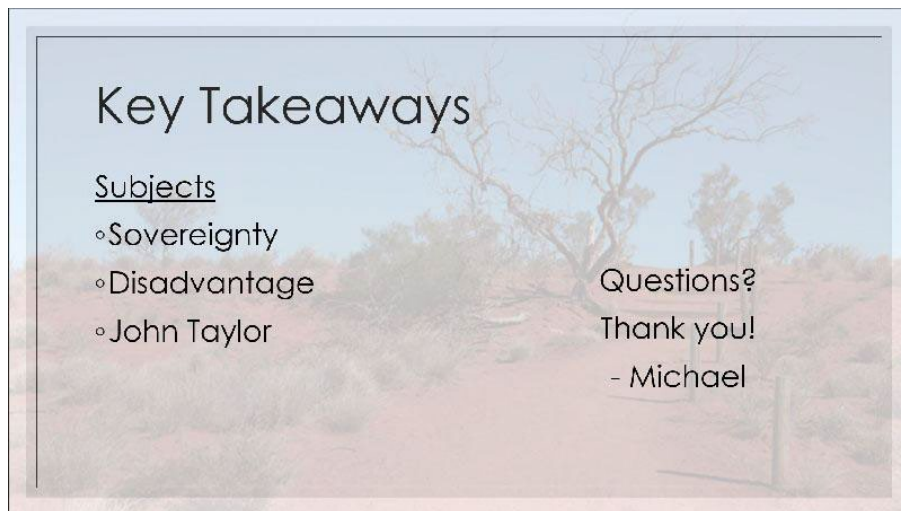
What exact search terms did you use to find the document(s)? Was there any point where you felt you didn't have information that you needed to successfully find the document? Did solving any task feel more complex than it needed to be?

Q7 Using the same URL for the previous Task above, please read the following scenario and undertake a search accordingly.

Task 3: By this stage of the conference, it was getting late and you were getting tired, but something caught your ear in one of the talks you heard. While you didn't get a photo of any of the content from that talk, you took a

photo of the final slide. You want to read more about topic but all you have is the final slide with some info on subjects covered in the talk.

Using information from the below photo, use the search engine to find the project.



For Task 3, please insert responses to the following prompts in the text box below.

What exact search terms did you use to find the document(s)? Was there any point where you felt you didn't have information that you needed to successfully find the document? Did solving any task feel more complex than it needed to be?

Thank you for your time.

If you would like to participate in a usability test interview with the CRC TiME Search Tool Designer via video-conferencing, please contact Renae Desai at r.desai@murdoch.edu.au.

Should you have questions about the survey or wish to provide us with more information about your responses, please contact Renae Desai at the email address above.

7.2.4 Think Aloud Usability Test Script

Web browser should be open to Google or some other “neutral” page

Hi, _____. My name is _____, and I’m going to be walking you through this session today.

Before we begin, I have some information for you, and I’m going to read it to make sure that I cover everything. You probably already have a good idea of why we asked you here, but let me go over it again briefly. We’re asking people to try using a Website that we’ve been working on so we can see whether it works as intended. This webpage design has been constructed based on an initial survey, interview data and initial design feedback using an evidence based design process. The session should take about 10 -20 minutes.

The first thing I want to make clear right away is that we’re testing the *site*, not you. You can’t do anything wrong here.

As you use the site, I’m going to ask you as much as possible to try to think out loud: to say what you’re looking at, what you’re trying to do, and what you’re thinking. This will be a big help to us.

Also, please don’t worry that you’re going to hurt my feelings. We are doing this to improve the site, so we need to hear your honest reactions.

If you have any questions as we go along, just ask them. If you still have any questions when we’re done, I’ll try to answer them then. And if you need to take a break at any point, just let me know.

I’m now going to read aloud the consent form to you. This consent form confirms that you have agreed to participate in this study voluntarily to help us work out what works the best in relation to the design of the site and that the information collected from you will inform the refinement of the search engine. It is also intended that results from your usability test along with results from other participants will be published in a peer-reviewed journal in the future. In the case of publication, your identity will not be disclosed. We also will make sure any quotes or language you use does not reveal your identity.

Please make sure you disable any notifications, messages or email popups from appearing on your screen. **Just so you know, this usability test will not be recorded.**

Do you have any questions so far?

Read the consent form aloud, and receive verbal confirmation from the participant to proceed.

OK, great. It is now time to start the usability test.

☑ Please copy and paste this link into a browser <http://206.189.45.97/~mesh20/sub3/search-v1.html> for the elibrary site’s Home page.

Can you please share your screen with me

First, I’m going to ask you to look at this page and tell me what you make of it:

- what strikes you about it
 - what it’s for
 - can you describe the look and feel of this page
-

-is there anything on this page you do not like?

You can scroll if you want to, but don't click on anything yet

Thanks. Now I'm going to ask you to try doing some specific tasks. I'm going to read each one out loud.

1. Task Description- In this search page can you please explain which element of the design catches your eye first?

Users Comments:

Testers Comments:

Which page do you think looks better to

No 1 this current page with vista

OR

Click on the 'learn more' link at the top of the page No2 with landscape

2. Task Description – Can you please describe what kind of information you think will be displayed after clicking the search button

Users Comments:

Testers Comments:

3. Task Description- Assuming you wanted to search with advanced search functions how would you go about that?

Users Comments:

Testers Comments:

4. Task Description –(After clicking on the advanced search link) Can you please describe the functions presented in the advanced search area

Users Comments:

Testers Comments:

5. Task Description – Assuming you wanted to add a search filter to the search function, how would you go about doing this?

Users Comments:

Testers Comments:

6. Task Description – please click on the search button

This is the search results page. We are going to look at 2 different versions of the search results starting from this current page. From your first impressions can you tell me which of the two you find the most appealing, can you explain why?

The current search results is number 1- a horizontal card view

Click on the first search result read more link- this is a vertical card view



Which one do you like the best

Users Comments:

Testers Comments:

7. Task Description- In this search results page can you please point out any other extra search related results?

Users Comments:

Testers Comments:

8. Task Description – Assuming you wanted to sort the search results by date, how would you go about this?

Users Comments:

Testers Comments:

9. Task Description- In this search results page can you please point out the most relevant search result?

Users Comments:

Testers Comments:

10. Task Description- In this search results page can you please point out any part of the page you don't understand?

Users Comments:

Testers Comments:

10. Task Description- What features within the search area did you find the most valuable and why?

Users Comments:

Testers Comments:

Summary of Test Results

Describe the main problems you or the user detected

