

7. Discussions and Conclusion

Our usability and accessibility framework for digital libraries concentrates on establishing a framework that focuses on the main characteristics of digital libraries. This focus is based on the findings we gathered from the extensive research we did of current usability practices adopted by JISC, the requirements of the stakeholders and additional investigation in the area of digital libraries.

According to our findings, the main characteristics of a truly usable and accessible digital library are:

- Support task-based information seeking behaviour
- Highly organised information content

The framework was constructed in a way that specifically addressed these factors, and met the usability and accessibility needs of digital libraries. Therefore ensuring that, by adopting the framework digital libraries, truly usable and accessible digital libraries can be produced.

The evaluations of a selection of JISC services were conducted using the usability and accessibility framework established for digital libraries. The methodologies adopted in this study were both analytic and empirical. Query techniques were used to establish the requirements and key problems that users currently experienced. User testing was conducted to further identify major usability and accessibility issues with each of the JISC services. This was followed by analytic evaluations such as heuristics evaluations and cognitive walkthroughs with usability and accessibility experts evaluating the JISC services based on their expert knowledge. Each stage in the process was supported and supplemented where needed by the one that followed in order to clarify the findings, identify further usability and accessibility issues and produce an iterative process.

Digital libraries have made traditional services and resources more usable and accessible:

- Users are able to search and retrieve the information they require remotely in their own time frame.
- A more diverse variety of resources can be easily accessed
- Information can be continually updated

Digital Libraries also have the opportunity to help develop and support user's idea creation and information seeking processes. These generally involve initial ideas that expand as the task develops. DL's can support this process by incorporating visualisation techniques to help users develop and widen their search. The KartOO portal displays an example of how this technique has been deployed. The system gathers the results, compiles them and represents them in a series of interactive maps through a proprietary algorithm (KartOO, 2003). Figure 8 demonstrates how KartOO visually represents the relationship between related resources.

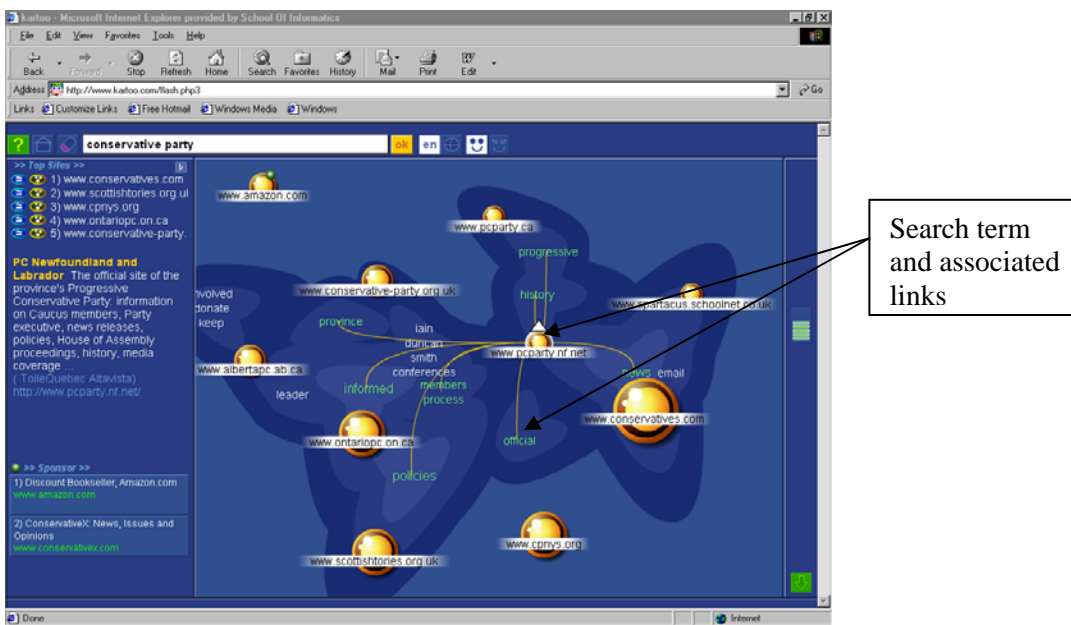


Figure 1: KartOO

Developments such as those used by KartOO can enable JISC's digital libraries to further extend and support end-user information seeking behaviour, and our DL framework can help ensure that these developments are truly usable and accessible, along with the following guidelines.

7.1 Suggestions to practitioners

Practitioners could apply the usability and accessibility evaluation framework into the evaluation of digital libraries. For JISC practitioners, the usability and accessibility evaluation framework could be adopted into the evaluation of the JISC Information Environment in order to assess the usability and accessibility issues for JISC.

Furthermore, the section on the review of literature on HCI design methods, techniques and guidelines provide some implementation suggestions for JISC with additional resources for further information. JISC practitioners could reference these methods, techniques and guidelines as a usability toolkit for JISC.

In the meantime, the usability and accessibility guidelines established from the findings of the four JISC services evaluated, could be adopted into the re-design of existing JISC services and resources as well as in the design for future JISC services. This would ensure appropriate usability and accessibility practices being adopted into the JISC Information Environment and enable a usable and accessible service and resource for the JISC Information Environment.

7.2 Suggestions to researchers

Future research directions for JISC could be in investigating how appropriate HCI design principles could best be applied within JISC services and resources. Also, how to address current developments in HCI design and synthesise these for use within the context of the JISC Information Environment. In particular, to cover the role of HCI design in the delivery of learning, teaching and research, and most importantly, to further investigate how JISC could be adopting these principles for HCI design within its practices more formally in the future.

At the same time, an investigation of visualisation techniques for use by JISC services and resources could be conducted, establishing sets of visualisation techniques and guidelines for JISC to enhance the delivery of information for learning, teaching and research within the JISC Information Environment.

Furthermore, as JISC is aware, the Disability and Discrimination Act now requires that services must be accessible to all, irrespective of disability. Therefore, there is a need for in-depth investigation into the accessibility of each of the JISC individual services and resources. An in-depth accessibility evaluation should be carried out on each individual JISC service and resource aiming to assess and evaluate their accessibility. Meanwhile, an investigation could be conducted on how accessibility guidelines could best fit into the JISC services and resources. This would enable JISC to apply the best usability and accessibility practices into their current and future services and resources, ensuring that the JISC Information Environment complies with the

legislation and is able to practice the 'Design for All' approach as promoted by the European Design for All e-accessibility network.

In terms of digital libraries, future research could be done into specific digital libraries, such as specific library services like geo-spatial information services and bibliographic database services. An in-depth investigation into these services specifically would help to refine our framework and guidelines presented in this project and to be able to further cater for the needs of different digital library services.

7.3 Usability and Accessibility Guidelines

7.3.1 Key principles of Human-Centred Design (HCD)

The HCD approach is a complement to software development methods, not a replacement for them. The key principles of HCD are as follows:

- *The active involvement of users and clear understanding of user and task requirements*

One of the key strengths of human-centred design is the active involvement of end-users who have knowledge of the usage context in which the system will be used. Involving end-users can also enhance the acceptance of and commitment to the new software, as people come to feel that the system is being designed in consultation with them rather than being imposed on them.

- *An appropriate allocation of function between user and system*

It is important to determine which aspects of a job or task should be handled by people and which can be handled by software and hardware. This division of labour should be based on an appreciation of human capabilities, their limitations, and a thorough grasp of the particular demands of the task.

- *Iteration of design solutions*

Iterative software design entails receiving feedback from end-users following their use of early design solutions. These may range from simple paper mock-ups of screen layouts to software prototypes with greater fidelity. The users attempt to accomplish 'real world' tasks using the prototype. The feedback from this exercise is used to develop the design further.

- *Multi-disciplinary design teams.*

Human-centred system development is a collaborative process that benefits from the active involvement of various parties, each of whom have insights and expertise to share. It is therefore important that the development team is made up of experts with technical skills as well as stakeholders in the website. The team might thus include:

- managers
- usability specialists
- end-users
- software engineers

- graphic designers
- writers
- editors
- interaction designers
- training and support staff
- task experts

7.3.2 General Presentation

1. Layout and navigation

- The organisation's logo should be consistently positioned in the same spot
- The design and page layout should be applied consistently
- The navigational elements should be displayed consistently

2. Registration

- Users should be able to get assistance when they have forgotten their password
- The reasons for and benefits of registering should be made evident to users
- Only necessary information should be required

3. Information Architecture

- The content of site areas should meet user expectations, e.g. navigation should lead to the expected content
- Rarely needed information should not be continuously presented to the users, but should be easily accessible via a link
- The web-site should not force the users to follow a rigid structure
- It should be obvious where you are and where you can go next

4. Labelling and headings

- Link labels should reveal the content that they lead to
- The labels for site areas should be easily understandable
- The headings should be informative and concise and should accurately reflect the content
- Labels should be written consistently and acronyms should be avoided where possible

5. Images and Animation

- The images should add value to the information presented on the page
- Pictures should be well implemented and not distorted

7.3.3 Specific Usability Aspects

1. Search

- There should be a site specific search engine
- Any search facility should be found easily and should not be hidden
- There should be a search functionality that allows the user to narrow down the search or the search results according to categories
- The search should not force the users to search by predefined menus or categories, i.e. keyword search in all categories should be made available
- The search should be error tolerant. Slightly modified keywords should lead to the same or similar results. Modifications which should be accepted include words with or without hyphen/space or abbreviations
- Search hints should be provided (e.g. of appropriate formats) within the search page or next to the search box where the hints would be obvious to the users

2. Navigation

- The navigation should not change, i.e. the top-level navigation items should still be available on a lower level
- The meaning of the navigation elements should be clear
- Clickable elements should be distinguished clearly from non-clickable content
- Already-visited links should be visually distinguishable in lists (e.g. search results) or in content (e.g. news articles)
- Each page should include a link to the home page

3. Forms Layout

- Forms should be structured in a reasonable way, i.e. information that belongs together should be grouped together
- In forms it should be clear which information is required and which is optional
- There should be instructions or examples (e.g. of formats) to help users to fill out forms
- Instructional text for forms should be clear and helpful

4. Contrast and Scanability

- The main pages (Home and 1st level) should be uncluttered, easily scanned and not too dense with content
- The font type, font size, line length and line spacing should allow for easy reading

- Important information should be highlighted appropriately. For example visual clues such as different font sizes should be used where necessary
- There should be a clear contrast between the background and the content (text, pictures, navigation) of the page

5. Optimisation (size and print)

- The most important links should appear high enough on the page to be visible without scrolling
- [The content should fit on a screen with a resolution of 800x600 without scrolling] OMIT? see my note
- The content should fit standard paper size (i.e. A4) if printed, i.e. none of the content will be cut off
- Print options, such as a printer friendly version, should be available

6. Help

- Breadcrumb navigation (e.g path) should support orientation and answer the question ‘Where am I on this site?’
- If site has functionalities that go beyond pure content presentation, there should be help features or FAQs available
- The help function should be easily found from every page
- The help section should offer answers to each important question about using the site
- The help section should be sorted alphabetically or thematically.
- The help function in a content page should be a direct link to the answers/help features for that specific section of the content rather than taking users to the general help menu
- Error messages should be expressed in plain language (no codes), precisely indicating the problem, and constructively suggesting a solution

7. Usage of Windows

- New browser windows or pop-up windows should not be used to show content of the site

8. Speed and Errors

- Overall the site should be stable, i.e. there should be no system errors
- Download times should be minimised, i.e. it should not take longer than 15s on a 56k modem to download any page
- The first page of the search results should be displayed quickly (there should be no interruptions, such as server problems).

7.3.4 Specific Accessibility Aspects

- 1.** “Skip navigation option” should be included in the interface design. An appropriate method should be used to facilitate the easy tracking of page content that provides users of assistive technology the option to skip repetitive navigation links
- 2.** Provide alternative text for all images. An "alt" (alternative text attribute) and/or a "longdesc" (long description tag) should be provided as equivalent alternatives for any multimedia presentation, i.e. text equivalent for every non- text element or in element content
- 3.** As JISC users are mainly task oriented and information seeking focused, information provided should be well structured with good categorisation of information. Provide navigation schemes to show users where they are in the context of the site’s hierarchy
- 4.** The interface layout should minimise the number of links available to users. This would assist users to navigate and browse the site more efficiently and effectively with their assistive technologies.
- 5.** Ensure users have control over the web page at all times. The link ‘Home’ should be provided in every single page of the site and should be identical to users.
- 6.** Provide each frame with a title. Title frames with text facilitate frame identification and navigation
- 7.** Data tables should provide identification of row and column headers. Ensure the title of each row and column header is clear. i.e. directly related to the content within that specific row or column
- 8.** Documents should be readable without requiring an associated style sheet.
- 9.** Use descriptive, clear text links and avoid the use of vague references such as "click," "here," & “more” etc.
- 10.** Avoid scrolling/moving text and the use of ‘...’, ‘+’ symbols in the content.
- 11.** All information required for navigation or meaning should not depend on the ability to identify specific colours. Background colours should be avoided since colour schemes can create problems with legibility
- 12.** Pages should be usable when scripts, applets, or other programmatic objects are turned off or not supported, or should provide equivalent information on an alternative accessible page
- 13.** Multiple browser testing has to be conducted on all the current versions of popular browsers such as Netscape Navigator, Internet Explorer, Opera and Lynx