An evaluation of the user requirements of users of the Irish Virtual Research Library and Archive

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Abstract

This thesis evaluates the user needs of users of the Irish Virtual Research Library and Archive (IVRLA). The research questions focused on examining three aspects of the IVRLA User Interface Version 1.0: basic functionality, added-value functionality and bilingual functionality.

To examine these research questions a usability study of the IVRLA UI was conducted, which included a pre-usability study questionnaire, a think out loud usability test and a post-usability study questionnaire. The usability study was conducted in the University of Limerick and involved six participants; four history researchers and two Irish language researchers.

As part of its conclusion this research study made a list of recommendations to improve the basic functionality of the IVRLA UI. This study also recommended the replacement of Delicious as the tagging system utilised by the IVRLA in favour of a tagging system incorporated in OJAX++. Finally, it was recommended that the IVRLA develop an Irish language version of its UI.
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### Abbreviations

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<tr>
<td>DHO</td>
<td>Digital Humanities Observatory</td>
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<tr>
<td>DOI</td>
<td>Digital Object Identifier</td>
</tr>
<tr>
<td>HII</td>
<td>Humanities Institute of Ireland</td>
</tr>
<tr>
<td>IUPUI</td>
<td>Indiana University – Purdue University Indianapolis</td>
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<td>IVRLA</td>
<td>Irish Virtual Research Library and Archive</td>
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<tr>
<td>OAI</td>
<td>Open Archives Initiative</td>
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<tr>
<td>OPAC</td>
<td>Online Public Access Catalogue</td>
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<tr>
<td>OSS</td>
<td>Open Source Software</td>
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<tr>
<td>PRTLI</td>
<td>Programme for Research in Third Level Institutions</td>
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<tr>
<td>RSS</td>
<td>Really Simple Syndication</td>
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<tr>
<td>SILS</td>
<td>School of Information and Library Studies</td>
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<tr>
<td>SRU</td>
<td>Search/Retrieval via URL</td>
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<tr>
<td>UCD</td>
<td>University College Dublin</td>
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<tr>
<td>UI</td>
<td>User Interface</td>
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<td>UL</td>
<td>University of Limerick</td>
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Chapter 1 - Introduction

The title of this thesis is “An evaluation of the user requirements of users of the Irish Virtual Research Library and Archive”.

1.1 Background information

1.1.1 IVRLA

The Irish Virtual Research Library & Archive (IVRLA) is a major digitisation and digital object management project launched in University College Dublin (UCD) in January 2005 and scheduled to run for five years. The IVRLA was conceived as a means to preserve and facilitate access to material held in UCD’s main repositories through the use of digitisation technologies. The IVRLA is a component of the Humanities Institute of Ireland (HII) and is funded by the Programme for Research in Third Level Institutions (PRTLI) Phase 3.

Materials from the repositories of the following schools and departments have been digitised or are in the process of being digitised and are available on the IVRLA User Interface Version 1.0:

- **UCD School of Irish, Celtic Studies, Irish Folklore and Linguistics**
  - UCD Delargy Centre for Irish Folklore and the National Folklore Collection
  - Irish Dialect Archive
- **UCD School of History and Archives**
  - UCD Archives
- **UCD James Joyce Library**
  - Special Collections Department

The repositories contain physical materials in documentary, audio, video and graphic formats and the resultant issues of conservation and preservation that surround these types of material result in limitations and restriction of use. The fact that the materials are dispersed across the various repositories in UCD means there are further difficulties in relation to access and use. The IVRLA provides a means of accessing these materials digitally without compromising their conservation and preservation.
In September 2007 the IVRLA repository was launched and has since been available for use by researchers through the IVRLA User Interface (UI) Version 1.0. The current UI enables users to browse, search, tag and cite digital objects, as well as view or download them in a variety of file formats. The aim of the IVRLA is to facilitate new forms of scholarship allowing for data mining, and for material to be drawn into virtual collections depending upon user research interest or requirements, as well as integrating with e-learning tools and Virtual Learning Environments. The IVRLA UI Version 1.0 is the first step in the research and development into the use and accessibility of digital collections with further developments of the IVRLA UI planned.

### 1.1.2 Evaluating user requirements

Long *et al.* (2005) quote from research by Buttenfield, stating the UI of a digital collection is “the gatekeeper to the collection, if the interface is not understandable, or does not work, the digital library holdings remain essentially inaccessible”. The success of a UI is gauged by the ease with which users can use it to find the information they require. Designers of UIs are aware that to make a UI more successful ‘they have to learn more about user’s needs and try to fulfil them’ (Kani-Zahibi, *et al*., 2006). According to Krug (2006), user involvement in the design and testing process of a UI illustrates whether your UI works and if not, how to improve it.

User needs assessment can be conducted by various means depending on the stage of development of the UI. If a prototype of the UI does not exist, user needs can be assessed through focus groups, surveys, questionnaires and card sorting. Once a version of the UI is available for testing, assessment can be carried out through usability testing, heuristic evaluation and observation methods. These methods provide quantitative and qualitative data on the usability of the UI.

The IVRLA aims to conduct research and development into the use and accessibility of digital collections. User involvement should be a central part of this research. Only then can future versions of the UI be seen to be developments of what the user needs.

### 1.2 Motivation for study

Commercial websites have long recognised that users are vital to their success. As a result they have involved users in the design process of their UI to ensure that users
leave as satisfied customers. More recently Digital libraries and collections have begun to realise the importance of user involvement in their development. Libraries are often bringing together disparate resources and making them available to users. The end result can be confusing for the user as they navigate from one database to the other within the Library website. This can lead to users abandoning the library website, and instead using a familiar search engine such as Google or Yahoo (Porter, 2007). Through the inclusion of users in the development of their resources Libraries can provide a more efficient service and as a result retain patrons and justify its provision of services.

Digital libraries provide access to resources and collections that were previously difficult to access because of their location or issues relating to conservation and preservation. The access they provide to these resources is a major achievement in itself; however, digital libraries can provide added functionality that can benefit the user further in their research. Social annotation, customisation feature, the creation of Virtual Research Environments (VRE’s) and Virtual Learning Environments (VLE’s) are all possible within the framework of a digital collection. To develop this added functionality further, it is necessary to include users and allow them to engage with these tools and contribute to their development.

Finally, the IVRLA includes English and Irish language material, as a result users’ research through both languages. The level of bilingual functionality of the IVRLA UI 1.0 needs to be assessed by users to ensure that their needs are being met through both languages.

1.3 Problem Statement

This study was necessary because it had never been done before. When the current IVRLA UI was being developed it was never tested by users. The IVRLA had a user needs study done as part of an MLIS thesis in the School of Information and Library Studies (SILS) UCD but this examined other digital archive UI's as there was no prototype UI for the IVRLA at the time. Alexandra Caccamo’s thesis entitled “User needs of the Irish Virtual Research Library and Archive” concluded that when a UI for the IVRLA was available that further research into the user needs of the IVRLA user group should be carried out (Caccamo, 2006).
During the design process of the IVRLA UI Version 1.0 the recommendations made by Caccamo were considered, with some being implemented. However, at no point during the design process were users asked to evaluate the usability of the UI. Surveys and questionnaires are suitable for gaining insight into what users want, need and like, but they will not be able to tell if a UI works. This can only be achieved by testing a UI with users (Krug, 2006). In carrying out research into the use and accessibility of its digital collections it is critical that the IVRLA test its current UI on users before any development work on IVRLA UI Version 2.0 can commence. This research study aims to complete a user needs study of the current UI. The study will look at three aspects: basic functionality, added-value functionality and bilingual functionality.

The IVRLA is being used as the initial test bed for OJAX++. OJAX++ is a collaborative research tool that uses Web 2.0 technologies such as Ajax, web services, recommender functionality and collaborative tagging (Wusteman, 2008). At present the various elements of OJAX++ are being developed in preparation for its integration into the IVRLA UI Version 2.0. As a result it is crucial that the IVRLA conduct a usability test of the current UI to ensure it is functioning properly before OJAX++ is implemented.

1.4 Purpose of the project

The objective of this study is to evaluate the user requirements of users of the IVRLA. This is a very broad statement; therefore for this evaluation to be a success it is necessary to narrow the focus of the evaluation to specific areas of the UI, search, added-value and bilingual functionality. These three areas of the UI will be tested by users to assess whether the UI designers are meeting their current research needs. Through consultation with users, this research study will seek to make recommendations to the IVRLA on improvements that can be implemented during the design of the IVRLA UI Version 2.0. Through this recommendation process this study will be assisting the IVRLA in achieving its goal of “minimizing or removing the obstacles to the use [of these collections] and secondly, maximizing their value by improving access to them” (IVRLA, 2006).
1.5 **Research Questions**

Background research into the IVRLA and consultation with the IVRLA team resulted in the drafting of the overarching research question:

- Are user requirements being met by the IVRLA user interface Version 1.0?

To answer this several sub research questions were formulated.

1. **To what extent is the basic functionality of the IVRLA UI Version 1.0 meeting user requirements?**

The search, view and cite functions were obvious choices as areas to be covered in the study. These areas serve as the basic functions of the IVRLA and will be utilised by all researchers who wish to use the IVRLA. This will focus on the usability of the search options within the IVRLA. It will also look at the ability to view digital objects in DjVu and JPEG file formats. Finally, this sub-research question will examine the use of Digital Object Identifiers (DOI’s) for the creation of citations for digital objects in the IVRLA.

2. **How effective is the added-value function of social bookmarking/tagging in the IVRLA UI Version 1.0 in meeting user requirements?**

This research question will focus on the use of Delicious as the social bookmarking manager for the IVRLA. According to the IVRLA, Delicious was chosen as the social bookmarking tool because of its popularity and because it was easily recognised (Drohan, 2008a). Researchers can tag items within the IVRLA for their own use and to share with other researchers. At present, this is the only web 2.0 technology currently available on the IVRLA UI.

3. **How are the requirements of Irish language users being met by the IVRLA UI Version 1.0?**

The IVRLA includes English and Irish language material. Are users satisfied with how Irish language material can be searched, and how the content is delivered to them through the medium of Irish? For example, the content description for the Irish Dialect
Chapter 1 - Introduction

Arc hive is in English though the material is Irish. The IVRLA is keen to improve the Irish language functionality of the digital archive because the current UI has little or no Irish language functionality.

These three research questions will provide a focus for the study but because the aim is to evaluate the UI it will be important to allow scope for users to talk about other areas of the UI that they believe could be improved. As a result they will be encouraged to explore and explain any areas they feel could be developed further by the IVRLA.

1.6 Methodology

The chosen methodology for this research study was usability testing. Caccamo’s (2006) study of user needs in relation to the IVRLA used surveys and interviews as its methodology. Now that a version of the IVRLA UI was available to be tested, usability testing was the most appropriate form of investigation.

A request for participants to take part in a usability study was sent out to History and Irish researchers in University College Dublin (UCD) and the University of Limerick (UL). From the list of respondents six participants, all from UL, were chosen to take part in the study; three history postgraduates, one history faculty member and two Irish language postgraduates.

The usability testing was carried out in a computer training room in the Library of the University of Limerick. Participants were asked to complete a pre-usability test questionnaire, which asked questions relating to their research area, internet usage, and usage of digital archive. Next, participants took part in a think out loud usability test whereby they had to perform a set of tasks using the IVRLA UI. During the testing, the participants were encouraged to think out loud about problems they encountered or suggestions on how to improve the UI. A video recorder was used to film the computer screen and to record the voices of the participants, which was later reviewed by the tester. A post-usability test questionnaire was carried out to gauge participants’ reaction to the UI and also to allow for any additional comments or suggestions by participants to be noted.
1.7 Limitations

Usability testing ideally should be conducted in a usability lab containing cameras, a computer and a two way mirror through which participants can be observed discretely. Due to financial constraints this was not possible but a temporary usability lab was set up in a computer training room and provided an adequate environment in which to do the testing.

During the usability test some participants felt that they were being tested as opposed to the IVRLA UI. It was necessary to reassure some participants that they could not fail the test or that anything they did would be perceived as an error or a bad decision on their part. Participants were asked to think out loud as they carried out the tasks. However, some participants had a tendency to forget that they were being asked to think out loud as they completed tasks. On occasion, the facilitator had to remind participants to verbalise their thoughts as much as possible. The use of colloquial or vague terms meant that it was difficult for the facilitator to understand what the participant were referring to. To combat this, participants were asked to explain their ideas or problems in greater detail and if necessary to point to the item on screen to verify for the facilitator what they were talking about.

The third sub-research question of the study examined Irish language functionality of the IVRLA UI. However, at present no Irish language prototype of the UI exists. As a result participants could not test any specific Irish language functionality but instead were asked to use the English language UI and indicate areas where Irish language functionality could be introduced. When an Irish language version of the UI is designed a usability test should be performed to ensure it meets users’ requirements.

1.8 Findings

The main focus of IVRLA UI Version 1.0 was on providing basic functionality such as searching and viewing of digital content for users. This study has tested these aspects of the IVRLA UI and has provided recommendations, based on the experience of users interacting with the IVRLA UI. This study has recommended improvements to the Search All Collections and Detailed Search functions of the IVRLA UI. It has also recommended that the IVRLA provide more information to users about the DjVu plug-in and Digital Object Identifiers
The IVRLA had provided limited added-value functionality by utilising Delicious as its tagging tool. However, this study discovered that Delicious provides limited functionality within the IVRLA. The IVRLA has stated that the next major redesign of the UI will focus on developing added-value functionality; as a result, the next usability study conducted by the IVRLA should focus on this aspect.

Finally, this study looked at bilingual functionality in relation to the IVRLA UI. At present the IVRLA UI does not have any Irish language functionality, but the IVRLA was interested in investigating the needs of Irish language users. Based on the result of the usability test, this study has made recommendations on how full or partial bilingual functionality can be implemented in the IVRLA UI. However, when the IVRLA begins the development of an Irish language version of the UI further research involving user input will need to be undertaken in this area.
Chapter 2 - Literature Review

Those within the field of library and information studies have long recognised the need to assess the requirements of users in relation to the services provided by libraries. Surveys, interviews and questionnaires are well established forms of data collection within libraries and have been effectively transferred into the research area of evaluating digital libraries. More recently libraries have begun to look to practical methods such as usability testing to assess and improve digital libraries. As part of its literature review this study has compared a variety of digital libraries and the user needs assessments methods employed by them when evaluating their UIs. The literature review also explores the usability prioritised by users in relation to digital libraries and the added-value functionality that is being developed by digital libraries in anticipation of user’s needs. Finally, a discussion on the development of bilingual UIs for digital libraries is provided as the IVRLA is keen to begin research on an Irish language UI.

2.1 Types of Digital Libraries

The term digital library is defined as describing “the use of digital technologies to acquire, store, preserve and provide access to information and material originally published in digital form or digitised from existing print, audio-visual and other forms” (Kani-Zabih, et al., 2006). According to Jeng (2005) a digital library can take form as “online public access catalogues and bibliographic databases, distributed document databases, scholarly and professional discussion lists and electronic journals, other online databases, forums, and bulletin boards.” From these definitions, it is clear that a digital library is a resource that can manifest itself in many forms. Therefore, it is worth examining a selection of the types of digital libraries that exist and, in doing so; gain an insight into why several different evaluation methods can be used when assessing user needs of a digital library.

Libraries serve a valuable function in that they bring together disparate information sources to provide a coordinated and organised information resource for users. Likewise digital libraries can serve the same purpose by bringing together electronic resources. Increasingly, a digital library is being defined as an intermediary that collects links to resources rather than holding the resources itself (Greenstein, 2000). In the
case of the European Library, it is a digital library that is attempting to bring together the National Libraries of Europe. At present, the European Library provides access to the separate OPACs of National Libraries across Europe. It aims to eventually provide access to digitised content from the various collections of all European National Libraries but for the moment it is predominantly restricted to providing references and bibliographic information from each library (Cousins, 2006). In essence the European Library is a digital library that does not hold collections of its own but provides access to millions of references. It could be said that the European Library duplicates collections from National Libraries but in doing so it now allows users to search across collections via a single portal. The European Library offers access through five means, via a libraries SRU interface, via the Z39.50-SRU gateway provided by the British Library, via the Library’s own local Z39.50-SRU gateway, via Open URL or through OAI and harvesting the data (Cousins, 2006). The European Library demonstrates on an international level what the modern function of a Library’s website is; to provide the digital equivalent of services already provided by a library.

Within Ireland, the Digital Humanities Observatory (DHO) was established to manage and co-ordinate e-resources in the arts and humanities. Its aim is to provide advice to digital projects and to “serve as a knowledge base in Ireland via consultations with project partners” (DHO, 2008). Its second function will be to establish national standards in preservation and long-term accessibility of digital resources. Finally, the DHO aims to establish a repository to provide centralised access to the various digital resources created in Ireland. As a result, humanities researchers will be provided with one resource that can link them to multiple digital resources in Ireland. This is another example of a digital library whose purpose is not the creation of digital objects but to coordinate multiple resources to enhance their usability for researchers.

What is often seen as one component of a Library’s website can also be defined as a digital library in its own right. Digital repositories/archives provide access to the digitised content of physical collections, thus removing the barriers to their use by researchers that once existed due to conservation and preservation fears. DocSouth, University of North Carolina digital repository (Norberg, et al., 2005), Indiana University – Purdue University Indianapolis (IUPUI) image collection (Kramer, 2005), Swedish East India Company Digital Archive (Benner, 2003), the Belgian American Research Collection (Clark, 2004) as well as the Irish Virtual Research Library and Archive (IVRLA) are all examples of physical collections that have been digitised. The
digitisation of these collections provides access to material and a new way for researchers to engage with materials. These examples of digital libraries provide access to texts, letters, diaries, photographs, oral histories and artefacts which were only accessible to a minority of researchers prior to their digitisation. Thousands of other digital libraries similar to these examples have enabled a new audience to engage with primary source material. As a result, they have allowed for new interpretations of political, social and economic events at local and national levels.

2.1.1 Basic Functionality of Digital Libraries

In designing a UI, the temptation exists to add as many features as possible. This in turn leads to confusion for users as there are so many features available to use that they get lost in the maze of possible functions. Krug (2006) says that the first law of usability is “don’t make me think”, which means the functions of a UI should be self evident, obvious and self-explanatory. Furthermore, Pearson et al. (2007) believe the design should be focused on allowing users to “accomplish their task as quickly and as painlessly as possible”. They believe there needs to be a balancing act between inadequate functionality that will render the UI redundant and over complexity that will make a UI difficult to use.

Problems for users in relation to the navigation of a site are a recurring issue in usability testing. Pearson et al. (2007) state that when comparing organised and unorganised screen designs, users will make twice as many errors and will have to think twice as long when using an unorganised UI. Nielsen (2003b) stresses the need to involve users when developing the navigation of a site as the mental model navigation scheme developed by a user will differ from that of a designer. Navigation was also pinpointed as an important component of functionality by Long et al (2005). In their usability test of the Aerial Photographs of Colorado UI users encountered difficulties in understanding the hierarchy of the web pages and were unable to decipher how to navigate back to the search page.

Searching is probably the most important function of a UI yet it is often the one that can cause the most problems. Popular and commercial search engines and websites such as Google, Yahoo, Youtube and Amazon are used on a daily basis by web users. They provide simple functionality that allows users to find the information they require. In turn when users attempt to search a digital library they expect the same level of
functionality. The Metalib usability study found that participants expected the search function would operate in a similar fashion to other familiar search engines, such as Google (George, 2008). Similar research conducted by the European library also reveals that users expect to be able to search a libraries catalogue and holdings in the same way as they can search the web (Cousins, 2006). Wustman (2008) states that in the development of OJAX they were conscious of the fact that users desired a “simple search” like Google which at the same time had the power of an advanced search. Wustman highlights the point made by Miller that the “user just wants a search box” and that you can build the most advanced search function in the world but if nobody uses it then it is redundant.

Apart from the ability to search a digital collection, users must also be able to view digital objects held in a repository. A balance has to be found between giving the user a high quality image of a digital object that they can use effectively and finding a file format that allows for stable and long term storage. At the same time the file format must be small enough to allow for the storage of thousands of digital objects in a repository. The Spectator Project examined the possibility of storing digital images in several different formats (Hancock, 2005). They looked at TIFF, PDF and JPEG file formats for storing digital objects but eventually decided to use DjVu files. DjVu was selected for viewing images as the Spectator Project wanted a small portable file format that was of a high quality and was secure, but had added functionality. DjVu only required a one-off payment for the software, and offered an unlimited quota for generating DjVu files. DjVu files are of an impressively high quality, with zoom up to 1200%, and include added functionality such as OCR - fully searchable text, DjVu bundles for books and zoom (Hancock, 2005). When deciding upon its digital object file format the IVRLA looked at Mr. Sid and JPEG 2000 but also decided upon DjVu (Drohan, 2008a). The IVRLA states that JPEG 2000 was rejected because of its notably higher computational and memory demands and the fact that it is not widely supported in present software. Mr. SID was deemed too expensive and involved ongoing costs if implemented. Also, Mr. SID was deemed to be unstable due to the fact that the format had already undergone extensive revision (Drohan, 2008a).
2.1.2 Added-Value Functionality of Digital Libraries

Once basic functionality is at a satisfactory level for users, the possibility of added-value functionality can be considered. Added-value functionality allows for a level of personalisation, customisation and annotation that enhances the user experience and through Web 2.0 technologies can give users a degree of control over content.

2.1.2.1 Personalisation and Customisation

Personalisation and Customisation allows users to adapt a UI to suit their needs. Pearson et al. (2007) state that personalisation and customisation can increase user satisfaction but warn that too much can lead to information overload for the user. They also make the point that personalisation and customisation can be an important tool on the UI of a website that aims to have an on-going or prolonged relationship with a user. In the case of a digital library this can be an important function as users can tailor the digital library to suit their research needs. Roda et al. (2005) also support the idea of personalisation and customisation as a way of allowing easier reuse for a user. They discuss the possibility of allowing users to create sub-collections relating to their needs that allows for easier and faster access. Their study focuses on the creation of a digital collection of art images for the American University in Paris. As part of the development they included the ability for users to create a folder to store images entitled “my collection” that they could save images in and reuse (Roda et al., 2005).

Real Simple Syndication (RSS) feeds and wikis have also been identified as ways of enhancing the personalisation and customisation of a digital library. Shelstad (2005) states that RSS feeds alert users to new content that relates to their area of research without the need of having to constantly access the digital library to check for updates. Shelstad outlines wikis as a useful tool for creating finding aids that can be added to or modified by users when necessary. Finally, blogs are being utilised by libraries to share research and resources, publish announcements and even to display catalogue records. Blogs not only allow for the dissemination of information but also provide the opportunity for feedback from readers, displayed as comments (Ramos & Piper, 2006). The Digital Library section of the National Library of Scotland (NLS) created a blog in 2007 and declares that the aim of its blog is to keep readers informed of its work in a casual manner (National Library of Scotland Blog, 2008).
At present, none of these added-value functions are available on the IVRLA UI. However, the IVRLA has researched these added-value functions and its aim for the next version of the UI is to implement user accounts, the ability to build virtual collections and include an RSS feed. Since 2005, an IVRLA project blog has been in existence and the IVRLA is looking at the possibility of transferring this to the UI as a added-value function (Drohan, 2008d).

2.1.2.2 Social Annotation

Social annotation is an added value function that has been implemented as part of the IVRLA UI Version 1.0. Social annotation is also known as “tagging”, “social classification”, “social indexing”, “social bookmarking”, “digital annotation” and “folksonomy”. Waller (2003) provides a definition of social annotation as being “a comment upon a digitally accessed resource as a whole, or contents of a resource, and which itself can be digitally accessed as well as stored”.

The theory behind social annotation is “that with a sufficiently large number of tags, useful folksonomies will emerge that can either augment or even replace traditional ontology’s” (Tonkin et al., 2008). Users are not restricted by the traditional language of classification or classification rules and can create folksonomies that are better suited to their current research needs and language use. Research into the area of social annotation has begun to move past looking at the development of social annotation software. Studies have now begun to explore “to what extent and in what manner users, consciously or unconsciously, take into account their communities of practice when assigning tags” (Tonkin et al., 2008). The basis of social annotation is that users are creating tags that hold the same meaning to other users and so information can be shared. However, if users are creating tags purely for their own use but are sharing them across a network then the network can become flooded with tags that are decipherable only to its creator. In an effort to combat this, tools such as Wordnet have been developed to help create a controlled vocabulary for tagging. As tags are created within a digital repository, they are checked against the controlled vocabulary in Wordnet. If they are deemed suitable they are then added to the folksonomy of the digital repository (Bjornson, 2008). Tonkin et al. are now looking at how different communities use social tagging and how effective it is within their online environment.
Traditional bibliographic management has not been abandoned within academic circles. Tools such as Citeulike have been developed to find a happy median between social bookmarking and traditional bibliographic management. Citeulike has transformed the researching techniques of academics who traditionally “gathered, collected, shared” through their published academic work but who now “gather, collect, share and network” through using Citeulike (Emamy & Cameron, 2007). Citeulike extracts the metadata required to make a bibliographic record automatically from the publisher’s site and so a researcher’s bibliography is being created simultaneously as they gather material for their research. The IVRLA utilises the social annotation service Delicious (formerly known as Del.icio.us) to allow users bookmark its contents. At present it has over three million registered users who use delicious to “tag, save, manage and share web pages from a centralized source” (Delicious, 2008). This study will examine how Delicious is utilised by researchers using the IVRLA and to what extent it meets their needs.

2.1.3 Bilingual Digital Libraries
The IVRLA holds digital objects in English and Irish, as a result the repository is utilised by researchers who carry out their research in both languages. At present the IVRLA UI is searchable through English only but the IVRLA has signalled its intention to develop an Irish language version of the UI during the next design process. Research into multilingual digital libraries has revealed that making minority language material available digitally can aid the progression of that language. Another widely held belief is that it makes little sense to have a collection with content in Irish, for example, but “whose supporting text instructions, navigation buttons, labels and help text is in another language” (Nichols et al., 2005).

According to Pavani (2001) in developing a multilingual digital library there are three language control parameters that can be implemented. These are:

1. Language of the content;
2. Language of the catalogue entry;
3. Language of navigation.

The first parameter is the most basic, whereby the digitised content is made available in its original language. The second involves translating the catalogue description
(metadata) into the language of the content. Finally the third parameter involves translating the entire UI into the language of the content. The importance of providing digital content in the various languages of researchers from different countries and ethnic groups has been recognised by UNESCO and the Human Info NGO. They provide support and information to digital initiatives aiming to make available content in languages other than English (Nichols et al., 2005).

The advent of open source software (OSS) development has allowed for the development of tools for creating digital libraries in indigenous languages. Greenstone and Citidel are tools that have been developed to allow non-experts to build a digital library in their indigenous language (Nichols et al., 2005; Hutchinson et al., 2005). According to Nichols et al. (2005) Greenstone

Automatically includes effective full-text searching and metadata-based browsing facilities that are attractive and easy to use. Different indexes can be constructed (including metadata indexes). Browsing utilizes hierarchical structures that are created automatically from metadata associated with the source documents. Collections can include text, pictures, audio, and video, and the interface to collections can be extensively customized.

Developing the digital library is relatively simple using Greenstone. The creator has an English language version of the UI open on the left hand side of the screen and on the right hand side is an identical page, that is initially empty but which the creator populates with metadata and content in their own language. English is used as the base language so that updates in the software can be distributed in one language, rather than having several updates in several languages being circulated (Nichols et al., 2005). Citadel is another OSS that provides the technology to create multilingual digital libraries. The developers of Citadel, like Greenstone, encourage volunteers to create translations of common word and phrases used in metadata and navigation and to submit them to their website (Hutchinson et al., 2005). This type of OSS collaboration could be utilised by the IVRLA in the development of its Irish language UI.
2.2 Possible Approaches to User Needs Assessments

In the context of digital libraries, user needs can be assessed through empirical or analytical techniques. Empirical techniques rely on the involvement of users whereas analytical techniques depend solely on usability experts assessing the UI (Jeng, 2005). This study relied solely on the involvement of users in assessing the IVRLA UI and as a result the review of possible approaches in assessing users’ needs focused on empirical techniques. Empirical techniques include surveys, interviews, focus groups, card sorting, heuristic evaluation and usability testing. These methods are rarely used in isolation but instead several can be used in conjunction with each other to give a more rounded view of user needs in relation to a UI.

2.2.1 Surveys

Surveys are predominantly used at the beginning of a digital library UI design/redesign process. Surveys are usually used in conjunction with another testing method. Online or paper based surveys are an effective way of getting feedback and input from users quickly about what their needs are and what they would ideally like to see in the UI of a digital library. Qualitative and quantitative data relating to navigation, visual element, search and help options, usability and functionality can be gathered, as well as leaving open questions to allow users to provide suggestions and comments on what a user friendly UI is to them (George, 2005). Another advantage of carrying out surveys amongst the user demographic is that, through the analysis of the survey data possible participants for future user testing can be identified according to their responses (George, 2005).

However, there are disadvantages to using surveys as part of the analysis and redesign process. Surveys of user requirements do not test the actual UI and as a result are often a list of ideal or even unrealistic requirements of users. Poor survey design and low response rates can result in skewed data thus hampering the design process (Turnbow et al., 2005).

2.2.2 Interviews

Interviews are a way of gathering qualitative data that is less pressurised for the user compared with other usability testing methods. Users are not being asked to perform
tasks and as a result feel that they are being tested as opposed to the UI. Some studies have recommended conducting in-home interviews with users so that they are more comfortable in their own environment and in a less test-like scenario (Porter, 2007). Interviews are often included at the end of a usability testing session where they are used to gauge “memorisation easiness, learning of the dynamics, general impressions after use and final satisfaction” with the UI (Ferreira & Pithan, 2005).

2.2.3 Focus Groups
Focus groups explore the needs and requirements of users through allowing them to discuss ideas and opinions with each other with the guidance of a moderator. The focus group is given an introduction outlining the purpose of the group and then the moderator will guide the group through a series of questions asking for opinions and feedback after each question (VandeCreek, 2005). The moderator may also use a computer to demonstrate aspects of a UI or a series of prototypes of a UI. The moderator may also ask group members to carry out a task using the UI (Norberg & Vassiliadis, 2005). During focus group sessions participants will often echo each others suggestions. This can be beneficial in confirming for UI designers certain requirements that need to be addressed. However, it is important to ally focus group findings with other data to ensure that the group feedback has not been distorted by the predominance of certain group members (Norberg & Vassiliadis, 2005). Krug states that focus groups are good for learning about user needs before you begin designing the UI but are not as effective as other methods once a prototype UI is available for testing (Krug, 2006).

2.2.4 Card Sorting
Card sorting is used to find out the users’ views of an information space and where they think each item should go (Nielsen, 2004). Users are given a selection of cards with words or phrases written on them. They are then asked to group or stack the cards that they believe are similar or connected to each other. If necessary participants are given a list of definitions for terms they may not be familiar with (Turnbow et al., 2005; Tolliver et al., 2005). Users can often be asked to name the groups that they have created and the terms created by users can later be used when designing “navigation labels, links, headlines, and search engine optimization” (Nielsen, 2004). According to
Nielsen card sorting is used when you “don’t yet have a design, and your goal is to find out how people think about certain issues” (Nielsen, 2004).

2.2.5 Heuristic Evaluation

Heuristic evaluation “involves having a small set of evaluators examine the interface and judge its compliance with recognized usability principles (the "heuristics")” (Nielsen, 2005). Nielsen has outlined his ten usability heuristics as:

1. Visibility of system status;
2. Match between system and the real world;
3. User control and freedom;
4. Consistency and standards;
5. Error prevention;
6. Recognition rather than recall;
7. Flexibility and efficiency of use;
8. Aesthetic and minimalist design;
9. Help user recognise, diagnose, and recover from errors; and

The evaluation process involves giving participants a list of heuristic principles and asking them to navigate through the UI and identify usability problems. Participants carry out the evaluation independently of each other so as not to adversely affect the results. Once all heuristic evaluations have been completed, results between participants can be compared and a list of findings can be produced. Several participants are used in the evaluation as one evaluator will miss out on the majority of problems. Also, using more than one evaluator means there is a higher degree of certainty that the majority of problems will be uncovered (Ahmed, 2008). The benefits of heuristic testing are that it is easy to conduct and requires minimal data analysis, a small number of participants are required and non-specialists can serve as participants (Long et al., 2005). While non-specialists can serve as evaluators in heuristic testing,
the most worthwhile heuristic testing is proven to be with expert evaluators. In a study by Ahmed (2008) expert evaluators were shown to identify 44% of problems compared to 8% by non-specialists during the evaluation of a UI. Ahmed then went on to compare heuristic evaluation with think out loud usability testing and proved that when evaluating a UI using non-specialists the best method to use is think out loud usability testing.

### 2.2.6 Think Out Loud Usability Testing

According to usability experts Krug and Nielsen, usability testing is the best way to assess whether a UI works and how best to improve it. Nielsen is referenced as stating that “thinking aloud may be the single most valuable usability engineering method” (George, 2008). Think out loud protocol “is a one-on-one activity during which representative users attempt real-world tasks. Users are asked to think out loud during task completion and verbalize what they are doing and thinking in order to provide a mental model of their activities” (George, 2008). When conducting usability testing there are five points around which to base the tasks:

1. Ease of use;
2. Efficiency of use;
3. Memorability;
4. Error frequency and severity; and
5. Subjective satisfaction (King & Jannik, 2005).

Ideally the testing should be carried out in a usability lab. However, more importantly Nielsen states that the equipment used, the computer and keyboard, and the web browser should be similar to what the participant uses ordinarily so as to ensure the testing is as realistic as possible (Nielsen & Loranger, 2006). Video recording the usability test and note taking by the researcher observing participants can produce fewer errors when compared with using participant reports that rely on long-term memory. Also, participant reports often contain ambiguous language that cannot be deciphered by the researcher (George, 2008).

The low number of participants required for a usability test means that it is an attractive option for researchers. Nielsen states that “the best results come from testing no more
than 5 users” (Nielsen, 2000). Nielsen goes on to say that a single user will identify one third of the problems in a UI. Then as more and more users are tested, less and less is learned as the same problems are identified by users. Nielsen believes that after five users you are “wasting your time” as you are observing the same findings but not learning much new about the UI (Nielsen, 2000). Krug agrees with Nielsen in relation to the amount of users required for a successful usability test. Krug (2006) believes that three or four users are an adequate number to test while eight is the ideal. To illustrate the success of usability testing Jeng (2005) lists twenty digital library projects that have carried out usability tests. Out of the twenty institutions only two used a questionnaire as their method of data collection. The others eighteen institutions carried out usability tests, using ‘think out loud protocols’ and ‘design walk-through’ testing methods. This low number of participants has proven to be sufficient for a multitude of studies as outlined in the Table 1 below.

<table>
<thead>
<tr>
<th>Site</th>
<th>Method</th>
<th>Subjects</th>
<th>Author</th>
</tr>
</thead>
<tbody>
<tr>
<td>Belgian-American Research Collection</td>
<td>Usability test</td>
<td>5 users</td>
<td>Clark (2004)</td>
</tr>
<tr>
<td>Georgia Institute of Technology Library website</td>
<td>Usability test</td>
<td>8 users</td>
<td>King &amp; Jannik (2005)</td>
</tr>
<tr>
<td>Metalib</td>
<td>Usability test</td>
<td>8 users</td>
<td>George (2008)</td>
</tr>
<tr>
<td>OJAX Federated Search Service</td>
<td>Usability test</td>
<td>7 users</td>
<td>Wusteman (2008)</td>
</tr>
<tr>
<td>UCLA Library Website</td>
<td>Usability test</td>
<td>10 users (2 distinct user groups of 5)</td>
<td>Turnbow et al. (2005)</td>
</tr>
<tr>
<td>University of Michigan Art, Architecture &amp; Engineering Library Website</td>
<td>Usability test</td>
<td>6 users</td>
<td>Toller et al. (2005)</td>
</tr>
</tbody>
</table>

Table 1 - Usability Assessments of Academic Sites.

Finally, when compared with other methods of assessing UIs, usability testing has been found to be the most effective and efficient. Ahmed found usability testing using actual users found a higher percentage of problems than testing using heuristic evaluation or cognitive walkthrough (Ahmed, 2008). Krug and Nielsens’s endorsement of usability testing, allied with Ahmed’s findings and the low number of participants required has resulted in usability testing, in particular think out loud protocol, being the chosen methodology of this research studies usability test of the IVRLA UI.
2.3 Review of User Needs Assessment Projects

The previous section has dealt with the possible approaches to user needs assessment and concluded that usability testing using a think out loud protocol was the most appropriate and worthwhile form of data collection for this research study. As part of the research carried out for this study numerous articles on usability testing of digital libraries have been reviewed and the information provided by them has been used to guide this project in formulating its tasks, testing procedures and analysis.

2.3.1 Selection of Participants

In the selection of participants the influence of Nielsen and Krug was again to the fore. Across the range of usability tests the number of participants ranged from ten (Turnbow et al., 2005) down to five (Clark, 2004). Almost all of the research studies referred to Nielsen’s (2000) article ‘Why you only need to test five users’ when explaining their reason for choosing such a relatively low number of participants. In this article Nielsen state that the number of participants necessary for a study can be calculated using the following formula:

\[ N(1-(1-L)^n) \]

Where \( n \) is the number of users, \( N \) is the total number of usability problems in the design and \( L \) is the proportion of usability problems discovered while testing a single user. Using this formula, Nielsen calculates that five users will find approximately 85% of problems while fifteen users will find 100% of problems (Nielsen, 2000).

It is worth noting the way in which research studies selected the participants. In all studies reviewed the emphasis has been on recruiting participants from the traditional user group of that particular digital library as this improves the validity of the study (George, 2008). For example the usability study conducted by Wusteman (2008) established that OJAX would be used in an academic setting and as a result focused recruitment of participants amongst university students and academics. Likewise in the usability study of the Aerial Photographs of Colorado initiative the researchers recruited participants from the departments of Geology and Geography to ensure the participants were a representative sample of the user group (Long et al., 2005). This research study identified history and Irish studies students and faculty as the IVRLA user group and recruited participants from these fields.
2.3.2 Development of Tasks

The success of a usability test depends on the design of the tasks used during the test. Ahmed (2008) states that “the success of the usability test largely depends on the quality and coverage of the experimental tasks. Users may miss out many interface problems that are not encountered in the tasks”. That is not to say that a usability test should cover every feature of a digital library’s UI. It is important for the design team to decide when formulating the task which features of the UI they wish to test. This can be achieved through outlining a set of objectives and developing tasks with these objectives in mind, such as was the case in the Metalib usability test (George, 2008). Other usability tests chose to outline their set of research questions and from there tailored their tasks to answer each research question and sub-research questions (Norberg & Vassiliadis, 2005).

In the same way, that it is important that the testing environment be comfortable and as close to the participant’s normal research environments as possible, so too it is important to develop tasks that are realistic. Scenarios are seen as a way of helping participants forget that they are participating in a usability test by creating a context in which they carry out each task. It is recommended that facilitators give participants an introduction outlining a possible scenario where they have to use the UI. Once this has been explained then the facilitators can give users a set of steps to follow to complete the task (Notess et al., 2005). This process of setting the scene and then providing the steps to follow is used successfully by George (2008) and by Wusteman (2008). Through their use of scenarios, designers are providing an incentive for participants to engage with the UI in a meaningful way and as they become more involved in the test hopefully their feedback will be more insightful. To ensure that the usability test is a success it is crucial that a pilot test is carried out before using it with participants. Even after usability testing with participants has begun, Notess et al. say it is important to continue “testing the test”. The idea of “testing the test” is evident in the development of successive usability tests by George (2005; 2008). George conducted a usability test of the Carnegie Mellon University website in 2005 and another on the Metalib interface in 2008. The Carnegie Mellon usability test consisted of fifteen tasks which could result in participant fatigue. In comparison the Metalib usability test comprised of six tasks, illustrating how George has refined her use of usability testing.

When outlining the usability tests developed for OJAX Wusteman (2008) uses Krug’s (2006) terms “get it” testing and key task testing to distinguish between the types of
tasks. Wusteman developed the OJAX usability test from analysing Steve Krug’s sample usability tests. Wusteman explains that “get it” testing involves showing the participant the UI for the first time and asking them for their initial comments on how it looks and also about how they would carry out a search. This allows the facilitator to ascertain which aspects of the UI are intuitive and those that are not. Key task testing constitutes the main part of the test whereby the participants are asked to carry out a set of “pre-defined queries” (Wusteman, 2008).

2.3.3 Testing Procedures
Ideally usability testing should be conducted in a usability lab (Krug, 2006). However, out of all the research studies reviewed none made use of a usability lab. In most cases an office or meeting room of a library was converted into a make shift usability lab for the duration of the testing. Nielsen recommends that usability testing should be conducted in an environment that is comfortable for the participants, using equipment that they are familiar with (Nielsen & Loranger, 2006). Therefore, as the evaluations carried out by these research studies were of academic digital libraries it was appropriate that the tests were carried out on campus.

During a think out loud test, users are asked to verbalise their thoughts so as to allow the facilitator to gain a better understanding of the user experience. This process has been criticised because to “think out loud seems very unnatural to people…the need to verbalise can slow the user, thus making any performance measurements less representative of the users’ regular working speed” (Ahmed, 2008). However, the insight gained by researchers through the think out loud process is often of more benefit to them in the UI design process and continues to be utilised. Ahmed recommends videotaping the usability tests so that the tapes can be reviewed at a later date to illustrate the problems that users encounter. The final recommendation made by Ahmed is to conduct transaction logging or note taking during the test by the facilitator that allows for an unobtrusive way of recording problems encountered by participants (Ahmed, 2008).

2.3.4 Results
The results of each usability test are different as they depend on what each research group set out to research and on the tasks they designed. Nevertheless, it is worth
looking at how they reported findings in published works for points that can be utilised in any usability test. In some cases, such as the Metalib usability study, results were discussed under the heading of each task that was completed by participants (George, 2008). George outlined the responses of users to each task and the implications for the UI redevelopment. This allowed for a clear discussion of each issue and a definite explanation of how the problem could be resolved. In comparison the Georgia Tech library website usability test took a more general approach discussing the findings and recommendations for changes to the website as a whole (King & Jannik, 2005).

The OJAX usability test took a more general approach and did not discuss the results of each task. But what is worth noting from this usability study is the fact that Wusteman discussed the findings under three types of scenarios experienced by users. These are kayak issues, an idea developed by Krug (2006), learning a new metaphor and unintuitive features (Wusteman, 2008). Kayak issues arose when a participant was “taken by surprise by OJAX’s behaviour” and while initially they may have been confused by what was happening on screen they were usually satisfied with the end result. Learning a new metaphor is explained by Wusteman as relating to a feature that requires the participant to learn something new but which results in an “immediate advantage to the user”. The final scenario related to unintuitive features, whereby the user attempted a task using a specific feature of OJAX but ended up confused or unable to complete the task and as a result recommended that the feature be changed or improved (Wusteman, 2008). Through the use of these scenarios Wusteman was able to clearly indicate what type of problem users were encountering, explain why it happened and then provide a possible solution.

2.4. Conclusion

This literature review has shown that the definition of a digital library encompasses a wide variety of digital resources, from digital libraries that coordinate other digital resources to those that are repositories of a unique collection. What is also evident is that users look first for basic functions in a digital library and secondly for added-value functionality. What is important is that users can search and view material in a digital collection. Once a digital library provides these functions, then it can begin to develop added-value functions. Finally, evaluating digital libraries is possible in a variety of ways. Surveys, interviews, focus groups, card sorting, heuristic evaluation and usability
testing are all used as evaluation methods. However, from the research studies examined usability testing is put forward as the most beneficial form of evaluating whether a UI works and how best to improve it.
Chapter 3 - Goals and Objectives

The goal of this study was to evaluate the user needs of users of the Irish Virtual Research Library and Archive. Therefore, this study set out to examine the usability of the IVRLA User Interface Version 1.0 and identify areas where improvements in usability could be made. To achieve this, the goals and objectives of this research study were first formulated into one over arching research question:

Are user requirements being met by the IVRLA user interface Version 1.0?

To address this research question three sub-research questions were formulated. These were:

1. To what extent is the basic functionality of the IVRLA UI Version 1.0 meeting user requirements?
2. How effective is the added-value function of social bookmarking/tagging in the IVRLA UI Version 1.0 in meeting user requirements?
3. How are the requirements of Irish language users being met by the IVRLA UI Version 1.0?

To examine these sub-research questions a usability study of the IVRLA UI Version 1.0 was conducted. This comprised a pre-usability test questionnaire, followed by a think out loud usability test and finally a post-usability test questionnaire.

The results of the usability study were analysed in the context of the sub-research questions and a set of recommendations on possible improvements to the IVRLA UI were produced. It is hoped these recommendations will improve the usability of the IVRLA UI Version 1.0. The follow on aim of these recommendations is that they will assist the IVRLA in preparing for the development of the IVRLA UI Version 2.0.
Chapter 4: Methodology

This evaluation of the user requirements of users of the IVRLA UI was completed over a period of five months. A usability study was chosen as the methodology. The usability study comprised three sections: pre-usability test questionnaire, a think out loud usability test and a post-usability test questionnaire. The usability study involved six participants: four history and two Irish language researchers. It was completed over two days in the University of Limerick.

4.1 Possible methodologies

As discussed in the literature review, a digital library can be evaluated in a number of possible ways. A user needs assessment of the IVRLA had been carried out by Alexandra Caccamo (2006); it was entitled: User Needs and the Irish Virtual Research Library and Archive. Caccamo’s study chose surveys and interviews as its methodology because, at that time, there was no prototype or working IVRLA UI available to be tested. As part of its conclusion Caccamo’s study recommended that when a working version of the IVRLA UI was available a usability study should be carried out. Therefore, it was decided that further surveys and interviews, while they might uncover some new information, would be a duplication of Caccamo’s research.

Krug (2006) believes that focus groups are an effective way of learning about user needs before beginning to design a UI. However, Krug states there are other more effective methods of evaluation once a prototype UI is available. Jakob Nielsen holds a similar belief in relation to card sorting as a means of evaluating usability. Nielsen recommends card sorting when you “don’t yet have a design, and your goal is to find out how people think about certain issues” (Nielsen, 2004). As a result, focus groups and card sorting were both deemed to be unsuitable methodologies for evaluating the IVRLA UI Version 1.0. Heuristic evaluation was another possible methodology. Research into heuristic evaluation has found it to be a successful method of evaluating UIs. However, Ahmed (2008) found the most rewarding heuristic evaluations were completed by specialist evaluators as opposed to non-specialist participants. In fact, Ahmed noted that specialist evaluators identified 44% of problems compared to 8% by non-specialists when evaluating a UI. This evaluation of the IVRLA UI relied solely on
the participation of non-specialists and as a result the use of heuristic evaluation as a possible methodology was decided against.

4.2 Chosen Methodology

A usability study was chosen as the methodology for evaluating the IVRLA UI as it has been proven to be an effective method for evaluating digital libraries (George, 2008). Nielsen (2003a) and Krug (2006) both make the point, that once a version of a UI is available to be tested, a usability study should be the chosen methodology. A usability study provides researchers with a mental model of a participant’s use of a system, as well as getting a better understanding of how the system works. This point is repeated in research studies when making the case for their chosen methodology (Clark, 2004; George, 2005; George, 2008; King & Jannik, 2005; Norberg & Vassiliadis, 2005; Turnbow et al., 2005; Tolliver et al., 2005). Turnbow et al (2005) emphasise the point by stating that think out loud usability test “provides essential real-time feedback on potential problems in the design and organization of a website.” They believe real-time feedback outweighs the benefits of interviewing a participant about their experience or asking participants to log diary entries about their experience after the event has happened.

According to Notess et al. (2005), most usability studies take a mixed methods approach to evaluating a UI. Firstly, demographic information on the participants is collected, followed by participants completing tasks and ending with a satisfaction questionnaire. This was the precise methodology chosen by this study and is explained in detail in the next section.

4.3 Usability Study Design

The usability study was divided into three sections. The first was a short pre-usability test questionnaire, which focused on gathering demographic information relating to participants occupation, internet usage and knowledge of digital resources. Secondly, participants engaged in a think out loud usability test. This involved participants completing five tasks, while talking out loud about problems they were encountering or opinions they had about the IVRLA UI. Finally, participants completed a post-usability test questionnaire. This evaluated participant’s impressions of the IVRLA UI, as well as
allowing them to put forward suggestions on how to improve the UI. The IVRLA usability study design was based on Wusteman’s (2008) design for the OJAX usability test.

The entire usability study script, including the pre-usability test questionnaire, the think out loud tasks and the post-usability test questionnaire can be viewed in Appendix 1.

4.3.1 Pre-usability Test Questionnaire
The purpose of the pre-usability test questionnaire was to garner demographic information about the participant’s level of study, their internet usage, particularly online research tools, and their previous use of materials held in UCD’s various repositories. It was hoped the responses given by participants to the questionnaire would provide background information and a greater insight into opinions given during the think out loud usability test. The pre-usability test questionnaire had a total of nine questions comprising multiple choice questions and open-ended questions. The questionnaire began by thanking the participants for agreeing to take part in the evaluation. The first question then asked them their occupation. This would make it possible to distinguish between the user needs of students and faculty.

Questions two to six dealt with participant’s internet usage. Participants were asked to distinguish between how often they accessed the internet and how often they accessed the internet to carry out academic research. The questionnaire asked participants to list the digital collections and resources they used in their research. Participants were given a list of popular academic digital collections to choose from as well as space for participants to list other collections not mentioned. This was the only question on the pre-usability test questionnaire that differed for the history and Irish user sub-groups. History researchers were given a list of digital collections that are utilised by history researchers such as Irish History Online. Irish researchers were given a list of digital collections relating to the Irish language such as Achtanna.ie. Following on from this, participants were asked to indicate their favourite and least favourite digital collection and to provide reasons for their choice. The digital collections mentioned by participants here could be used to provide examples of how the IVRLA could improve its UI and also what pitfalls to avoid.

The third section dealt with social bookmarking tools. The first question was used to gauge the participant’s awareness of social bookmarking. If participants had indicated
that they used social bookmarking tools they were asked to indicate the specific tool. As part of the think out loud usability test, participants were asked to use the Delicious bookmarking tool. The answers provided for this section of the questionnaire would provide information to be used in conjunction with that task. Finally, participants were asked to indicate if they had used any of the collections in UCD's repositories. Their evaluation of the user experience and level of access provided digitally by the IVRLA could then be compared with their experience of using the physical versions.

4.3.2 Think Out Loud Usability Test

Prior to beginning the think out loud usability test participants were given some background information about the IVRLA. Next, the facilitator outlined what was required of participants during the test. The facilitator emphasised that the purpose of the think out loud usability test was to test the UI and not the participants. The participants were encouraged to say exactly what they thought of the UI and to “think out loud” as much as possible. Participants were told that they could ask questions during the test but that the facilitator may not be able to answer their questions until after the test was complete. The facilitator then explained that the test would be videotaped and asked participants to sign a release form giving permission for the test session to be used for research purposes. Finally, participants were asked if they had any questions before the test began. Once the facilitator had answered all of the participants questions the usability test could begin.

The think out loud usability test was divided into two sections. Following Krug’s (2006) methodology of think out loud usability testing, the first section comprised of “get it” tests and the second section focused on key task testing. As part of the “get it” test participants were asked to find the IVRLA website on the internet and navigate to the IVRLA Welcome page (http://ivrla.ucd.ie). Participants were then asked to take a moment to review the Welcome page and then comment on any features they liked or disliked and their general impression of the page.

The key task testing involved the development of five separate tasks that had to be completed by participants. The IVRLA user group is made up of several different sub-user groups. For this evaluation of the IVRLA UI, a decision was made to focus on two sub-groups, history researchers and Irish language researchers (see section 4.5 Participant Selection). Previous research into usability testing has emphasised the
importance of developing tasks that are realistic and tailored to the specific user group (Notess et al., 2005). Therefore, it was decided to develop separate tests for these distinct user sub-groups of the IVRLA. The tasks developed for each user group were testing identical features but the wording of the tasks differed to reflect a realistic research scenario.

Task 1 and Task 2
The first two tasks focused on the usability of the quick search and the detailed search functions of the IVRLA UI. By completing these tasks it was hoped the participants would be able to identify any problems that may be encountered by users when searching within the IVRLA. Participants were given a scenario where they needed to search for a specific item within the IVRLA. They were then asked to use the search functions and to look at the results returned by the IVRLA.

Tasks one and two for the History user sub-group were:

1. Imagine you want to find a letter written by Sir Roger Casement to Robert Donovan.
   Do a search and look at the results.

2. Imagine you want to find a letter written by Matthew Dawes to Eugene O’Curry concerning his genealogical research into the Corr family.
   Use the DETAILED SEARCH to run a query using this information and look at the results.

Tasks one and two for the Irish language user sub-group were:

1. Imagine you want to find a letter written by Tomás de Bhaldraithe to Miss Fionnuala Duane.
   Do a search and look at the results.
2. Imagine you want to find a letter from Marion Gunn to Fionnuala Duane containing information about correspondence between Cornelius Duane and Seán Ó Dalaigh.

Use the DETAILED SEARCH to run a query using this information and look at the results.

Task 3
The third task related to the use of the digital versions of documents within the IVRLA. The IVRLA utilises the DjVu plug-in, through which users can view and manipulate images. Alternatively the IVRLA provides a JPEG copy of the image. The aim of this task was to explore the use of the DjVu plug-in or the JPEG version of the digital object.

Task three for the History user sub-group was:

3. Find a photograph of James Joyce as a boy?

Now imagine you want to view the larger digital image of the photograph and then save the digital image of the photograph to your desktop. Try and do this now.

Task three for the Irish language user sub-group was:

3. Find the item entitled Toradh Ceistiúcháin ar Na Tincéirí, Cúige Laighean?

Now imagine you want to view the larger digital image and then save the digital image to your desktop. Try and do this now.

Task 4
To aid researchers in creating citations and to provide them with a permanent link to IVRLA materials, the IVRLA provides a Digital Object Identifier (DOI) for each item held within the IVRLA. Therefore, task four was designed to investigate whether or not participants were able to identify a DOI provided by the IVRLA and how to use it in creating a citation. As part of the task participants were asked to search for a particular item within the IVRLA, and then use the information provided by the IVRLA to construct a citation for this item.
Task four for the History user sub-group was:

4. Search for an item relating to the Ancient Foundling Hospital in Dublin. Look at your results.

Select one of the items you have found. Now imagine that you are going to use this document in your research and you want to create a citation. How would you do this?

Task four for the Irish language user sub-group was:


Select one of the items you have found. Now imagine that you are going to use this document in your research and you want to create a citation. How would you do this?

Task 5
The final task concentrated on testing the Delicious bookmarking tool used by the IVRLA. Participants were asked to browse the IVRLA collection and locate the contents and structure page of a particular collection. The next step of the task explained that they did not have time, at present, to search this collection and were then asked to use Delicious to bookmark the page so that they could return to it at a later stage.

Task five for the History user sub-group was:

5. From the COLLECTION BROWSE page select the papers of William Frazer. You do not have time to complete your search but you would like to return to view this collection again.

Bookmark this page using the Del.icio.us bookmarking tool.

Task five for the Irish language user sub-group was:

5. From the COLLECTION BROWSE page select the Irish Dialect Archive Card Catalogue. You do not have time to complete your search but you would like to return to view this collection again.
Bookmark this page using the Del.icio.us bookmarking tool.

During the test if participants experienced difficulties in completing a task the facilitator did not intervene until it was apparent that participant was not progressing any further with the task. The facilitator waited five minutes to see if the participant could resolve the difficulty they were having and after that point intervened. The decision to intervene at certain points was made because it was felt the study had gained enough information about a task after it had become apparent that the participant could not resolve the problem themselves.

4.3.3 Post-usability test questionnaire
The post-usability test questionnaire allowed participants to give feedback on their experience of using the IVRLA. It also gave participants the opportunity to elaborate on issues they felt were important or points that they did not get the opportunity to talk about during the test. The post-usability test questionnaire comprised of eight open ended questions. The first question asked participants to describe their experience of using the IVRLA. The next two questions asked participants to identify which feature they liked and disliked the most and to explain their reasons for choosing them. Question four asked participants how long it would be before they would feel competent using the IVRLA and to explain their reasons why.

Next, questions five and six asked participants what new features they would like to see incorporated into the IVRLA. This included features that they may have used in other digital collections. In the pre-usability test questionnaire participants were asked a similar question about what digital collections they used and what features of these collections they preferred. However, participants were asked the question again having completed the usability test, as using the IVRLA may have reminded them of useful features they had encountered in other digital collections.

Question seven asked participants to rate the IVRLA as a digital resource, thus providing participants with a further opportunity to discuss what features they liked and disliked about the IVRLA. The final question was used to gauge how effective the IVRLA was in providing an alternative means of access to materials held in UCD. Participants were asked if they would still feel it was necessary to visit UCD and view the original documents now that they had used the digital versions in the IVRLA.
4.4 Pilot Test

Notess et al. (2005) emphasise the importance of “testing the test”. This is crucial when asking participants to complete a set of tasks. First of all, it ensures that any ambiguous instructions are eliminated. Secondly, it verifies that the digital library is capable of performing the actions set out in the test. Before the pilot test was conducted a meeting was held with staff of the IVRLA. Each section of the usability test was discussed to allow for input from the IVRLA. The IVRLA asked that an additional question be included at the beginning of the think out loud usability test asking participants to locate the IVRLA website on the Internet. The IVRLA wished to find out how users found the IVRLA website, to see if users enter the website through the welcome page or if they navigate straight to the search page. After this meeting, the question requested by the IVRLA was added and the questionnaires and usability test were ready to be pilot tested.

The pilot test was conducted by two MLIS students from UCD School of Library and Information Studies. The pilot testers were selected because both had completed degrees and postgraduate degrees in History and Irish prior to enrolling in the MLIS course. The pilot tests were conducted separately and the pilot testers were asked to comment on the wording and structure of the test. After these tests the wording of several of the tasks was re-evaluated to eradicate instructions that were deemed confusing. The pilot testers also recommended that the test facilitator should stress to participants that there are only five tasks to be completed. This would help to ensure that participants took their time during the usability test and did not rush through the tasks.

4.5 Participant Selection

The importance of participants being a representative sample of the user group of a digital collection has been discussed in the literature review. Caccamo (2006) defined the user group of the IVRLA to initially include History and Irish studies researchers. This was later broadened to include researchers from the fields of Archaeology, English, Music and Geography. For this study History and Irish research students were identified as the most suitable user sub-groups to participate in the study. Both sub-groups could evaluate the usability of the UI, in addition the Irish research students could also test the bilingual functionality of the UI. If all user sub-groups had been
included it would have been necessary to develop a separate set of tasks to match the research interests of each sub-group.

Prior to beginning the participant selection process this research study applied for and was granted an exemption from ethical review by the Human Research Ethics Committee in UCD. Following on from this, a letter outlining the purpose of the study was sent to administration staff within the History and Irish Departments of UCD and the University of Limerick (UL) asking them to circulate it among staff and research students (see Appendix 2). Those interested in participating in the study were asked to make contact via email so that their suitability could be assessed. In total, eight people replied via email and indicated an interest in participating in the study. However, one participant was not available to participate on the dates selected for testing and another was deemed unsuitable because their research area was sociology. In all, six participants were chosen from UL, four History and two Irish language researchers. A cross section of potential users was chosen including faculty and research students, all of whom had various levels of expertise in the use of digital collections and were diverse in age and gender.

4.6 Conducting the Usability Study

All the participants for the study were located in UL and so it was arranged to conduct the usability study on campus over two days. The facilitator contacted UL Library and booked a PC training room to use for the duration of the study. Each participant was given an allocated time to come to the room and complete the usability study. The PC used by participants during the think out loud usability test was identical to the PC used by them on a daily basis when conducting their research. A video recorder was used to record the computer screen during the testing process. Prior to the test, participants were asked to sign a permission form to allow the session to be recorded. Participants were then asked to complete the pre-usability study questionnaire. Once this was completed, the video recorder was turned on and participants were asked to begin the think out loud usability test. Finally, the post-usability test questionnaire was administered. The video recorder continued to record during the post-usability test questionnaire to record participant's responses. During the testing process participants were told that they could ask questions but that the facilitator may not answer the
question until the test had been completed. Each testing session lasted approximately one hour.

4.7 Analysis of Results

Due to the fact that there were six participants taking part in the study it was unnecessary to code the data. The answers from the completed pre-usability questionnaires were correlated in a Microsoft Excel spreadsheet and reviewed. Next, the video tapes of the think out loud usability tests and the post-usability tests were reviewed and the results for each participant were transcribed and compared. The complete results are presented in Chapter 5 - Results.

4.8 Timeline of Activities

The timeline of activities for the evaluation of the user needs of users of the IVRLA is illustrated in Table 2.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Selection</td>
<td>November 2007</td>
</tr>
<tr>
<td>Meeting with IVRLA</td>
<td>15 January 2008</td>
</tr>
<tr>
<td>Research Proposal Submitted</td>
<td>29 February 2008</td>
</tr>
<tr>
<td>Thesis Research Seminar</td>
<td>7 April 2008</td>
</tr>
<tr>
<td>Thesis Treatment Submitted</td>
<td>28 April 2008</td>
</tr>
<tr>
<td>Review of Literature</td>
<td>May - June 2008</td>
</tr>
<tr>
<td>Development of Questionnaires and Usability Test</td>
<td>May - June 2008</td>
</tr>
<tr>
<td>Invitation to Testers Issued</td>
<td>4 June 2008</td>
</tr>
<tr>
<td>Review of Questionnaires and Usability Test with IVRLA Staff</td>
<td>19 June 2008</td>
</tr>
<tr>
<td>Pilot test of Questionnaires and Usability Test</td>
<td>21 June 2008</td>
</tr>
<tr>
<td>Conducted Usability Study</td>
<td>24-25 June 2008</td>
</tr>
<tr>
<td>Analysis of Results</td>
<td>1-21 July 2008</td>
</tr>
<tr>
<td>Writing of Thesis</td>
<td>21 July-30 Sept 2008</td>
</tr>
</tbody>
</table>

Table 2 - Timeline of Activities.
4.9 Criticism of Methodology

One issue that arose during the think out loud usability test was the fact that some of the participants felt that they were being tested as opposed to the IVRLA UI. As part of the introduction to the usability test it was explained to participants that the objective of the usability study was to test the IVRLA UI and not the research skills of the participants. Nevertheless, it was necessary to reassure some participants that they could not fail the test or that anything they did would be perceived as an error or a bad decision on their part.

Also, some participants had a tendency to forget that they were being asked to think out loud as they completed tasks. This is understandable as participants would not normally talk about the decisions they make as they carry out research. On occasion, the facilitator had to remind participants to verbalise their thoughts as much as possible.

Difficulties resulted from the language used by participants to explain problems they were experiencing or ideas they had. The use of colloquial or vague terms meant that it was difficult for the facilitator to understand what the participant was referring to. To combat this, participants were asked to explain their ideas or problems in greater detail and if necessary to point to the item on screen to verify for the facilitator what they were talking about.
Chapter 5: Results

This chapter outlines the results of the usability study conducted in the University of Limerick (UL). It is divided into three sections:

1. Pre-usability test questionnaire;
2. Think out loud usability test;
3. Post-usability test questionnaire.

The responses and actions of the six participants who took part in the usability study are detailed below. Each participant was given an individual identification to ensure their anonymity ranging from P1-P6.

5.1 Pre-usability Test Questionnaire Results

At the beginning of the usability study participants were asked to complete the pre-usability test questionnaire. The questionnaire was comprised of eight questions. Participants were first asked their occupation, a breakdown of which is given in Table 3.

<table>
<thead>
<tr>
<th>Occupation</th>
<th>No. of Participants.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lecturer</td>
<td>1</td>
</tr>
<tr>
<td>Post doctorate</td>
<td>1</td>
</tr>
<tr>
<td>Postgraduate</td>
<td>4</td>
</tr>
</tbody>
</table>

Table 3 - Occupations of Participants

5.1.1 Internet Usage

Participants were then questioned about their internet usage. They were first asked how many days a week they accessed the internet and secondly, how many days a
week they accessed the internet to search for academic material. The results of these questions are illustrated in Table 4.

<table>
<thead>
<tr>
<th>Participant ID</th>
<th>No. of days a week they access the internet</th>
<th>No. of days a week they access internet for research purposes</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>7</td>
<td>5</td>
</tr>
<tr>
<td>P2</td>
<td>7</td>
<td>2</td>
</tr>
<tr>
<td>P3</td>
<td>5</td>
<td>Less than once a week</td>
</tr>
<tr>
<td>P4</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>P5</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>P6</td>
<td>6</td>
<td>4</td>
</tr>
</tbody>
</table>

Table 4 - Participants’ Internet Usage.

5.1.2 Digital Collections and Resources

Questions four to six required participants to provide information about the digital collections/resources they has used. To cater for the two distinct user sub-groups that participants came under, History and Irish, two separate lists of historical and Irish digital collections/resources were provided for question four. Participants were also given the opportunity to list any collections they use but which did not appear as an option. Table 5 lists the Digital Collections and Resources used by participants and the number of participants who used each.

Question five asked participants to indicate their preferred digital resource and to give a reason for their choice. P1 stated that JSTOR was their preferred digital resource because “it is the only resource I have used with any regularity”. P2 and P6 both answered that Goolge Scholar was their preferred digital resource, commenting that it was “quick and usually efficient, links to everything,” and that it was “fast and easy to use”. P3, P4 and P5 all stated that Irish History Online was their preferred digital resource. Adding that it was “relevant to the area they are researching”, it is “a very comprehensive collection” and provides “easy access to primary sources, easy access to specific dates or subjects”.

41
<table>
<thead>
<tr>
<th>Digital Collection or Resource</th>
<th>No. of Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Achtanna.ie (Government Legislation)</td>
<td>1</td>
</tr>
<tr>
<td>British Official Publications Collaborative Reader Information Service (BOPCRIS)</td>
<td>1</td>
</tr>
<tr>
<td>Diospoireachtai Parlaiminte (Parliamentary Debates)</td>
<td>1</td>
</tr>
<tr>
<td>Google Scholar</td>
<td>2</td>
</tr>
<tr>
<td>History Study Centre</td>
<td>1</td>
</tr>
<tr>
<td>House of Commons Parliamentary Papers</td>
<td>2</td>
</tr>
<tr>
<td>Irish History Online</td>
<td>4</td>
</tr>
<tr>
<td>Irish Resources in the Humanities</td>
<td>1</td>
</tr>
<tr>
<td>Irish Statute Book</td>
<td>2</td>
</tr>
<tr>
<td>JSTOR</td>
<td>2</td>
</tr>
<tr>
<td>TCD, Northern Ireland Parliamentary Papers</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 5 - Digital Collections and Resources used by Participants.

Question 6 asked participants to name their least favourite digital resource and explain their reasons for their answer. P1, P3 and P6 did not provide any answer for this question. P2 stated that the UL library website is their least favourite as “it can be difficult to find sources”. P4 indicated that JSTOR was their least favourite resource because “while it is comprehensive I feel the search facility is not user friendly”. P5 did not name a specific digital resource as their least favourite, but instead made a general comment that “sometimes digital resources are a little 'big' and difficult to negotiate”.

5.1.3 Social Bookmarking
Questions seven and eight focused on participants’ knowledge of social bookmarking or tagging. Question seven asked participants if they had heard of or used a tagging or social bookmarking tool. Participants could indicate that they “have used it”, “heard of it but not tried it” or “never heard of it”. Out of the six participants, none answered that they “have used it”. Three participants said that they had “heard of it but not tried it”. Two participants indicated that they had “never heard of it”.

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Question 8 asked participants to indicate what tagging software tools they had used. As none of the participants had used tagging software tools no answers were provided for this question.

5.1.4 Previous Use of UCD Repositories
The final question of the pre-usability test questionnaire asked participants to state if they had previously used any of UCD’s repositories during their research. Participants were given a list of UCD repositories that have material in the IVRLA and asked to select any they had used. Table 6 lists the various UCD repositories and the number of participants who have used them.

<table>
<thead>
<tr>
<th>UCD Repository</th>
<th>No. of Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>UCD School of Irish, Celtic Studies, Irish Folklore and Linguistics</td>
<td>1</td>
</tr>
<tr>
<td>UCD Delargy Centre for Irish Folklore and National Folklore Collection</td>
<td>1</td>
</tr>
<tr>
<td>UCD Dialect Archive</td>
<td>0</td>
</tr>
<tr>
<td>UCD School of History and Archives</td>
<td>0</td>
</tr>
<tr>
<td>UCD Archives</td>
<td>1</td>
</tr>
<tr>
<td>UCD James Joyce Library Special Collections</td>
<td>0</td>
</tr>
<tr>
<td>None of the above</td>
<td>3</td>
</tr>
</tbody>
</table>

Table 6 - Previous Use of UCD Repositories

5.2 Think Out Loud Usability Test Results
The think out loud usability test comprised five tasks. Participants were asked to first read the instructions for the task and then attempt it. When attempting the tasks participants were asked to think out loud so that their ideas and comments on the task could be recorded. The wording of the tasks differed between those for history researchers and Irish researchers to make the tasks seem more realistic for participants. However, the tasks for both user sub-groups were testing the same
elements of the UI; therefore the results of the tasks for both sub-groups can be discussed together.

5.2.1 Locating the IVRLA
Before participants began the tasks they were asked to log onto the internet and find the IVRLA website. All six participants chose to search for the IVRLA using the Google search engine. Each participant entered the word IVRLA into Google and chose the first search result returned by Google. This brought them to the IVRLA page on the UCD website, where they could choose between entering the IVRLA Repository 1.0, the Dissemination Website or the Mailing List. All participants chose the first option, and entered the IVRLA repository.

5.2.2 “Get it” Task
Once participants had entered the repository the IVRLA Welcome page appeared. Participants were asked to take a minute to peruse the page and to talk about their initial impression of the page and any comments they had about it. Comments made by participants included:

- “The technical stuff is alien to me and sometimes it turns me off when I am hit with that first thing. But this is good, the terms and conditions, it looks to me like the top three terms and conditions are given prominence and then the user can look at the remainder there [pointing at the link to the terms and conditions]. I think that is a good idea rather than pulling them all out straight away, I would think they [the three terms and conditions listed] are the key terms and conditions so I think that is a good start.”(P4);

- “I don’t know what this is [participant points to the DJVu icon].”(P5);

- “This bit [pointing to the terms and conditions] would nearly put me off a bit. I am not too sure do I then have to write to the repository and get permission to use it…or maybe that is just publishing. So I would be unsure if I could use it and just reference the IVRLA or does it mean I can’t reprint and get special permission if I want to publish my research.”(P6).
5.2.3 Task 1
Task one asked participants from the history user sub-group to find a letter written by Sir Roger Casement to Robert Donovan. Participants from the Irish language user sub-group were asked to find a letter written by Tomás de Bhaldratithe to Miss Fionnuala Duane. All six participants were able to complete this task without any problems.

For this task all the participants used the Search All Collections function at the top of the IVRLA Main page (See Fig. 1). Out of the history user sub-group two participants entered the search term “Roger Casement” into the search box. This returned nine results. The first result in the list was the digital object referred to in the task; therefore, both participants had completed the task. P3 entered the search term “Roger Casement to Robert Donovan”, this resulted in 36 results being returned. However, the required digital object was the first in the list and so P3 did not have to look through the other results. Finally P5 entered the search term “letter from Roger Casement to Robert Donovan”. This search query returned 465 results but again the required digital object was the first item in the list. For their first task the Irish language participants both chose to enter the search term “Tomás de Bhaldratithe” in the Search all Collections function. This returned 51 search results. The required digital object was the first result, which participants selected, thus completing the task.

During the task, participant commented that:

- “Highlighting of the terms that you have searched for would be useful so that your eye was drawn to it more quickly.”(P1);
• “The outline details are fairly comprehensive and they contain the kind of details you would need to create a reference to this document. The note itself that describes the document is quite useful. You could spend time trying to examine the document, maybe trying to make out the handwriting, and then it’s not useful but this note gives you a good sense of what it is about.”(P4);

• “It is nice to see the thumbnail, the collection and the date.”(P5);

• “The search results give me a synopsis of what each letter is.”(P6).

5.2.4 Task 2
In Task two the history user sub-group were asked to imagine that they wanted to find a letter written by Matthew Dawes to Eugene O’Curry concerning his genealogical research into the Corr family. The Irish user sub-group were told to imagine they wanted to find a letter from Marion Gunn to Fionnuala Duane containing information about a correspondence between Cornelius Duane and Seán Ó Dalaigh. Both groups were then specifically asked to use the Detailed Search function to carry out their search.

Fig. 2 - Detailed Search Function of the IVRLA

P6 had used the IVRLA previously and was able to use the Detailed Search page without experiencing any problems. P6 entered the search term “Matthew Dawes” in the first text box of the Search function. In the Limit by function they chose “Select all” from the “Institutions” drop down menu. P6 clicked on the search button and six results were returned. The second digital object in the list was acceptable as the digital object
required for the task. P2 was also able to complete the task without any assistance. In the Search function P2 entered the search term “Marion Gunn” and chose to search under the Names index. P2 next clicked on the drop down menu for “Limit by role” and selected “all roles” before selecting the Boolean operator “and”. P2 then entered the search term “Fionnuala Duane” in the second search box and also chose to search in the Names index for this term. When P2 pressed the search button one result was returned, which was the digital object they required.

The other four participants attempted the task but after five minutes the facilitator intervened and provided assistance. Participants were confused about where to enter their search terms. Participants tried searching using the Boolean operators. When this failed, they used the Subject Browse search facility. On the right hand side of the detailed search page is the Limit By function. This allows users to narrow their by selecting options from the drop down menu. The default setting for the Institutions drop down menu is “UCD Micheal Ó Cleirigh Institute”. As a result search queries are automatically restricted to items from this institution unless the setting is changed by the user. Four of the participants did not realise this and as a result each search query carried out by them returned zero results. The search terms used should have returned the correct search results had the “limit by” setting been changed. Once this setting was pointed out to two of the remaining four participants were able to complete the task.

However, P3 and P5 were not able to complete Task two. For example, P5 began by selecting the Names index in the Subject Browse function but then closed it again without selecting any name. They then entered the surname Dawes in the Subject Browse search box. Next they moved up to the Search function and entered “Dawes, Matthew” in the first search box, selected to search in Names from the drop down menu. P5 typed “O’Curry, Eugene” in the second search box and again chose to search in Names. Finally, in the third search box they entered “Corr Family Research” and chose to search in Item Notes. They clicked the search button and no results were returned. P5 changed their third search query to search for “Corr Family Research” in Names rather than Item Notes. Again this search query returns no results. At this point the facilitator showed P5 the Limit By function and asked them to change the Limit By Institution to Select All. P5 pressed the Search button again and no results were returned. P5 then deleted the word “Dawes” from the Subject Browse text box, searches again but still no results. P5 clicked on the Name index in Subject Browse
Chapter 5 - Results

and selects “Eugene O’Curry, 1796-1862”, searched again but no results returned. They then deleted all terms from the Search function so that they are only searching for the “Eugene O’Curry, 1796-1862” subject heading in the Subject Browse, but again no results were returned. P5 states “I am obviously doing something very wrong here because this is in there”. P5 returned and selected the “Eugene O’Curry, 1796-1862” subject heading again from the Names Index of the Subject Browse function, searches again and no results are returned. Next P5 clicked on the All Subjects index in Subject Browse, selected Letters, then in the search box entered “O’Curry, Eugene” and 161 results were returned. P5 returned to the Search function and added Matthew Dawes to the second search box but no results are returned. P5 then deleted Matthew Dawes and searches again, the original 161 results are returned. P5 goes back to the Detailed Search page looks at Limit By Collection drop down menu but does not see the Eugene O’Curry Papers listed so P5 did not select any option [Eugene O’Curry Papers are listed, but P5 did not see them in the list]. P5 “If I could limit the collection because other than that I have to go through 161 hits but I am not sure how I can limit it down again”. At this point the Facilitator thanks P5 for attempting the task and asked them to move on to Task 3.

5.2.5 Task 3

The aim of task three was to evaluate the use of DJVu plug-in by participants. Participants in the history user sub-group were asked to find a photograph of James Joyce as a boy. Participants from the Irish user sub-group were asked to find an item entitled Toradh Ceistítúcháin ar Na Tíncéirí, Cúige Laighean. All participants were then asked to view the larger digital image of the item and then save the digital image to their desktop.

For this task all of the participants reverted to using the Search All Collections function in favour of the Detailed Search function to find the item they required. None of the participants had any difficulty in finding the items using the Search All Collections. P6, who had previously used the IVRLA, found the image of James Joyce as a boy and from this digital objects Contents page selected to view the JPEG of the photograph instead of using the DJVu plug-in to view the image. P6 then saved the JPEG to the desktop of the PC. In contrast, the other five participants all found the digital image they required but then used the mouse to right click on the thumbnail on the Description page and selected to save the image to the desktop. When the participants
clicked on the saved image to open it, it automatically opened in Adobe Photoshop and appeared as a thumbnail image.

<table>
<thead>
<tr>
<th>Description</th>
<th>Contents</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. [Front]</td>
<td>Download DjVu   Download Jpeg</td>
</tr>
<tr>
<td></td>
<td>11.25 x 15.75 (cm)</td>
</tr>
<tr>
<td>2. [Front]</td>
<td>Download DjVu   Download Jpeg</td>
</tr>
<tr>
<td></td>
<td>11.25 x 15.75 (cm)</td>
</tr>
</tbody>
</table>

Fig. 3 - Options to View Digital Objects.

At this point the facilitator asked the five participants to return to the IVRLA Welcome page and pointed out the DjVu plug-in icon. They were then asked to click on the DjVu plug-in icon and follow the download instructions. Several of the participants commented that it was not evident on the IVRLA site that it was necessary to download the DjVu plug-in to view images. Participants experienced difficulties in downloading the DjVu plug-in from the Lizardtech webpage. When Participants clicked on the DjVu plug-in icon on the IVRLA Main page the Lizardtech webpage (Fig. 4) opened in a new browser window.
At first, the location of the DjVu plug-in link was not evident to participants. Eventually participants had to scroll down the page until they reached a link which stated “visit the new DjVu browser plug-in webpage”. Clicking on this link opened a third browser window where participants were given the option of downloading the DjVu plug-in for use on a Windows, Mac OS X or Unix operated system (Fig. 5). For the usability test all participants were using a Windows operated PC and as a result chose the first download option. Once participants selected to download the plug-in the Active X popup warning appeared at the top of the browser window asking participants to ensure it was safe to download the DjVu plug-in. Participants hesitated at this point, but then chose to run the application and finished installing the DjVu plug-in.

With the download of the plug-in complete, participants were asked to return to the IVRLA and attempt to open the image again. On this occasion when participants clicked on the thumbnail image of the digital object on the Description page it opened in the DjVu viewer. P4 stated that they “could see the difference after installing the programme [DjVu plug-in]”.

Fig. 4 - Lizardtech Webpage.
5.2.6 Task 4

Task four focused on evaluating how participants create a citation for digital objects they use from the IVRLA. In particular, it was focused on ascertaining if users would use the Digital Object Identifier (DOI) associated with each digital object in the IVRLA. Participants from the history user sub-group were asked to find an item relating to the Ancient Foundling Hospital in Dublin, while participants from the Irish user sub-group were asked to find a questionnaire response by Seán Ó Dúbhda, Carraig, Ballynagall, Dingle, Co. Kerry. They were then asked to imagine they were going to use the document in their research and wanted to create a citation. They were then asked to explain how they would do this.

Fig. 5 - DjVu Plug-in Download Page.
During the task none of the participants indicated that they would use the DOI supplied by the IVRLA as part of their citation. Participants used the bibliographic information such as the author, title and date to create the citation. Also, four of the participants stated that they would reference the URL for the IVRLA as it appeared in the address line of the web browser. Once all the participants had finished creating their citation the facilitator pointed out the DOI and explained its purpose. Participants commented that “it didn’t jump off the page at me, if it is important information then it should be more prominent” (P1) and that they “would not have noticed that [DOI] there as it is hard to see” (P2).

In relation to Irish language functionality, P1 stated that “if I am going to use this item and I am going to create a citation then it is going to be in Irish so it would be helpful to have the bibliographic information in Irish so I don’t have to translate it myself, I can just pull it from the screen”.

5.2.7 Task 5
The final task asked participants to bookmark a page on the IVRLA using the Delicious bookmarking tool. At present, only the Collection Description and the Content and...
Structure pages of collections within the IVRLA can be bookmarked. Participants were instructed to navigate to the Collection Browse page and from there select the Papers of William Frazer and the Irish Dialect Archive Card Catalogue for the History and Irish user sub-groups respectively. The Delicious icon appears at the top right hand side of the page and by clicking on it users can then automatically bookmark and save the page in their Delicious account (See Fig. 7).

Fig. 7 - Bookmarking a Page Using Delicious (link highlighted in green).

All of the participants were able to locate the “bookmark this on Delicious” link on the screen without any difficulty. However, none of the participants had an active Delicious account. Therefore, the facilitator asked participants to click on the Delicious link and create a user account. All six participants were able to follow the registration process on the Delicious website. Setting up a Delicious account was completed in three steps. The first step asks participants for personal details such as name, email address and password. The second step asked participants to install bookmarking buttons. However, several participants found it confusing to install the Delicious shortcut buttons in the web browser because they were unsure what the purpose of the shortcut buttons was (Fig. 8). Two of the participants chose to “add buttons”, while four of the participants chose to “skip this step”. The two participants who chose to “add buttons” were then asked to run the “deliciousbookmarks.exe” file to install the buttons in the web browser. The final step of the download process asked participants to “Import
existing bookmarks” from their browser. As the computer used for the think out loud usability test was not the regular PC of any of the participants, none of the participants could complete this step.

Fig. 8 - Delicious Add Buttons Page.

When this was completed participants returned to the IVRLA and bookmarked the page. None of the participants created tags or added notes when saving the bookmark. Instead they chose to save the bookmark using the URL and the title of the page (Fig. 9). Two participants stated that they would normally save a web page to the favourite’s folder of the web browser if they wanted to return to a web page.
5.3 Post-usability Test Questionnaire Results

Upon completing the usability test, participants were asked to complete the post-usability test questionnaire. The questionnaire consisted of eight open ended questions focused on gauging the reactions of participants to using the IVRLA UI and allowing for any comments or suggestions they wished to make.

5.3.1 Describing the experience of using the IVRLA

The first question asked participants to describe their experience of using the IVRLA. This question evoked a mixed reaction from participants. Some of the positive comments included:

- “It was easy to navigate for the most part.” (P1);
- “It is straightforward, quick and responsive.” (P3);
- “More comprehensive than I expected.” (P4);
- “Very straightforward and easy to use.” (P6).

However, some of the more negative comments included:
• “It was not clear to me that something in the limit by column corresponded to something in the other column [in the Detailed Search]. If you are not used to using delicious or things like that it would not occur to you to use it to bookmark but that’s more to do with personal internet use habits that the site itself.”(P1);

• “From the point of view of researching through Irish the website is in English so it is difficult to browse…to get used to, because none of it is in Irish.”(P2);

• “I don’t see what is on the screen… so much going on [on] the screen.”(P5);

• “The thing I would like to see when you go on to it is a list of the collections, I didn’t see that, I know they are in further but it might be useful if you saw straight away what collections are available to date as I know they are being updated all the time. They expect you to know what you are looking for when you go into certain repositories. If they explain what is in there then straight away I know I can go in there.”(P6).

5.3.2 Likes and Dislikes
The second question asked participants what features they liked and disliked and to asked them to give reasons for their choice. Participants liked:

• The option to limit by language in the Detailed Search function. (P1)

• Search All Collections function - because it is accessible. (P2)

• Contents and Structure pages for each collection – “because all the documents are listed and described and when you get into each individual document they are described very well, that’s important if you are viewing this on a slower internet connection, you need to save time rather than opening up the document”.(P4)

• The way search results are displayed –“it gives a good synopsis of the content.”(P6).

Participants disliked:

• Lack of an Irish language version of UI (P1; P2).
5.3.3 Difficult Tasks
Question three asked participants to name the task they found the most difficult to complete and to explain why. Two of the participants chose not to answer this question. Two participants said they found Task 3, viewing and saving a digital image, the most difficult as they did not understand that they needed to download the DjVu plug-in. Three participants stated that Task 5, bookmarking a page using Delicious was the most difficult. All the participants gave the same reason for their answer saying they did not know they had to download the Delicious bookmarking tool before they could use it.

5.3.4 Confidence in Using the IVRLA
Question four asked participants how long it would take for them to feel as confident using the IVRLA UI as using their favourite digital collection, and to explain their reasons why. Three participants chose not to answer this question. The other three participants stated that they would feel confident using the IVRLA very quickly. P4 said they would feel confident using the IVRLA “a lot quicker than on the House of Commons Parliamentary Papers site as that is complex and vast…this is more user friendly and easier to search”. P5 believed they would be confident using the IVRLA UI after “one or two more times” using it, while P1 said they would be confident using it after an hour of use.

5.3.5 New Features
The fifth question asked Participants to name new features they would like to see incorporated into the IVRLA UI and if possible to give a reason for their answer. Three participants said that they could not think of any new features at that point in time. Both of the Irish language researchers stated that they would like to see an Irish language version of the UI. Finally, P6 suggested that the IVRLA should provide information explaining its work to date and proposed digitisation of collections of UCD. P6 went on to say that “if I was interested in another collection in UCD if the IVRLA explained what is in the pipeline or that they hope to have it in the next

- Downloading of DjVu plug-in and Delicious (P4; P5).
six months. It would save me going to UCD if I knew that it would be accessible online when I needed it”.

5.3.6 Features from other Digital Collections
Question six asked participants if there were any features from other digital collections or resources that they would like to see incorporated in the IVRLA. Five participants did not provide an answer to this question. P4 suggested it would be helpful if items were categorized according to subject such as political, social or military history. However, items within the IVRLA are categorized according to subject headings selected from the Library of Congress.

5.3.7 Rate the IVRLA
Question seven provided another opportunity for participants to give their overall impression of the IVRLA. It asked them how they would rate the IVRLA as a digital resource. One participant did not answer this question. The other participants made comments such as:

- “takes a while to get used to it and I would like more language options considering the collections they have”. (P2);
- “Good, out of 10 a 7 because it is not in Irish”. (P1);
- “I would rate it as strong, user friendly, has a lot of potential. It could become something very useful in the future and researchers would welcome it.” (P4).

5.3.8 Use of the Physical Collections
The final question asked participants: Now that you have used the IVRLA, would they still feel it was necessary for them to go to the archives and view the original documents and to explain their reasons. All of the participants said that they would not
feel it was necessary to view the original documents once they were available through
the IVRLA. Some of the comments they included were:

- “No, this is useful and would save a lot of time because it is on my
  computer.”(P2);

- “I would probably be happier using something like this in the future and be
  happier to accept the advantages (economic advantages) it brings to me as a
  researcher.”(P4);

“Not the ones [collections] that are online and it seems very good, just as good as
what I have looked at on microfilm. I would like it to tell me if there are some items
missing just to be sure I have accessed everything and that I definitely don’t need to
go to the archive.”(P6)
Chapter 6: Discussion

This chapter will discuss the sub-research questions of this research study in the context of the usability study results outlined in Chapter 5. Similar usability studies will be re-examined to compare and contrast their findings and solutions with those put forward by this study of the IVRLA UI Version 1.0.

6.1 Basic Functionality of the IVRLA

The first sub-research question of this research study was:

To what extent is the basic functionality of the IVRLA UI meeting user requirements?

To address this question, the research study focused on three areas of the IVRLA UI; the search function, viewing digital objects and citing information from the IVRLA.

6.1.1 Quick Search

The first two tasks, of the think out loud usability test, focused specifically on examining the search function of the IVRLA UI. However, all five of the tasks required participants to search the IVRLA. As a result, the findings of all five tasks have influenced this discussion of the search function.

The IVRLA UI allows users to search the collections in four ways. When users enter the IVRLA the *IVRLA Main* page (http://ivrla.ucd.ie/ivrla10/main.html) has a search option at the top of the page; the *Search All Collections* option. The *Search All Collections* option appears at the top of every page of the IVRLA so that users can search the IVRLA from any location within the digital library. If users click on the *Search/Browse* link underneath this search option they are brought to the *Search/Browse* page which provides another three ways of searching the IVRLA. Here users select one of the three tabs; *Collection Browse*, *Quick Search* and *Detailed Search*. 
Fig. 10 - Search Page of the IVRLA.

The Search All Collections option and the Quick Search function on the search page provide a similar search option. However, the Quick Search function allows users to narrow their search by selecting a specific collection to search, and a particular resource type, such as text, still image, sound recording etc (See Fig. 11). Throughout the think out loud usability test participants used the Search All Collections option instead of using the Quick Search function. None of the participants used the Quick Search option on the Search/Browse page. When using the Search All Collections option users had no way of limiting their search. As a result, the amount of search results returned ranged from zero to several hundred. Despite this, participants indicated that they found detailed searching or Boolean searching confusing and preferred a simple search function similar to that used in commercial search engines.

The results of this study imply that the IVRLA should remove the Search All Collections option from the IVRLA Main page. The Search All Collections option on the IVRLA Main page can mislead users into thinking this is the only search option available. In contrast, the Quick Search option offers a greater degree of usability, allowing users to set limiters on their search while still being simple to use. Ensuring users begin their search from the Search/Browse page allows users to select the search function that suits their needs. The Search All Collections option should remain available at the top of all other pages. Thereafter users can make the choice to navigate back to the Search/Browse page or to use the Search All Collections option at the top of the page wherever they are located within the IVRLA.
Fig. 11 - IVRLA Quick Search function.

The Metalib usability test made recommendations for improving navigation such as using a different font size or colour for links, using different line spacing, creating a visual cue to separate the navigation from the content, like a line spacing or a box or leaving white space around the menu (George, 2008). At present, there is no space between the Search All Collections function and the Home, Search/Browse and Help links underneath it. As a result users can mistake the links to be part of the Search All Collections function rather than links to other pages. A distinction should be made between the Search All Collections function and the links provided to the Home, Search/Browse and Help pages. In the case of the IVRLA, creating more white space between the Search All Collections function and the Home, Search/Browse and Help links underneath would help users distinguish between their separate functions.
6.1.2 Detailed Search

Task two of the think out loud usability test was aimed specifically at the testing the Detailed Search function of the IVRLA. The majority of participants experienced difficulty in using the Detailed Search function. Participants did not recognise that in the Limit By option the default setting for the Limit By institutions option was the UCD Micheal Ó Cleirigh Institute. When questioned, the IVRLA stated that this setting was due to a javascript error on the page and would be rectified (Drohan, 2008a).

During the usability study, several of the participants referred to their dislike of using advanced search options in digital collections, similar to the Detailed Search function provided by the IVRLA. P4, a university lecturer, stated that they do not use advanced search options but instead select to do a quick search where possible. P3 remarked that when using the advanced search option of a digital collection there are “too many choices and I don’t know where to go.” As part of the pre-usability test questionnaire, two participants had indicated that Google Scholar was their preferred digital resource, stating that it was “quick” and had “links to everything”. Another participant selected Irish History Online as their preferred digital resource as it provided “easy access to primary sources.” Both Google Scholar (Fig. 12) and Irish History Online (Fig. 13) provide users with the ability to conduct an advanced search. However, their advanced search options are both kept to a minimum giving users a total of nine search options to choose from. In comparison, the Detailed Search function (Fig. 14) of the IVRLA allows users to insert three search terms and select corresponding Boolean operators for each. It also provides six different drop down menus, which allow participants to limit the search, and also a subject browse option where participants can search under the options of All Subjects, Names, Places and Titles.
Fig. 12 - Google Scholar Advanced Search Option.

Fig. 13 - Irish History Online Advanced Search Option.
Furthermore, the layout of Google Scholar and Irish History Online appears in a linear fashion and as a result seems less confusing to the user. In contrast the IVRLA *Detailed Search* option is broken into sections and, as P1 stated, it was not clear that something in the *Limit By* column corresponded with something in the *Search* function or the *Subject Browse* function. Miller (2004) has stated that, “Google Scholar has taught us, quite powerfully, that the user just wants a search box. Arguments as to whether or not this is “best” for the user are moot – it doesn’t matter if it’s best if nobody uses it.” The IVRLA provides this “search box” in its Quick Search function. This is not to say that its *Detail ed Search* function is redundant but it does need to be refined so that it appears less daunting to the user. Wusteman (2008, p. 14) states that “interfaces need to be familiar enough so that users are prepared to give them a chance. What is needed is to build on user familiarity, determining whether each potential change is acceptable to the user or pushes them beyond their tolerance limit.” Therefore, the *Detailed Search* function of the IVRLA should look familiar to users to ensure that they are willing to use it. One possible solution is for the IVRLA to amalgamate the *Search* function and the *Subject Browse* function on the *Detailed Search* page thus removing the use of Boolean operators, which had deterred participants. Instead users would be given options to search under the headings of *Author* or *Name*, *Place*, *Title* or *All Subjects*. For each heading users could enter their own search terms in a text box or they could click on an index button and choose from a prescribed list. This would improve the usability of the *Detailed Search* function while still allowing users flexibility.

Fig. 14 - IVRLA Detailed Search Option.
Task three asked participants to; find an item in the IVRLA, open the digital image and save it to the desktop of the computer. None of the participants used the DjVu plug-in during this task. One participant was able to find the required item and opened the alternative JPEG version of the digital object. The other five participants found the required item and saved the thumbnail of the digital object to the desktop. However, when they opened the digital object it reopened as a thumbnail image. At this point, the facilitator asked the participants to return to the Welcome page of the IVRLA where they were shown the DjVu icon and asked to download the plug-in. At the beginning of the think out loud usability test participants were shown this page. They were asked to take some time to look at the page and comment on it. The majority of participants commented on the terms and conditions section at the bottom of the page but only one participant noticed the DjVu plug-in icon. P5 saw the DjVu plug-in icon, pointed at it and said “I don’t know what that is” and then moved on to talk about the terms and conditions section on the same page.

If users do not download the DjVu plug-in, it is more difficult to view digital objects in the IVRLA, thus reducing the usability of the IVRLA. If users attempt to open the thumbnail image on the description page for a digital object a new blank webpage will open. Likewise, the “download DjVu” link on the Contents page for a digital object will not work if users have not installed the DjVu plug-in. To view digital objects without the DjVu plug-in users must navigate to the Contents page of the digital object and select the “download JPEG” link. After participants had been shown the DjVu plug-in link they were asked to download the plug-in and attempt the task again. Three participants stated that this was the hardest task and that the plug-in download process was confusing. However, once the download process was complete and participants began to view digital objects using DjVu they were immediately impressed by the visual quality of the digital objects.

Obviously, the download process from the Lizardtech website is beyond the control of the IVRLA but it can give greater emphasis to the benefits of downloading the DjVu
plug-in. On the *Welcome* page of the IVRLA users are confronted with two important pieces of information, the need to download the DjVu plug-in and the need to agree to the terms and conditions of use of the IVRLA (See Fig. 15). During the usability study participants were immediately drawn to the term and conditions section of the IVRLA *Welcome* page and as a result bypassed the information concerning the DjVu plug-in. Greater emphasis needs to be given to the advantages of downloading the DjVu plug-in. The results of this imply that the IVRLA should state that to optimise the usability of the IVRLA and to view digital objects with added-functionality it recommends users download the DjVu plug-in.

![Welcome page of the IVRLA](image)

**Fig. 15 – “Get DjVu” link on IVRLA Welcome Page.**

Underneath the DjVu link on the IVRLA *Welcome* page it states that “detailed information about this file format is available on our *Help* page” (Fig. 16). However,
when a user goes to the IVRLA Help page the section relating to the DjVu plug-in recommends users go to the Lizardtech website for more information and provides a link to the website (Fig. 16). At this point users have not garnered any additional information about what the DjVu plug-in will allow users to do or any advice about how to download the DjVu plug-in. The IVRLA could deliver a better user experience by providing more information about the advantages of using the DjVu plug-in and helpful advice on the downloading procedure.

![DjVu Plugin](image)

The DjVu plugin must be installed before utilizing the main features of this repository. Please visit the DjVu download page and follow the instructions. More information on the use of DjVu is available at the LizardTech website.

![Get DjVu](image)

[Please note that the DjVu plug-in for Mac OS X 10.4 is not compatible with IVRLA. Select the MacOView and Download files to your desktop for viewing.]

Back to Help Menu

Fig. 16 - DjVu Plug-in Information on the IVRLA Help Page.

6.1.4 Digital Object Identifier

The IVRLA has provided a Digital Object Identifier (DOI) for each digital object held within the IVRLA. The DOI provides users with a permanent identifier for the digital object even if the location of the digital object changes. For example if the web address of the IVRLA were to change, as long as a user had the DOI for the digital object they required they can relocate it easily. Task four of the think out loud usability test asked users to create a citation for a digital object within the IVRLA using information found on the IVRLA UI. None of the six participants used the DOI provided by the IVRLA in creating their citation. Four participants indicated that they would reference the URL for the IVRLA when creating a reference. When participants had completed the task the facilitator pointed out the DOI and explained its purpose. Participants commented that if this is important information then it should be more noticeable. Theoretically the DOI is in a good position at the top of the page for each digital object. However, the grey background colour used does not help make the DOI to stand out (Fig. 17). A more vibrant colour would help ensure it is noticed and consequently used by users. The
help page of the IVRLA provides information about the purpose of a DOI for users who are unfamiliar with it. To further assist users, it would be useful if a link was provided from each DOI to the description of its purpose on the Help page. This could help to ensure that users utilise this facility of the IVRLA.

Fig. 17 - Example of a DOI used in the IVRLA.

6.2 Use of Added-value Functionality

The IVRLA UI Version 1.0 included one added-value function, which was social bookmarking. Therefore the second sub-research question was:

How effective is the added-value function of social bookmarking/tagging in the IVRLA UI Version 1.0 in meeting user requirements?

The pre-usability test questionnaire asked users about their knowledge and use of social bookmarking tools. None of the participants had previous experience of using social bookmarking tools. Three participants stated that they had “heard of it but never used it.” The final task of the think out loud usability test asked users to tag a page of the IVRLA using Delicious. Participants were able to locate the Delicious link without any difficulty, illustrating that it is well positioned at the top of the web page and highly visible on the pages on which it is used. None of the participants had Delicious accounts, therefore they were asked to click on the link and create a Delicious account. Creating an account involves three stages, creating a username, adding Delicious shortcut buttons and importing bookmarks from a web browser. When creating a Delicious account four participants chose not to install the Delicious shortcut buttons. However, the Delicious icon does not appear on the page of each digital object within the IVRLA but only on the Content and Structure and Collection Description pages. As a result if a user has not installed the Delicious shortcut buttons in their browser they are restricted in the degree of bookmarking they can carry out in the IVRLA. The added-value functionality of the IVRLA relies on the users’ use of Delicious not just for bookmarking digital objects within the IVRLA but as a core element of their online research techniques.
As part of the research in relation to increasing information “findability” in OJAX++, Bjornson (2008) has recommended the Open Annotation and Tagging System (OATS) be implemented as the tagging software of the IVRLA and other repositories using the OJAX federated search engine. Bjornson goes on to state that OATS can be implemented seamlessly into the UI of the IVRLA and has the potential to be utilised for tagging textual and visual digital objects. To compliment the use of OATS Bjornson also recommends using the controlled vocabulary WordNet to assist in lowering the rate of misspelling of tags and the use of irrelevant tags. The IVRLA has stated that in the next version of the IVRLA UI they envisage implementing user accounts and the ability for users to build virtual collections. As part of this they also envisage implementing a personal tagging option (Drohan, 2008d). OJAX++ is also due to be implemented in the next version of the IVRLA. At this point, if OJAX++ has incorporated a tagging system then the IVRLA can utilise this function. However, if this has not occurred then the IVRLA should progress with developing and implementing a tagging system.

6.3 Bilingual Functionality

The IVRLA is comprised of English and Irish language material. To meet the needs of Irish language users, the IVRLA has stated its intent to further develop the Irish language functionality of its UI. Therefore the third sub-research question was:

How are the requirements of Irish language users being met by the IVRLA UI Version 1.0?

To address this question, two Irish language researchers were recruited as participants to take part in this usability study. The Irish language participants were given tasks relating to Irish language digital objects within the IVRLA. At present the IVRLA has no Irish language functionality, as a result there was no Irish language functionality for the participants to test. Instead participants were given tasks relating to Irish language digital objects within the IVRLA. As they completed the tasks participants were asked to comment on the level of Irish language functionality they would like to see incorporated into the IVRLA UI.

Both participants stated that they would like the entire UI to be in Irish. P2 went on to say that they are completing a PhD through Irish and conduct all of their research
through Irish. When searching for Irish material within a digital collection they expect that the metadata describing the content would be in the same language. As a result P2 stated that the IVRLA UI was “difficult to browse” when researching in Irish. Caccamo’s (2006) research study had recommended that the IVRLA develop an Irish language version of the UI in tandem with the English language version. She cited the National Library of Wales bilingual UI as an example of how two languages can be incorporated successfully. However, during the development of the IVRLA UI, the workload in developing an English language UI was too great to attempt an Irish language version at the same time (Drohan, 2008c).

In future versions of the IVRLA UI, a possible solution in helping develop an Irish language version of the UI would be to use open source software such as Greenstone and Citadel that allow non-experts to build a digital library in their indigenous language (Nichols et al., 2005; Hutchinson et al., 2005). Another possibility in developing an Irish language version of the UI would be to get volunteers to submit Irish language translations of metadata. The developers of Citadel have used this method successfully; therefore, the IVRLA could use it to develop an Irish language UI without having to employ Irish language experts (Hutchinson et al., 2005). Undoubtedly, the issue of developing an Irish language UI is going to arise for other digitisation projects in Ireland, as they move from the digitisation process to developing a UI. The Digital Humanities Observatory (DHO) could play a key role in liaising between different projects and provide advice on how best to tackle the issue of developing a bilingual UI.

The first step towards creating a bilingual UI could be to provide Irish language metadata for Irish language material held in the IVRLA. During the usability study, P1 stated that it would be helpful to have the metadata and bibliographic information so that it could be copied and used by them. Instead they have to translate the information which can be a time consuming process. Pavani (2001) has outlined three language control parameters that can be implemented in a UI. These are: language of the content, language of the catalogue entry and language of navigation. If the IVRLA translated its catalogue entries for Irish material it would have implemented the first two parameters and as a result would increase the usability of the IVRLA for Irish language users.
6.4 Accessing the IVRLA

When a user enters the acronym IVRLA into the Google search engine three of the top four results will bring the user to a page of the IVRLA that could be labelled the IVRLA “Main” page. On the IVRLA Welcome page the IVRLA asks users to agree to the term and conditions of use of the IVRLA. The IVRLA indicated that it was interested to find out how users access the IVRLA. As a result, at the beginning of the think out loud usability test participants were asked to log on to the internet and find the IVRLA through whatever means they wished. All six participants logged on to the internet and chose to search for the IVRLA using the Google search engine. The first search result found through Google brings users to the IVRLA page on the UCD website, illustrated in Fig. 18 (http://www.ucd.ie/ivrla/). From here users can access the IVRLA repository, IVRLA dissemination website or the IVRLA mailing list. The third result in Google brings users to the IVRLA Main page (Fig. 19) (http://ivrla.ucd.ie/ivrla10/main.html). Finally the fourth result in Google allows the user to navigate to the IVRLA Welcome page (Fig. 20) (http://ivrla.ucd.ie/).

![IVRLA Page on the UCD Website](http://www.ucd.ie/ivrla/)

All six participants chose the first result returned by Google and entered the IVRLA through the UCD website. When participants chose the “Enter Repository” link on this page they were brought to the IVRLA Welcome page where they are asked to agree to the terms and conditions of use of the IVRLA. However, if participants chose the next option to enter the IVRLA in Google they bypass the IVRLA Welcome page and are
brought immediately to the **IVRLA Main** page. As a result, they are not required to agree to the terms and conditions of use. This study has recommended that the **Search All Collections** function be removed from the **IVRLA Main** page. If the IVRLA proceeded with this recommendation the **IVRLA Main** and the **IVRLA Welcome** pages could be merged to create one **IVRLA Main** page. This would reduce the need for users to navigate through between two and three web pages before they reach a point where they can begin searching with the repository. It would also mean that information about the IVRLA, the terms and conditions of use, the DjVu plug-in and searching/browsing would be brought together on one page in a more convenient layout for the user. Finally, this design change would help to ensure that users do not bypass the terms and conditions of use of the IVRLA thus, preventing copyright infringement.

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**Fig. 19 - IVRLA Main Page.**
6.5 Limitations of this study

This research study does not test every aspect of the IVRLA UI as this was outside the scope of the study. However, aside from making recommendations on specific aspects of the IVRLA UI, it provides a testing framework that can be used by the IVRLA when testing the next version of the UI. It is important that at each stage of development users are involved in retesting the design of the UI to ensure that it continues to meet their needs.

One of the sub-research questions of this study examined how the IVRLA was meeting the needs of Irish language users. However, at present the IVRLA UI does not have any Irish language functionality. As a result participants could not test any specific Irish language functionality but instead were asked to use the UI and indicate areas where Irish language functionality could be introduced. When an Irish language version of the UI is designed a usability test should be performed to ensure it meets users’ requirements.
Chapter 7 – Conclusion

7.1 Recommendations

Following the analysis and discussion of the results of the usability study of the IVRLA UI Version 1.0, this research study puts forward the following recommendations for improving usability.

**Search All Collections** - IVRLA should remove the *Search All Collections* function from the *IVRLA Main* page. As a result, users would begin their search from the *Search/Browse* page. However, the *Search All Collections* function should remain available on all other pages within the IVRLA.

A distinction should be made between the *Search All Collections* function and the links provided below it to the *Home, Search/Browse* and *Help* pages. Creating white space between the *Search All Collections* function and these links would help distinguish between their separate functions.

**Detailed Search** - The layout of the *Detailed Search* function should be changed to replicate the advanced search functions of digital collections commonly used by members of the IVRLA user group. The *Search* and *Subject Browse* functions of the *Detailed Search* page should be amalgamated. Boolean search operators should be replaced; instead users should be given the options to search under the headings of *Author* or *Name, Place, Title* and *All Subjects*. For each heading users could enter their own search term in a text box or select a search term from a prescribed list. The *Limit By* function should be moved from the right of the *Search* function to below it so that all search functions appear in linear form.

**DjVu plug-in** - Great emphasis should be placed on the advantages of downloading the DjVu plug-in. The IVRLA should provide more information on the *IVRLA Main* and *Help* pages about what the DjVu plug-in does and how to download it.

**DOI** - The grey background colour of the DOI should be changed to a more vibrant colour, to ensure that it is seen and consequently utilised by users. A link to the Help page should be provided beside the DOI to help users learn more about its function.

**Tagging** - When OJAX++ is implemented in the next version of the IVRLA UI, the IVRLA should utilise the tagging system incorporated in OJAX++ and suspend the use
of Delicious as its tagging system. If OJAX++ does not incorporate a tagging system, then IVRLA should progress with developing its own.

**Irish Language** - A full Irish language version of the IVRLA should be developed. If this is not immediately viable, the first step towards this should be to provide an Irish language version of the metadata for Irish language material held in the IVRLA.

**IVRLA Main page** - The *IVRLA Main* and *IVRLA Welcome* pages should be merged to create one *IVRLA Main* page.

### 7.2 Future Work

Following the implementation of the recommendations made in this research study another usability study of the IVRLA should be conducted. This will ensure the changes made to the UI have actually improved the usability of the UI. Furthermore, any future versions of the IVRLA UI should be tested by users, preferably during the developmental stage. The design of this usability study provides a template for the IVRLA on which to base future usability studies. However, the IVRLA should endeavour to keep abreast of both national and international improvements in usability testing to optimize the benefits of any usability studies it conducts.

The DHO (2008) has been established under cycle four of the PRTLI to coordinate the collaborative development of humanities computing in Ireland building on best international practice. Cooperation between the DHO and IVRLA could optimise the developmental potential of the IVRLA UI, while also allowing it to be used to develop standards to which other digitisation projects in Ireland can aspire.

Outside of Ireland, libraries have been utilising usability testing as a means of improving digital resources for over ten years. However in Ireland, library and information studies have continued to rely on qualitative and quantitative methods, such as surveys and interviews, to conduct research. Tolliver *et al.* (2005) and Porter (2007) emphasise the benefits of usability testing in libraries, and the need for teaching usability testing skills to Librarians. UCD’s School of Information and Library Studies (SILS) actively promotes the importance of qualitative and quantitative research methods in Library research through the provision of high credit modules in these areas. Introducing usability testing as part of the curriculum would provide another practical skill for researchers in the field of Library and Information Studies.
7.3 Conclusion

The main focus of IVRLA UI Version 1.0 was on providing basic functionality such as searching and viewing of digital content for users. This study has tested these aspects of the IVRLA UI and has provided recommendations, based on the experience of users interacting with the IVRLA UI. Implementing these recommendations and then retesting the basic functionality of the UI will provide a platform from which the IVRLA can begin to develop the added-value functionality of the UI.

The IVRLA had provided limited added-value functionality by utilising Delicious as its tagging tool. However, this study discovered that Delicious provides limited functionality within the IVRLA. The IVRLA has stated that the next major redesign of the UI will focus on developing added-value functionality; as a result, the next usability study conducted by the IVRLA should focus on this aspect. Finally, this study looked at bilingual functionality in relation to the IVRLA UI. At present the IVRLA UI does not have any Irish language functionality, but the IVRLA was interested in investigating the needs of Irish language users. Based on the result of the usability test, this study has made recommendations on how full or partial bilingual functionality can be implemented in the IVRLA UI. However, when the IVRLA begins the development of an Irish language version of the UI further research involving user input will need to be undertaken in this area.
Appendix 1: IVRLA Usability Study Script

IVRLA pre-evaluation questionnaire

**Note** this study involved two user sub-groups, history and Irish language researchers. Alternative question used for Irish language participants has been inserted as a supplementary question, Q4. A. In reality both user sub-groups were given separate questionnaires.

Participant: ____

Thank you for agreeing to help me evaluate the IVRLA user interface version 1.0. I would be grateful if you could answer the following questions.

1. Occupation

   - Undergraduate
   - Postgraduate
   - Post doctorate
   - Lecturer
   - Library professional
   - Other (please specify)............................

2. On average, how many days a week do you access the Internet?

   - 7 days a week
   - 6 days a week
   - 5 days a week
   - 4 days a week
   - 3 days a week
   - 2 days a week
   - 1 day a week
   - Less than once a week
3. On average, how many days a week do you use the Internet to search for academic material? (That is, journals, journal articles, theses, reports, grey literature, monographs etc)

- 7 days a week
- 6 days a week
- 5 days a week
- 4 days a week
- 3 days a week
- 2 days a week
- 1 day a week
- Less than once a week

4. If you research online, which of these digital collections/resources do you use?

- ECCO (Eighteenth Century Collections Online)
- EEBO (Early English Books Online)
- ESTC (English Short Title Catalogue)
- History Study Centre
- House of Commons Parliamentary Papers
- Intute: Arts and Humanities
- Irish History Online
- Irish Resources in the Humanities
- Irish Statute Book
- Other (please specify)

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4.a. If you research online, which of these digital collections/resources do you use?

- Achtanna.ie
- Encyclopaedia of Language and Linguistics
- Irish History Online
- Irish Resources in the Humanities
- Irish Statute Book
- Diospoireachtaí Parlaiminte
- Other (please specify)

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5. Which, if any, of the above digital collections/resources is your preferred method of searching for material and why?

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6. Which, if any, of the above digital collections/resources is your least favourite method of searching for material and why?

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7. Have you heard of/used “tagging” or “social bookmarking”?

- Have used it
- Heard of it but not tried it
- Never heard of it
8. If you have used it what “tagging” or “social bookmarking” software do you use?

- Yahoo Bookmarks
- Google Bookmarks
- Del.icio.us
- Digg
- Reddit
- Stumbleupon
- Facebook
- Other (please specify)

9. In your research have you used materials held in any of the following repositories?

- UCD School of Irish, Celtic Studies, Irish Folklore and Linguistics
- UCD Delargy Centre for Irish Folklore and National Folklore Collection
- Irish Dialect Archive
- UCD School of History and Archives
- UCD Archives
- James Joyce Library Special Collections
- None of the above
IVRLA User Interface Evaluation

Introduction

You probably already know, but let me explain why I’ve asked you to come here today: I’m testing the user interface of the Irish Virtual Research Library and Archive (IVRLA). I want to see how people use it and what they think of it.

Introducing the IVRLA

The Irish Virtual Research Library and Archive (IVRLA) was conceived as a way to exploit material held in UCD’s various repositories, including UCD Archives, the Delargy Centre for Irish Folklore, the Irish Dialect Archive and the James Joyce Library Special Collections. The IVRLA has been available online since September 2007. Since then researchers have had unlimited access to the materials held in these collections where before they were restricted by issues like preservation and conservation.

Reassurance

- **I want to make it clear right away that I’m testing the user interface, not you.** You can’t do anything wrong here so please don’t feel like you are making mistakes.

- **I want to hear exactly what you think,** so please don’t worry that you’re going to hurt my feelings. The point of this process is to improve it, so I need to know honestly what you think.
• As we go along, I’m going to ask you to think out loud, to tell me what’s going through your mind as this will help me.

• If you have questions, just ask. I may not be able to answer them right away, since I’m interested in how people do when they don’t have someone sitting next to them. I want you to try and solve any problems or issues by yourself but I will try to answer any questions you still have when we’re finished.

• With your permission, I’m going to videotape the computer screen and what you have to say. The video will be used only to help me figure out how to improve the site, and it won’t be seen by anyone except me. It also helps me, because I don’t have to take as many notes. I will destroy all personal data after the study.

• Would you mind signing this to say you don’t mind me videotaping the session and using the video as I just explained?

• Do you have any questions before we begin?
Video Recording Release Form

I would be grateful if you could sign and date the following statement:

I understand that my test session will be recorded. I give permission to Senan Healy to videotape an online evaluative session of IVRLA user interface version 1.0. I understand that the resulting video will be used only to evaluate the usability of the IVRLA and won’t be seen by anyone except Senan Healy. All personal data will be destroyed after the study.

Signed:……………………………………………………………..

Date:……………………

Thank you for your time

Senan Healy
Reactions to IVRLA

First I would like you to log on to the internet and find the IVRLA website and navigate to the search page.

And again, it will help us if you can try to think out loud as much as possible so I know what you’re thinking about.

Now, I’m just going to ask you to look at this page and tell me

- What strikes you about it

Key task testing

- Now I’m going to ask you to perform some tasks.
- There are only 5 tasks in total.
- Please read the full details of each task and ask me any questions you have about the particular task before you perform it.
- Again, please think aloud as much as possible.
- **Note: Extra point mentioned to Irish language participants** - As you complete each task please point out and explain areas of the IVRLA where you would like to see Irish language functionality.
Tasks to be completed by History researchers user sub-group

Task #1

Imagine you want to find a letter written by Sir Roger Casement to Robert Donovan.

Do a search and look at the results.

Task #2

Imagine you want to find a letter written by Matthew Dawes to Eugene O’Curry concerning his genealogical research into the Corr family.

Use the DETAILED SEARCH to run a query using this information and look at the results.

Task #3

Find a photograph of James Joyce as a boy?

Now imagine you want to view the larger digital image of the photograph and then save the digital image of the photograph to your desktop. Try and do this now.

Task #4

Search for an item relating to the Ancient Foundling Hospital in Dublin.

Look at your results.

Select one of the items you have found. Now imagine that you are going to use this document in your research and you want to create a citation. How would you do this?

Task #5

From the COLLECTION BROWSE page select the papers of William Frazer. You do not have time to complete your search but you would like to return to view this collection again.

Bookmark this page using the Del.icio.us bookmarking tool.
Tasks to be completed by Irish Language user sub-group

Task #1
Imagine you want to find a letter written by Tomás de Bhaldraithe to Miss Fionnuala Duane.

Do a search and look at the results.

Task #2
Imagine you want to find a letter from Marion Gunn to Fionnuala Duane containing information about correspondence between Cornelius Duane and Seán Ó Dalaigh.

Use the DETAILED SEARCH to run a query using this information and look at the results.

Task #3
Find the item entitled Toradh Ceistiúcháin ar Na Tíneirí, Cúige Laighean?

Now imagine you want to view the larger digital image and then save the digital image to your desktop. Try and do this now.

Task #4
Search for a questionnaire response by Seán Ó Dúbhda, Carraig, Ballynagall, Dingle, Co. Kerry.

Look at your results.

Select one of the items you have found. Now imagine that you are going to use this document in your research and you want to create a citation. How would you do this?

Task #5
From the COLLECTION BROWSE page select the Irish Dialect Archive Card Catalogue. You do not have time to complete your search but you would like to return to view this collection again.

Bookmark this page using the Del.icio.us bookmarking tool.
Appendix

Post-evaluation questionnaire

1. How would you describe your experience of using the IVRLA?

2. What features did you particularly like/dislike? Why?

3. What tasks did you find most difficult to complete? Why?

4. How long would it take you to feel as competent using the IVRLA as you are using your favourite digital collection/resource? Why?

5. What new features would you like in the IVRLA and why?

6. Are there any features from other digital collections/resources you would like to see incorporated in the IVRLA?

7. Overall, how do you rate the IVRLA as a digital resource?

8. Now that you have used the IVRLA, would you still feel it was necessary for you to go to the archives and view the original documents? Can you explain why?
Appendix 2: Invitation to Testers

An evaluation of the user requirements of users of the Irish Virtual Research Library and Archive (IVRLA).

The Irish Virtual Research Library and Archive (IVRLA) was conceived as a way to exploit material held in UCD’s various repositories, including UCD Archives, the Delargy Centre for Irish Folklore, the Irish Dialect Archive and the James Joyce Library Special Collections. The IVRLA has been available online since September 2007. Since then researchers have had unlimited access to the materials held in these collections where before they were restricted by issues like preservation and conservation (IVRLA, 2008).

The purpose of this study is to evaluate the user requirements of users of the IVRLA current user interface (UI) version 1.0. For the IVRLA to be a success it is essential that researchers are able to utilise the user interface effectively when conducting their research. The aim of this research study is to complete a usability study of the IVRLA interface with a view to making recommendations on enhanced usability for the next version of the user interface.

To complete the research study I am looking for humanities researchers in the areas of History and Irish (including Celtic Studies, Irish Folklore and Linguistics) to participate in a usability study.

The usability study will consist of:

1. Pre-questionnaire: this will be used to collect demographic information on the participants and to gauge their level of understanding and use of digital archives in general.

2. Think out loud protocol: participants will be asked to complete a set of tasks on a computer. During each task they will be asked to think out loud, explaining what they are doing and any problems they have or general impressions about the user interface. The success of this study is based on participants giving honest feedback on what they are doing so they will be encouraged to speak honestly about their experience of completing the tasks. The think out loud protocol will be filmed using a video camera. The camera will be focused on the computer screen that participants are using and will
be used only to record the participant's voice. Participant's anonymity is assured and they are free to leave the test procedure at any time.

3. Post-questionnaire: this brief questionnaire will be used to gauge the participant’s satisfaction levels with the user interface and to record any additional comment they may have.

In total the three sections of the test should take less than 1 hour to complete for each participant. Again, participant’s anonymity will be protected and their responses will only be used for the purpose of this study.

I hope to complete the usability study between Monday 23rd and Wednesday 25th June 2008 in the University of Limerick, but if these dates do not suit other arrangements can be made to suit participants. An incentive will be provided for anyone who does participate in the study.

If you or anyone you know is interested in participating please email me at senanhealy@hotmail.com or if you would like to see the IVRLA user interface for yourself it is available at www.ucd.ie/ivrla.

Your help is very much appreciated.

Regards,

Senan Healy.
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