5. CONCLUSIONS

In our view the key finding of this study is the fact that it has demonstrated the benefit of involving users and other key stakeholders in the design of interactive DL services.

Through our focus groups, interviews, questionnaires and especially our participatory design exercises we have found that all stakeholders had valuable suggestions and input to make when it comes to designing IV techniques for DLs.

5.1. Key findings

1. Our PD sessions through input from users and other stakeholders developed representative paper prototypes of IV techniques and methods that are applicable to specific web-based, end user-oriented JISC services.

2. Our PD results section specifically proposes which IV techniques have been suggested for which type of JISC service (portals, images, bibliographic or geo-spatial).

3. Our Usability and Accessibility evaluations revealed valuable information about the benefits and obstacles of use of IV techniques by users. Especially we think that the results of our accessibility should be taken seriously by JISC and others that provide web-based IV enhanced applications online.

4. Our proposed evaluation guidelines provide a starting point for future studies in this area.

5.2. Specific findings

Finding from Query Based Techniques

We noticed that the majority of participants of our focus groups, although involved in their majority with the development and maintenance of JISC services, were not familiar with information visualisation. Participants in the geo-spatial focus groups were more familiar with

information visualisation as this area is considered to be closely related to the discipline of Geospatial information.

There were misconceptions with participants thinking that IV is simply about maps, 3D games and virtual reality. Some participants were amazed that IV could be applied to applications that didn't consider to be feasible to use IV for.

The majority of participants thought that visual presentations (for example maps) are useful in assisting their search when using digital libraries. Both stakeholders and end users were interested in exploring how the relationships between results could be display – i.e. how the results generated correlate between each other and how users could compare the results at a glance. They thought that information visualisation might be helpful in contributing towards this issue.

For geo-spatial libraries, experts in geo-spatial information systems stressed that the ideal geo-spatial libraries do not only shows the GI data but make it able to link and correlates the GI data with non-GI data – national service/data (e.g. economic and social data, census data) in order to assist them in their research. But in order to do this, it will takes an extensive among of afford by all relevant agencies (especially owners of the data sets).

Participants of the portal, images and bibliographic focus groups, also raised the issue of designing applications that show relationships among data, and these relationships need to be obvious and represented visually.

Replies to our questionnaire showed that the majority of the current and perspective (currently in progress) JISC services do not have any plans to incorporate information visualisation into their design in the immediate future.

Findings from Participatory Design Workshops

Zooming was by far the most popular technique applied to the prototypes followed by Dynamaps. Zoom enables users to magnify specific aspects of the site, whereas Dynamaps permits users to manipulate information from a set of widgets (options) to simultaneously present

the data on the interface. The common ground for both of these techniques is that the user controls the level of detail that is presented.

Based on the results of the participatory design sessions we can recommend that the following techniques should be further investigated in terms of appropriateness, usability and accessibility:

- Portals: Dynamaps and Zooming
- Images: Graphical Interface for Digital Libraries, PhotoMesa Image Browser and Generalized Query Previews
- Geospatial: Zooming
- Bibliographical: Graphical Interface for Digital Libraries

The participatory design method was an effective approach to get feedback on how information visualisation can be applied to web services.

Findings from Accessibility and Usability Evaluations

Information visualisation relies heavily on the use of graphical representation of the data. It is unlike average web sites, which provide textual information on the pages for users to comprehend. Certain services used a number of visualisation techniques such as dynamic queries and zooming and the user was required to manipulate the data which was hidden behind the use of menus to gain an insight into the information available. However, the blind user had great difficulty interacting with the data because the software component used (Java) was not compatible with the screen reader.

There are a number of usability problems associated with the use of information visualisation, mainly with the users in understanding the data and successfully using the service. Services applying information visualisation should aim to make the site simplistic as possible, though this may not always be the case due to the nature of the information. It is recommended that the criteria represented in the IV usability evaluation guidelines be used as basic guideline for the development of such services.

5.3. Suggestions to practitioners

Practitioners could apply the usability evaluation guidelines proposed in this study as a means for assessing the usability and accessibility of IV techniques used in the services. For JISC practitioners, the usability and accessibility guidelines could be adopted into the evaluation of IV for the JISC Information Environment.

Furthermore, our Participatory Design exercises can act as a step by step guide to practitioners who are interested to employ a user-centred design methodology for their IV services.

5.4. Suggestions to researchers

One of the key areas that we believe JISC and other researchers might find worth investigating is the area of accessibility of Information Visualisation. Given the visual aspects of IV one can immediately realise the challenge embedded in this area. But, we strongly believe that there is a need for an in-depth exchange of ideas, findings and studies that will find means and methods for developing IV techniques that can be accessible for people with disabilities.

A further area of research could be projects that try to study in more depth specific application areas of IV (e-learning for example) and the effectiveness (learning) of such techniques for HE and FE.