

4. APPLYING THEORY TO PRACTICE

The objectives of this activity were to use Participatory Design to generate a set of low fidelity prototypes using information visualisation and identify which techniques are applicable to web-based, end-user oriented JISC services. Also to assess the feasibility for taking these techniques forward to final designs and implementation.

4.1 Participatory Design

Participatory design (PD) (often termed the “Scandinavian Challenge” (Bjerknes, et al., 1987)) refers to a design approach that focuses on the intended user of the service or product, and advocates the active involvement of users throughout the design process. User involvement is seen as critical both because users are the experts in the work practices supported by these technologies and because users ultimately will be the ones creating new practices in response to new technologies (Blomberg & Henderson, 1990).

Blomberg and Henderson (1990) characterise the PD approach as advocating three tenets:

1. The goal is to improve the quality of life
2. The orientation is collaborative
3. The process is iterative

The methodology used looked at four of JISC's Information Environment services; Portals, Images, Geospatial and Bibliographical. No reference was made to a particular web service but the categories of services as a whole were examined.

The Participants

Representative of users were recruited to participate in the sessions. Students and staff from City University were targeted and a questionnaire was designed to assist in the screening of each user (see Appendix 4). The results from the questionnaire helped us to divide the users into the four groups depending on prior experience.

Six people were recruited from within the Centre for Human Computer Interaction Design, of which four were PhD students, two researchers and one project administrator. Three participants were recruited from the University Library whose expertise lay in

bibliographical services. One participant who was externally recruited classified himself as an expert user of geospatial services. The rest of the participants were either undergraduate or masters students from IT/computing courses.

In total 32 individuals were recruited to take part in the study of which only 22 turned up for the actual sessions. Initially eight users were recruited for each service but in the end six were present for the Portal, Images and Bibliographical services and four for Geospatial.

Equipment

All sessions were fully equipped with the necessary stationery i.e. coloured pens, pencils, felt tips, scissors, sellotape, card, paper, acetates, overhead projector, post-it notes etc to help the participants in getting their thoughts on paper. The sessions were also selectively video recorded and photographed.

The participatory design session

The structure applied to each of the four sessions was the same throughout. All sessions were scheduled for three hours and were held at City University. The structure for each session was as follows:

1. Welcome and introduction
2. Introduction to information visualisation
3. Introduction to the service
4. Activity 1: Requirements gathering
5. Documentation on information visualisation techniques
6. Activity 2: Paper-based prototypes in pairs
7. Activity 3: Presentation of initial designs
8. Activity 4: Final prototype

1. Welcome and introduction

Participants were welcomed and asked to read and sign the consent form (see Appendix 4). They were also asked to raise any reservations they had regarding the consent form. Name plaques were provided to help identify individuals.

2. Introduction to information visualisation

A high-level introduction to information visualisation was presented. The introduction also outlined the misconceptions of information visualisation which were derived from the focus groups that were conducted earlier in the project. The participants were given the option to ask further questions if they did not understand the concepts being put across. However at this stage all participants felt comfortable with the given definitions.

3. Introduction to the services

An introduction to the services was provided (for instance what is a portal along with specific examples of portal sites).

4. Activity 1: Requirements gathering

The first activity focused on getting the users to start thinking about the service that they were looking at. The technique used here was that of affinity diagramming. Affinity diagramming is a simple and effective method of gathering a number of ideas that are then organised by grouping related items together.

Each service was given a specific scenario and the users were required to individually brainstorm ideas on post-it notes in terms of what information and/or functional requirements users have. The participants were asked to keep to one idea per post-it note.

The participants were then asked to select three of their post-it notes and place them on the whiteboard/flipchart and group any similar requirements together. The participants were asked to discard any ideas that had already been placed on the board. This was repeated until all of their ideas were put on the board.

The facilitator then led the participants in naming the groupings by reading out all the requirements per category and the participants were given the opportunity to reshuffle the requirements to other categories if needed. Participants also highlighted any relationships that existed among the categories.

Thirty minutes were allocated to this activity.

5. *Documentation on information visualisation techniques*

Samples of information visualisation techniques were given to the participants to browse over for five minutes. The techniques were not discussed with the participants to prevent any bias.

6. *Activity 2: Paper-based prototypes in pairs*

The participants were asked to work in pairs to sketch design ideas using some form of information visualisation for the given scenario using the ideas that had been generated in the previous activity. They were asked to restrict their designs to one of the categories and not design a whole interface for the entire web site (for example concentrating on the search function).

The participants were allowed refer to the documentation provided and use any or none of the techniques illustrated.

Thirty-five minutes were allocated to this activity but depending on the stage reached by the users an additional ten minutes were granted.

7. *Activity 3: Presentation of initial designs*

Each pair presented their design explaining how it worked and where information visualisation techniques were applied.

8. *Activity 4: Final prototype*

To develop the final prototype each group was asked to choose one of three options:

1. Work in existing pairs on the same prototype
2. Work together as a whole group developing one prototype to the next level
3. Work together as a whole group starting afresh and developing a new prototype

All groups chose to work together either developing an existing idea and taking characteristics from other prototypes on board or developing a new prototype combining

methods/techniques or thinking of new ways to present the information. The groups were given forty minutes to design their prototype.

At the end of each session the participants were asked a series of questions on how the designs could be implemented on web sites. The questions asked were:

- Who should be involved in the next stage, for moving this project forward?
- What type of software/technology would be needed to develop these designs?
- What type of hardware would be required to run the sites?

Results of the PD Sessions

This section presents the data gathered from the participatory design sessions.

Data from questionnaires

Of the 22 people that participated 14 were female and 8 male. The age distribution of the participants was as follows:

- 18% under 20
- 59% 21-30
- 9% 31-40
- 5% 41-20
- 9% 51-60

All users had some experience of using portal related sites such as Yahoo, MSN, BBC. 95% had knowledge of using Geographical and Bibliographical sites and 73% were interested in some form of imagery. The data from these results assisted in the division of the users into the respective sessions.

27% of the participants had knowledge of information visualisation and 45% had been involved in developing some form of prototypes whether as students or professionally.

The breakdown for each session was as follows:

Portals - 6 people participated in the session of which:

- 4 were females and 2 males.
- 2 had prior information visualisation knowledge.
- 4 had prototyping knowledge

Images - 6 people participated in the session of which:

- 2 were females and 4 males
- 1 had prior information visualisation knowledge.
- 1 had prototyping knowledge

Geospatial - 4 people participated in the session of which:

- 2 were females and 2 males
- 1 had prior information visualisation knowledge
- 3 had prototyping knowledge

Bibliographical - 6 people participated in the session of which:

- All participants were female
- 2 had prior information visualisation knowledge
- 2 had prototyping knowledge

Results for Portals

Activity 1: Requirements gathering

The hypothetical scenario setting for the portal service given to the participants was:

- “JISC is a public organisation that supports further and higher education. JISC has released a tender to develop a new portal site aimed at students in further and higher education to provide information and resources on Music. The tender requires you to:
 - Identify the requirements of the site i.e. what users want in terms of information and functionality”

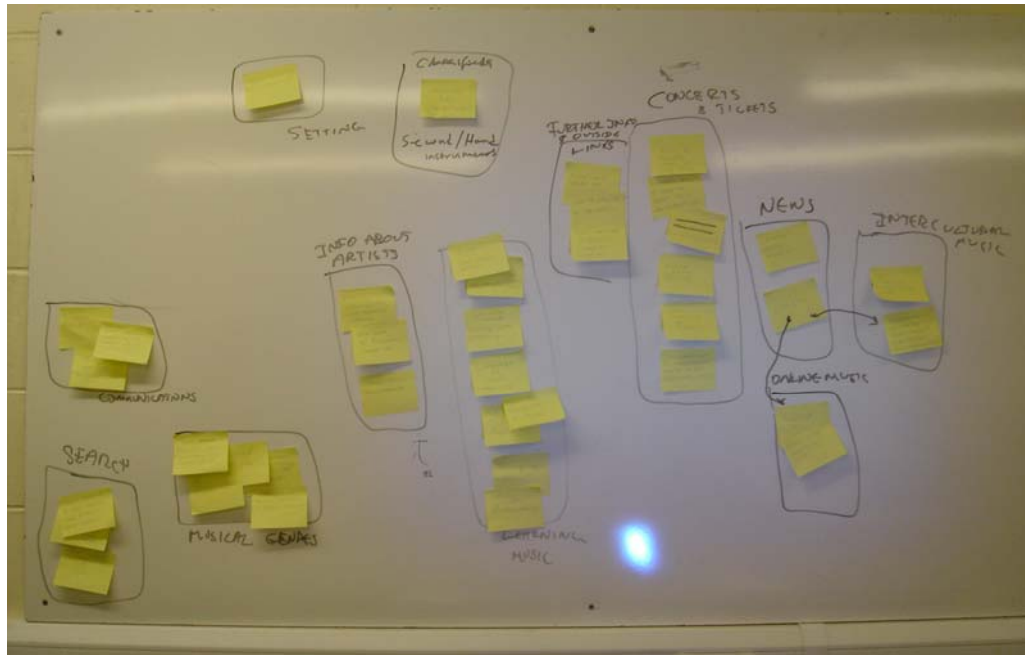


Figure 34: Portals affinity diagram

The following is a breakdown of the categories defined by the participants:

Setting

- Option to change fonts, colours etc

Classifieds/second hand instruments

- Musicians ads wanted/available

Concerts and tickets

- Links to web sites where they are able to purchase or get more information about a certain search, artist etc...
- Ability to purchase tickets for live music/concerts
- Previous gig and CD reviews
- A search facility to check for concert tickets – link to ticket site
- Concert discounts for members
- Upcoming events

Online music

- Download music and audio samples

- Online music where to gain access

Intercultural music

- Information about music from different cultures/different parts of the world e.g. Indian, Arabian, African etc...
- Music charts across the world

Communications

- Different chat rooms according to user's music preferences
- Ability to add entries e.g. unlisted events
- Message board

News

- Charts
- Latest music releases

Further information and outside links

- Music programmes on television or books, magazines etc...
- Links to web sites of the artists
- Further links to relevant sites

Learning music

- Education – music courses available
- Use of computers in music
- Language of music (notes etc)
- Interactive tutorials, writing notes, composing
- Song orchestration and composition
- History of music
- Music and mathematics
- Theory of music

Information about artists

- History of specific artists, groups/bands
- Artist search to biographies, samples etc...
- Artists information and career history

Musical genres

- Musical instruments
- Play characteristic samples per music genre
- Musical genres
- Information on key music instruments per genre
- Enable users to listen to songs audio feature or purchase CD, tape DVD etc...

Search

- Search facility to find specific song details, maybe lyrics
- Search by city, date, event, musician
- Search for song, tabs, midi, lyrics

The participants also established some relationships among the categories/items between News (charts), Intercultural Music (charts across the world) and Online Music (download music and audio samples)

Portals Activity 2 and 3: Paper-based prototypes and their presentation

The participants worked in pairs taking the findings of the requirement gathering into consideration to design an idea by applying some form of information visualisation.

Group 1

The purpose of this design was to track specific music journals across the world.



Figure 35: Portals Group 1

- The red dots on the world map represent cities
- The selection criteria are presented below the map. The user can select the country they wish to find music journals for, the timeframe (1960 -1970), the chart level (e.g. top ten), and the Genre (e.g. pop, jazz, folk etc).
- The results are displayed in a colour-coded format and symbols on the map
- It is possible to filter out information and have the information presented in different views. The user can zoom in and zoom out at a continent and country level.
- Data between countries can be compared, and viewed using the other visualisation methods such as histograms, bar charts, pie charts etc by manipulating the criteria
- A pop-up window appears to view details of selection i.e. top ten charts in New York.

The design was inspired by the following information visualisation techniques:

Dynamaps and Zooming

Group 2

The purpose of this design is to demonstrate the sales of albums and concerts worldwide.

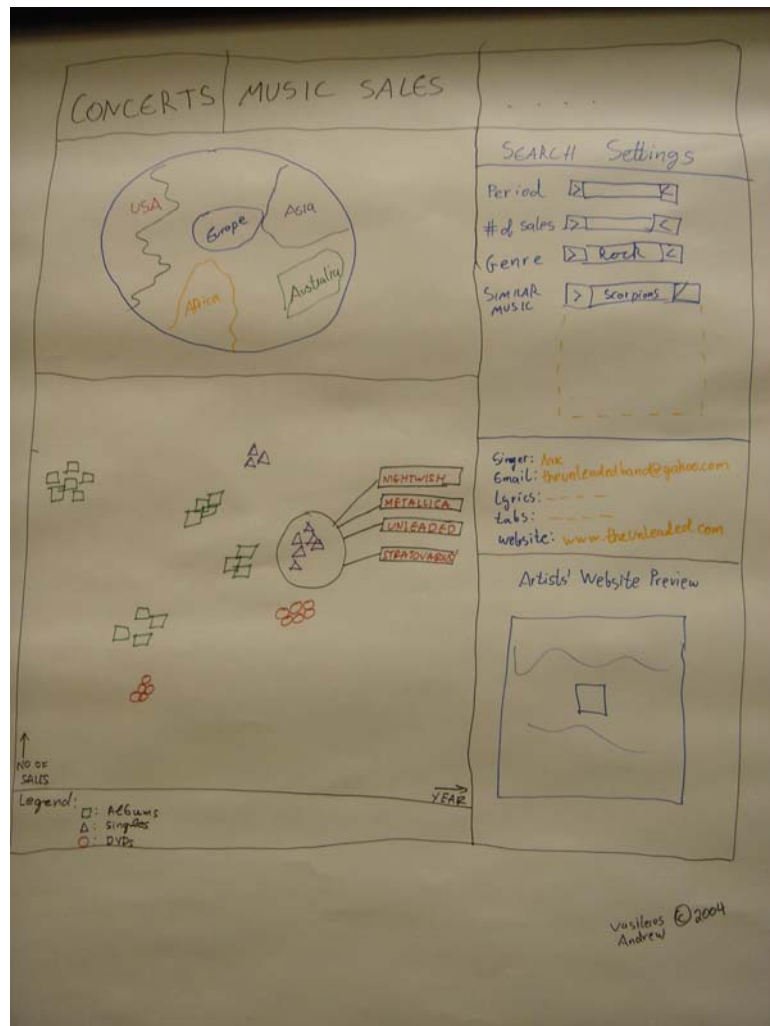


Figure 36: Portals Group 2

- The user can search for sales or concerts worldwide by selecting the appropriate tab/link at the top of the page.
- Can zoom in to continent, country, city, town via the worldwide map.
- The search settings on the right helps refine the criteria, as once the user has selected the desired location they can search by period (1990-1994), number of sales, genre and similar music. The combo boxes expand to allow the user to select/refine the search criteria.
- The results are immediately displayed in the bottom left hand box. The squares, triangles and circles represent albums, singles and DVD sales respectively. The Y axis shows the number of sales and the X axis show the year it was published. (The triangles etc are not grouped together because they are similar but because they have similar number of sales.)

- The labels represent the different groups (genres) and are placed on the display for easier selection.
- On selecting a label further information is provided on the right beneath the search settings.

The design was inspired by the following information visualisation techniques: Dynamaps, Zooming, Excentric labelling, and Shneiderman's FilmFinder application (the latter was recalled by the participant having seen a video of the application in a course lecture)

Group 3

The purpose of this design was to learn about music from different cultures.

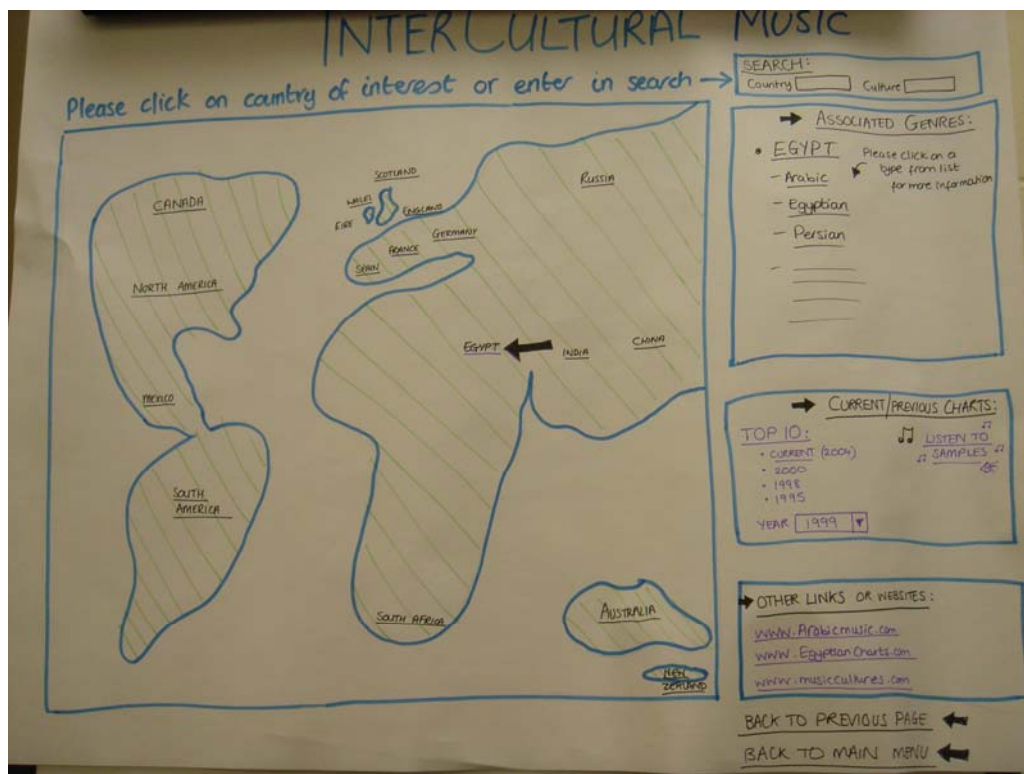


Figure 37: Portals Group 3

- Selecting a location zooms in to select a city, town
- Information can also be searched using the search on the top right. If search is used the map will zoom in to the selected city.
- Details on the right hand side of the screen are empty until a user selects a location
- When a user selects a location e.g. Egypt the Associated Genres appear in the top right hand side of the screen.



Figure 38: Portals Group 3, associated genres screen

- On selecting one of the options provided in the Associated Genres window further details are provided in the pop-up window shown below.



Figure 39: Portals Group 3, Arabic Music screen

The design was inspired by the following information visualisation techniques:
Dynamaps and Zooming

Portals Activity 4: Final Prototype

The participants worked in a group of six to design the final prototype and developed two versions:

The first prototype was an enhancement of Group 2's prototype comparing the number of charts reaching number one.

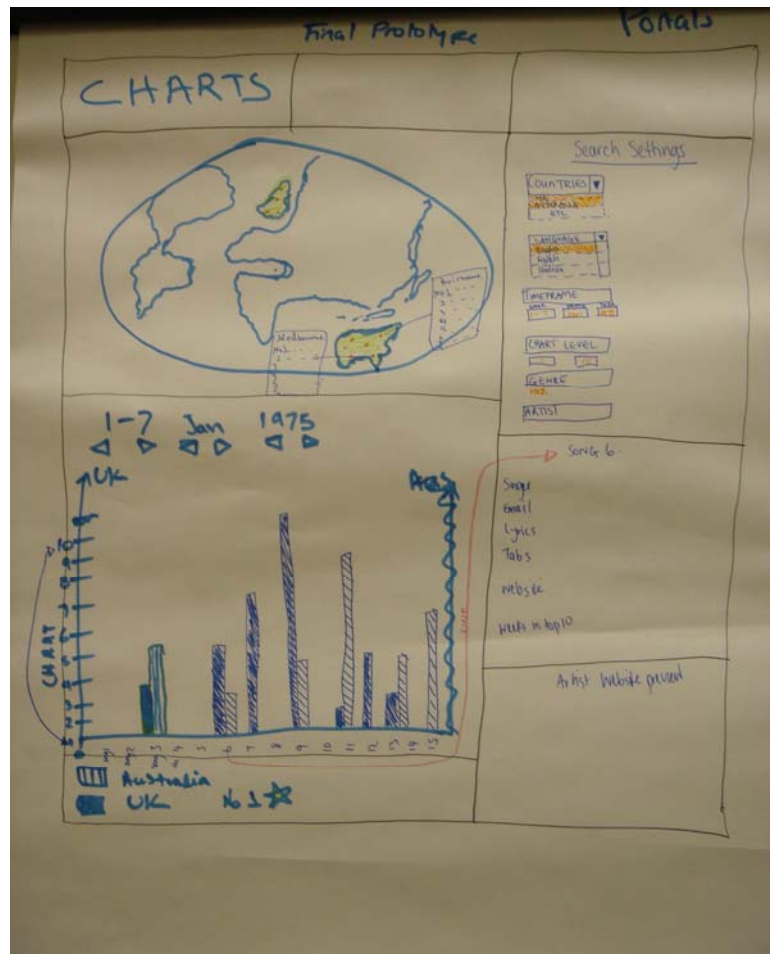


Figure 40: Portals Combined Prototype 1

- The globe presents an overview of the information; the selection of an area will zoom in to country, city, and/or town. A user selects two areas e.g. Australia and U.K to compare the song and the place it appeared in the chart. The results are displayed in the bar chart.
- If the user enters the interface via the globe, the user can further refine their search using the timeframe on top of the bar chart.
- Alternatively the user may enter their criteria using the search settings which are presented in the top right hand corner.
- On selecting a particular entry from the bar chart specific information about that song is presented under the search settings e.g. singer, email, lyrics, number of weeks in top ten.
- Changing the criteria immediately updates the bar chart.
- The problem outlined by the participants was that too much information is presented for small screens.

The design was inspired by the following information visualisation technique:
Dynamaps and Zooming

The second version was an enhancement of Group 3's concept attempting to show information on music from different cultures.

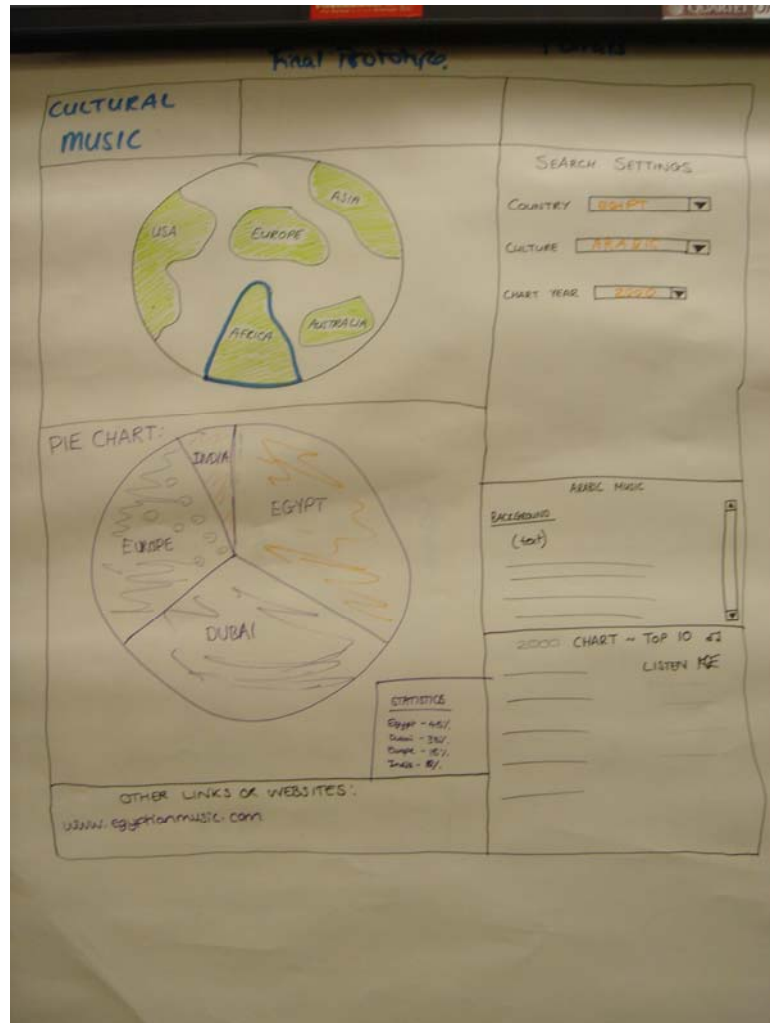


Figure 41: Portals Combined Prototype 2

- The globe presents an overview of the information; the selection of an area will zoom in to country, city, and/or town.
- On selecting a particular area the pie chart will show music from that culture and will illustrate where in the world that music is listened to/produced. The legend will show the percentage.

- The search settings allow a user to further refine the criteria. E.g. by selecting Egypt as the country, Arabic as the culture and music produced in 2000, the pie chart will depict all Arabic music across the world.
- Changing the criteria immediately updates the pie chart.

The design was inspired by the following information visualisation technique:
Dynamaps and Zooming

At the end of the session the participants were asked what considerations need to be taken into account to implement their designs on the web site:

- Who should be involved in the next stage?
 - Users to assist in determining layout and personalisation of site.
 - Designers
 - Developers with expertise in JAVA, PHP
- What type of software/technology would be needed to develop these designs?
 - JAVA
 - PHP

Results for Images

Images Activity 1: Requirements gathering

The hypothetical scenario setting for the image service given to the participants was:

- “JISC is a public organisation that supports further and higher education. JISC has released a tender to develop a new image site aimed at students in further and higher education that will present images on the history of the computer. The tender requires you to:
 - Identify the requirements of the site i.e. what users want in terms of information and functionality”

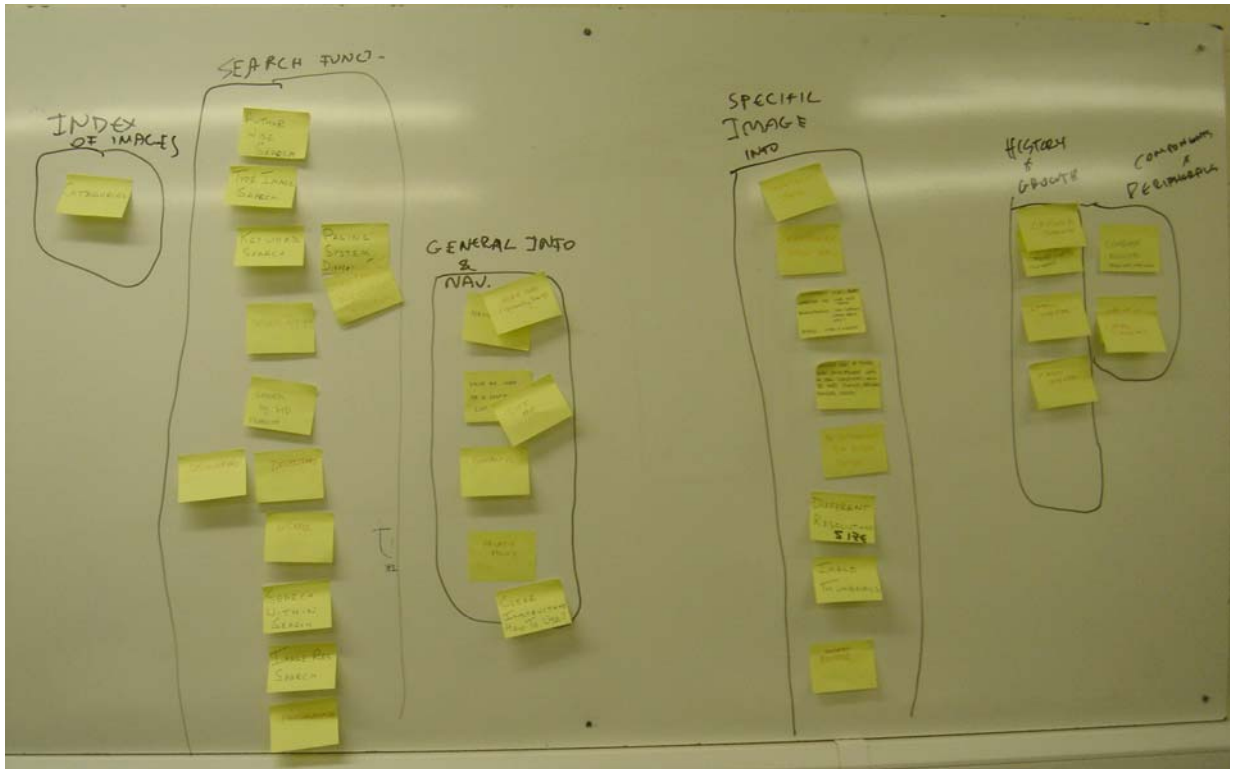


Figure 42: Images affinity diagram

The following is a breakdown of the categories defined by the participants:

History and Growth (Timeline)

- Origin and growth
- A text about computer history, who invented what
- Information: 10 biggest computer producers
- First computer
- Latest computer

Specific image information

- Compatibility status
- Brief profile beside image
- Different uses: history. Computer use: who used them? Development: how changes came about, why? People: who and where.
- Possible uses in future: give development ideas on how computers will be used, science, personal, business, leisure

- References for more detail
- Different resolutions (size)
- Expert reviews
- Image thumbnails

Index of images

- Categories

Search function

- Search by year
- Keyword search
- Type image search
- Author wise search
- Time range for output selection
- Paging system, different options
- Search by hard disk capacity
- Developers
- Users
- Search within search
- Image resolution search
- Programmers
- Discoverers

General information and navigation

- More information (upcoming events)
- Navigation
- Have an index or a contents list
- Site map
- Contact us
- Clear instructions – how to use?
- Privacy policy

Components and peripherals

- Chips (computer)
- Images of components of computers
- Computer accessories (printer, mouse, camera, scanner)

Images Activity 2 and 3: Paper-based prototypes and their presentation

The participants worked in pairs taking the findings of the requirement gathering into consideration to design an idea by applying some form of information visualisation.

Group 1

The design concentrated on finding ways to search images.

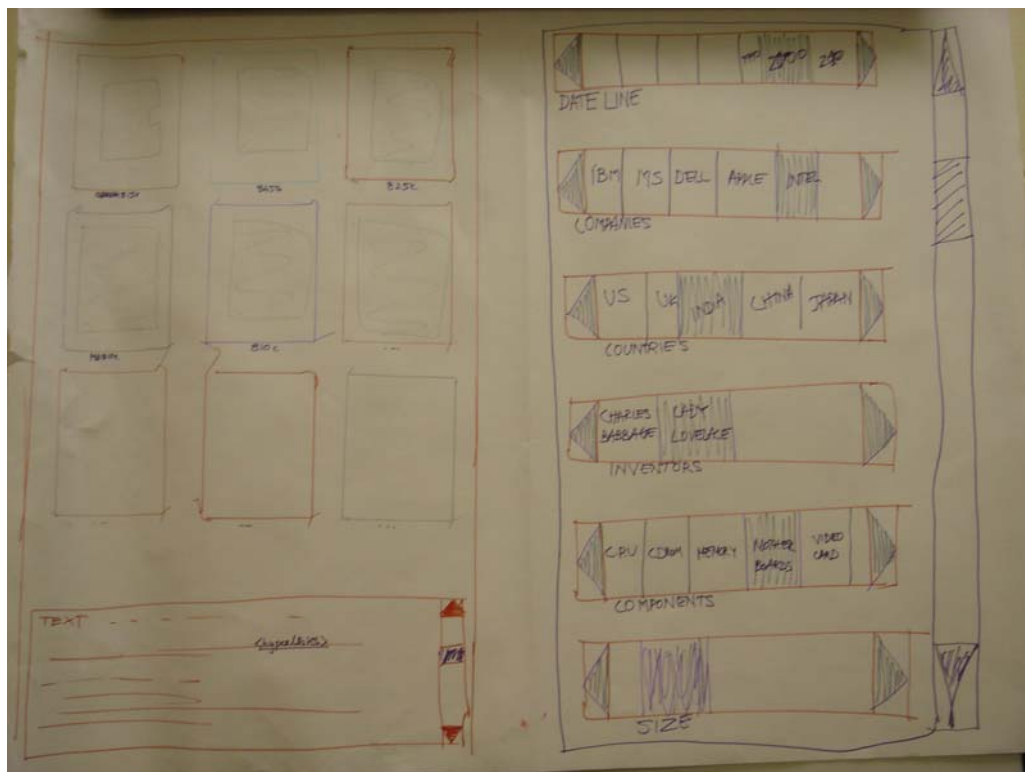


Figure 43: Images Prototype of Group 1

- Images are displayed randomly on the left hand side depending on the search
- The search criteria are presented on the right, where a user can select one or more options to refine the search and display the results concurrently on the left.

- Categories/options for the search are not predefined; they change depending on the criteria selected.
- Image details are displayed beneath the images once a particular image is selected.

The design was inspired by the following information visualisation technique:
Dynamaps

Group 2

The purpose of the design was to look at ways in which images could be searched.

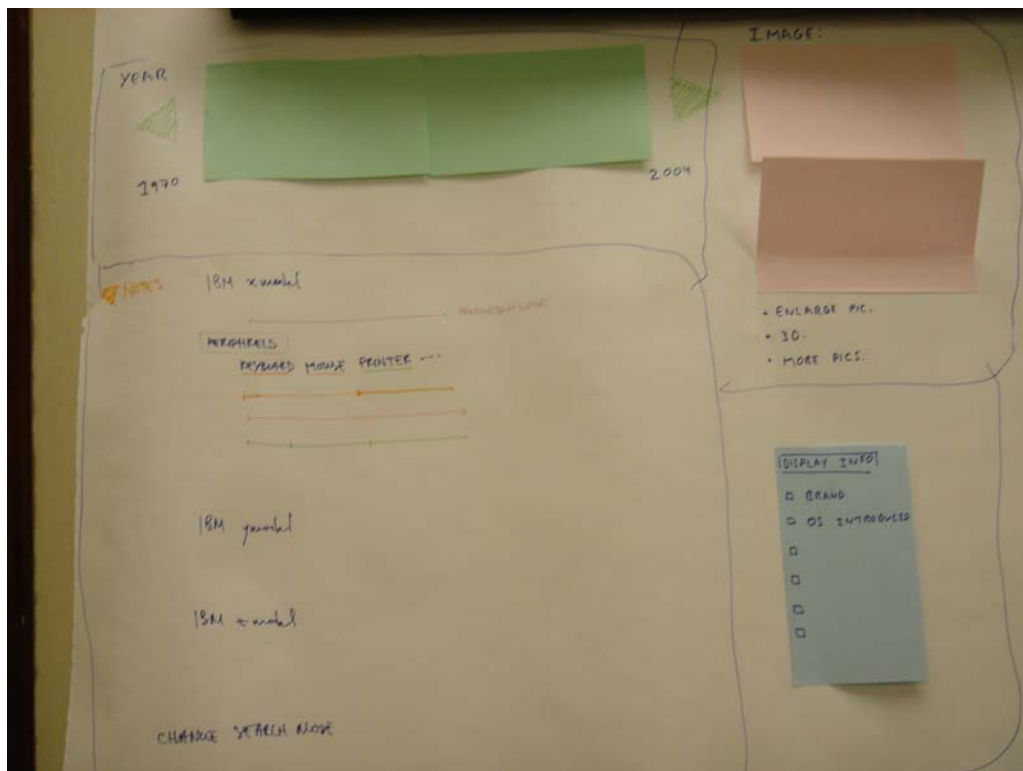


Figure 44: Images Prototype of Group 2

- The user selects the year range at the top (green post-it notes) which then displays the results beneath (e.g. all computers developed between 1985 and 1987). Selection of the results displays an image in the top right of the screen (pink post-it notes).
- Production lines (Lifelines) are used to show the peripherals developed in the particular timeframe selected. Selection of these lines display an image in the box on the top right. For example selecting a keyboard in the mid point of the production line will display an image of a keyboard developed in 1986.

The participants identified the following problems with the prototype

- Image space is not big enough

- Only one image displayed at one time

The design was inspired by the following information visualisation techniques:
Lifelines, TreeMap.

Group 3

The purpose of this design was to provide an alternative way to display search results.

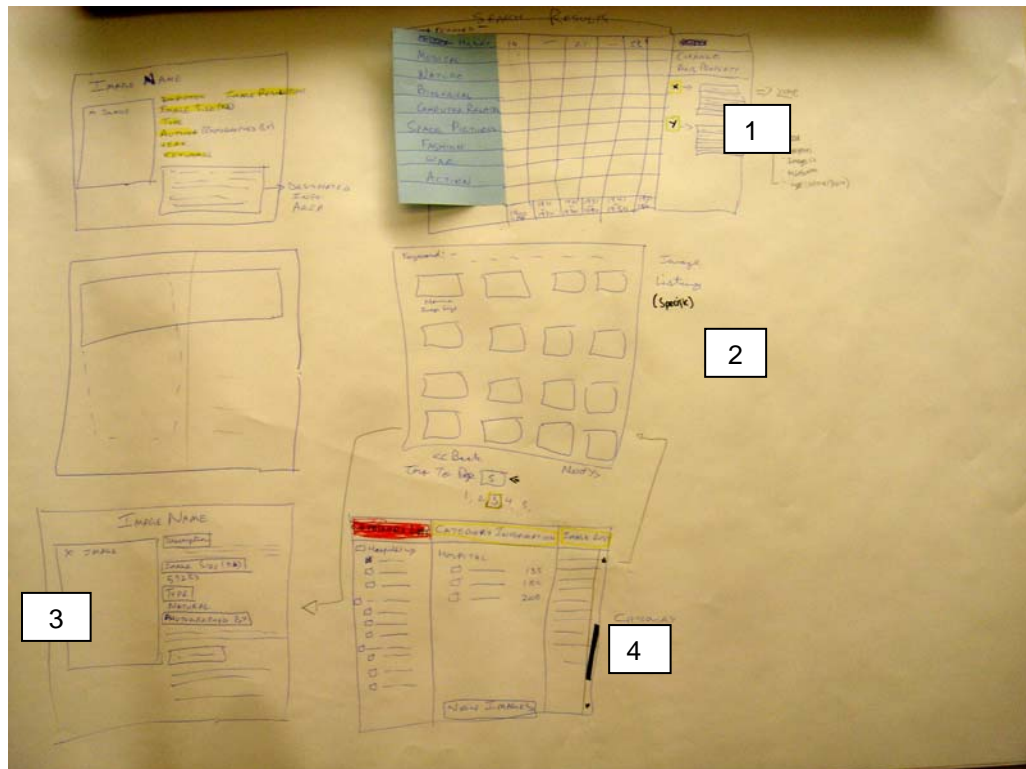


Figure 45: Images Prototype of Group 3

- Referring to screen 1 the categories are displayed on the left hand side (Y axis)
- The X axis can display the year, resolution, type (colour/black and white) etc, depending on the criteria the user has selected.
- The numbers of images pertaining to the Y and X axis criteria are displayed in a grid. The user can only select the particular images by clicking on the number and not on the categories.
- Once the user selects the number for a particular category and year (for example), the results are displayed as thumbnails of the images on screen 2.
- On selecting a thumbnail a bigger image and details are provided on screen 3.
- Screen 4 - this screen acts as a category index for images

The design was inspired by the following information visualisation techniques: Graphical Interface for Digital Libraries, PhotoMesa Image Browser and Generalized Query Previews.

Images Activity 4: Final prototype

The participants worked in a group of six to design the final prototype. There was much discussion amongst the participants as each group wanted to develop their ideas further. However the final prototype was an enhancement of Group 3's prototype.

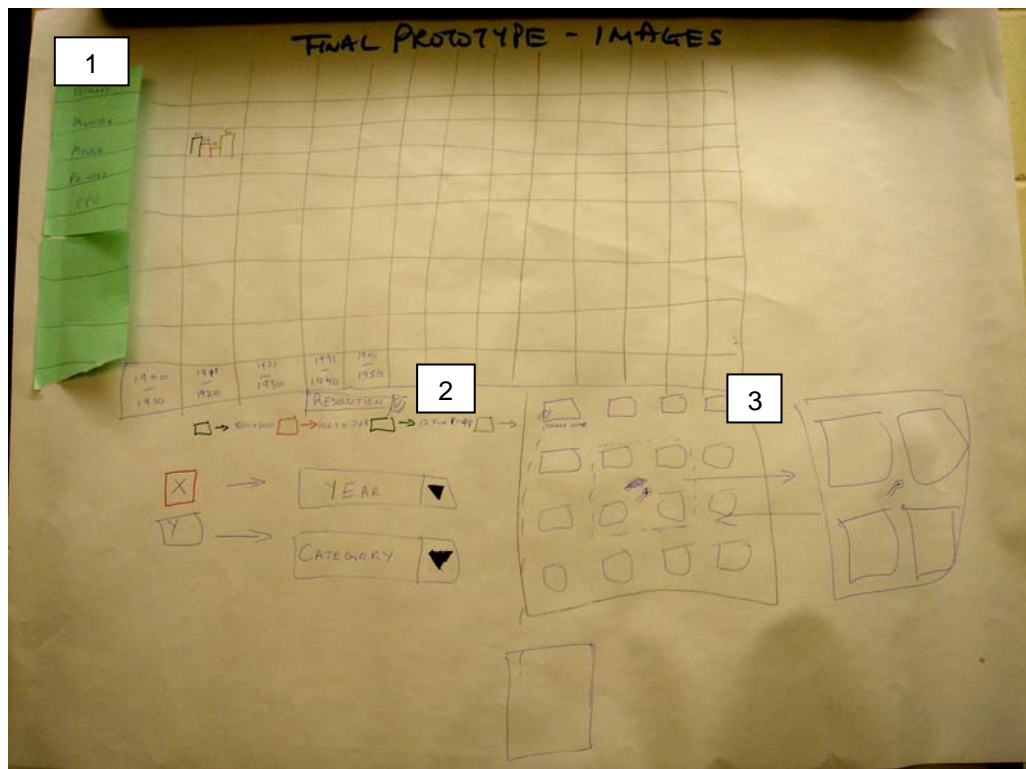


Figure 46: Images Combined Prototype

- The Y axis displays the categories and the X the year.
- The number of images for each category and year are represented in the form of colour coded bars along with a number.
- The colour coded bars denote the resolution of that image. For example there 21 mouse images for the year of 1999 in 800x600 resolution
- On selection of a bar, thumbnails of the image are shown.

- Selections of the thumbnails can be zoomed in to. The mouse can select one, two, three, four or more images to increase the size of the image. (Zoom out is also possible, to return to all thumbnails.)

The design was inspired by the following information visualisation techniques: Graphical Interface for Digital Libraries, PhotoMesa Image Browser, Generalized Query Previews and Zoom.

At the end of the session the participants were asked what considerations need to be taken into account to implement their designs on the web site:

- Who should be involved in the next stage, for moving this project forward?
 - End users
 - Programmers
- What type of software/technology would be needed to develop these designs?
 - HTML
 - JAVA
 - JavaScript
- What type of hardware would be required to run the sites?
 - High speed computer

Results for Geospatial

Geospatial Activity 1: Requirements gathering

The hypothetical scenario setting for the geospatial service given to the participants was:

- Mapitnow is a mapping service that enables users to locate areas of interest.
 - Identify the requirements of the site i.e. what users want in terms of information and functionality



Figure 47: Geospatial affinity diagram

The following is a breakdown of the categories defined by the participants:

Help

- Help facility
- Informative help messages i.e. EC1V is not South London

Search

- Various search categories
- Post code search
- Spell checker on search facility

Usability

- The function should be handy
- No scrolling information to be displayed on screen
- Use of colour
- Touch screen
- Information presented hierarchy – menus/sub menus

- Relevant icons

Route information

- Best route around specific points
- Easiest route from A to B
- Multi-trips i.e. looking at more than one place per search
- Easily get to next location

Map information

- Post code identified on map
- Compass directions
- OS grid reference
- Identify boundary – council information
- Overview of map in either context
- Co-ordinates

Print

- Print out of the map and route

Zoom

- Zoom
- Scale of representation
- Maps of small areas like towns

Additional features and other information

- Aerial photo
- Sightseeing options in different locations
- Attractive scenery
- Maps in 3D
- Option to view other related information
- Ability to select maps in different formats

- Weather maps

Geospatial Activity 2 and 3: Paper-based prototypes and their presentation

The participants worked in pairs taking the findings of the requirement gathering into consideration to design an idea by applying some form of information visualisation.

Group 1

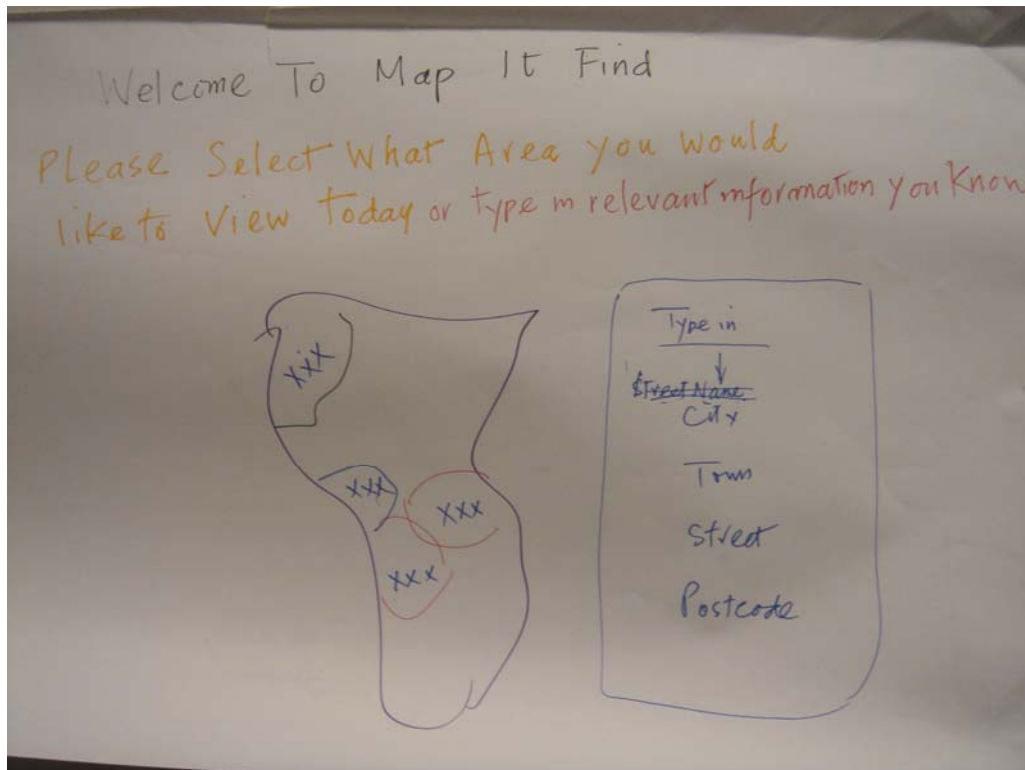


Figure 48: Geospatial Prototype of Group 1, Screen 1

- The welcome screen presents a map and search criteria. Clicking on an area on the map takes the user to screen 2.
- Alternatively the user can be more precise by entering details in the search in terms of city, town, street and/or postcode.

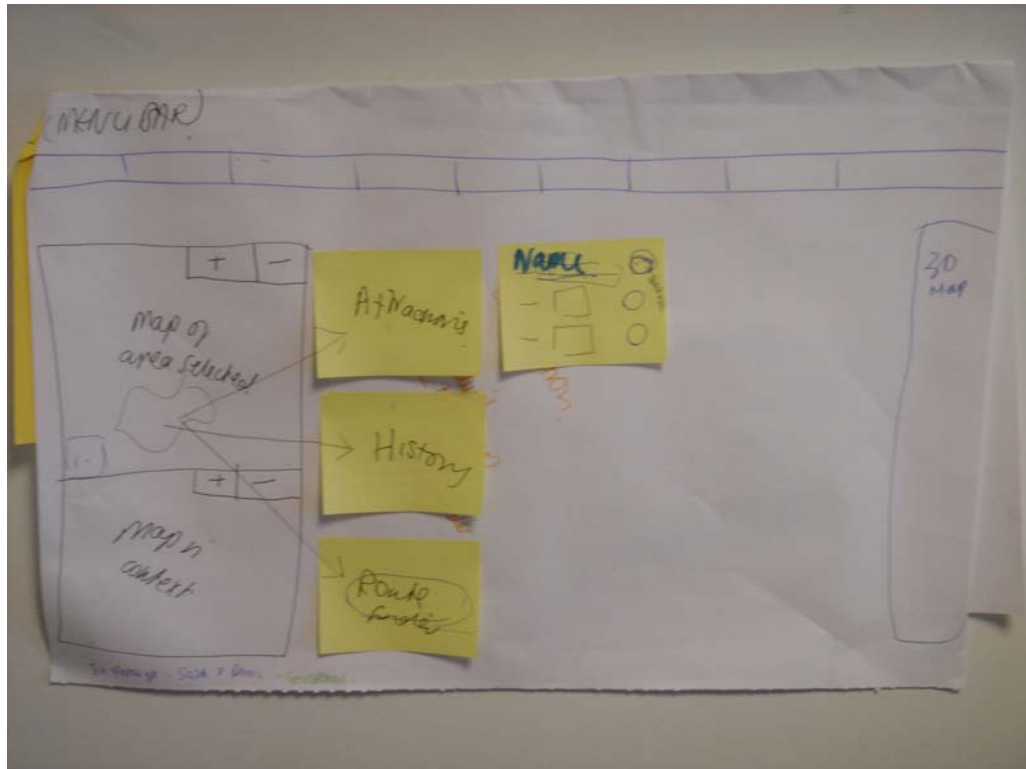


Figure 49: Geospatial Prototype of Group 1, Screen 2

- Two maps are presented on the left hand side of the screen. One is a map of the area that was selected and second is a map of the area in context.
- Each map allows zooming in and out.
- Beside the maps are a set of links/icons that allow the user to discover more about the particular area i.e. Attractions, History and Route Finder.
- On selection of these links information is displayed on the right with thumbnails for images.

The design was inspired by the following information visualisation techniques:
 Zooming, TimeSearcher, PhotoFinder and PhotoMesa Image Browser

Group 2



Figure 50: Geospatial Prototype of Group 2

- The 'route identifier' is the cursor. The cursor when hovered over the map magnifies the area in context and is clickable.
- When an area is magnified information relating to that area is shown in the box on the right.
- When the user clicks on a particular area it takes the user to the bottom screen which shows a detailed map of the area and provides further options (3D map, aerial photo, roads)

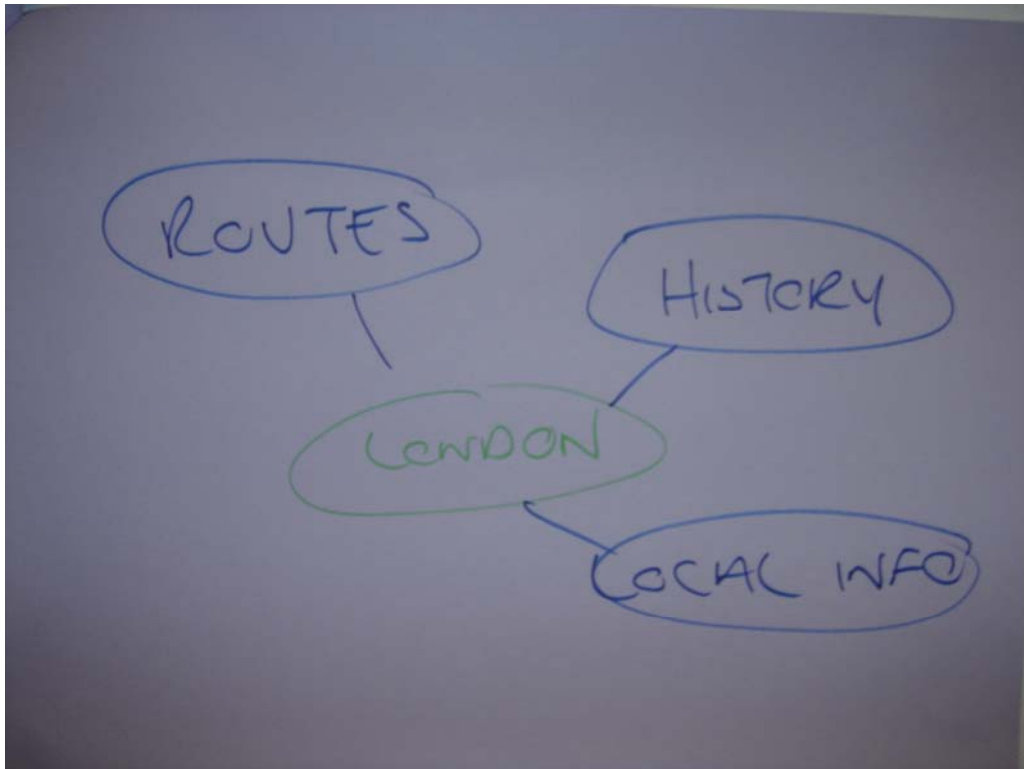


Figure 51: Geospatial Prototype of Group 2, menu option

- Another form of navigating the service is the menu option. Once a location is selected on the map (one click) the user can select the Menu option from the main navigation bar. On selecting this option the spider diagram will replace the map, but maintain the rest of the layout. Selecting a link from the spider diagram displays either further navigation as shown below or the information relating to that link on the right hand side box.



Figure 52: Geospatial Prototype of Group 2, menu option examples

The design was inspired by the following information visualisation techniques:
 Zooming, SpaceTree and PhotoMesa Image Browser

Geospatial Activity 4: Final prototype

The participants worked in a group of four and developed Group 2's concept further but taking ideas from the other group's design.

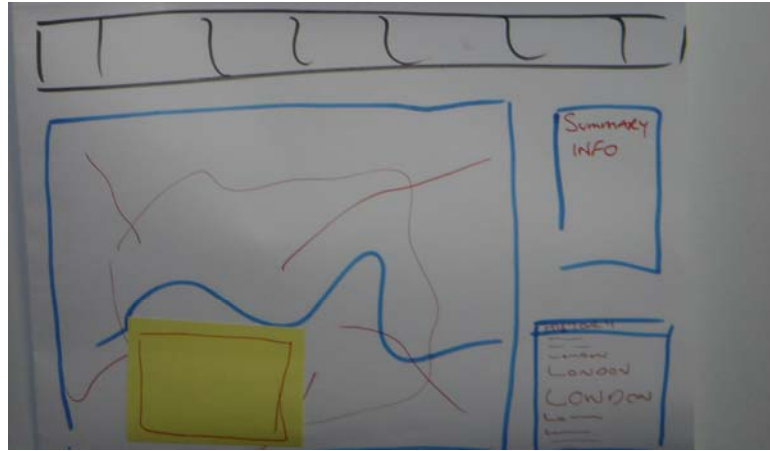


Figure 53: Geospatial Combined Prototype, screen 1

- The post-it note acts as a cursor. When hovering over the map the selected area is magnified. A summary of information is provided simultaneously in the top right hand corner.
- The History section is a Fisheye Menu showing the user where/what they have visited
- When a user double clicks on a specific location screen 2 appears displaying information relating to that area.

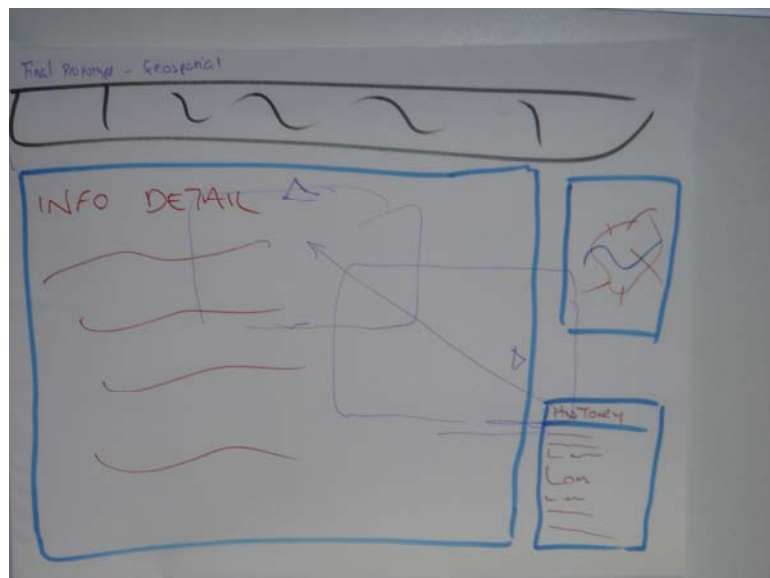


Figure 54: Geospatial Combined Prototype, screen 2

- The map then appears in the top right hand corner so is always accessible.

The design was inspired by the following information visualisation technique: Fisheye Menus and Zooming

At the end of the session the participants were asked what considerations need to be taken into account to implement their designs on the web site:

- Who should be involved in the next stage, for moving this project forward?
 - End users
 - Web designers
 - Experts with GIS experience
- What type of hardware would be required to run the sites?
 - High speed

Legal issues also need to be considered

Results for Bibliographical

Bibliographical Activity 1: Requirements gathering

The hypothetical scenario setting for the bibliographical service given to the participants was:

- “JISC is a public organisation that supports further and higher education. JISC has released a tender to develop a new site that enables individuals to donate/upload their papers and allow free access to all users. The tender requires you to:
 - Identify the requirements of the site i.e. what users want in terms of information and functionality”

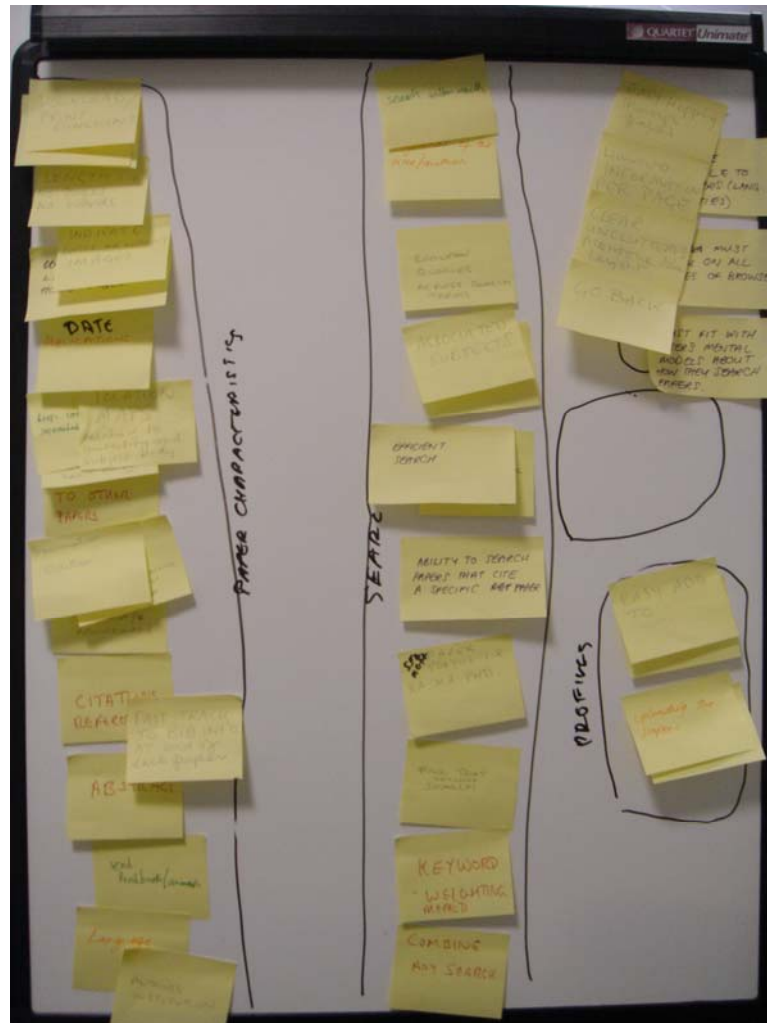


Figure 55: Bibliographical affinity diagram

The following is a breakdown of the categories defined by the participants:

Usability and accessibility

- Must be accessible to all users (language/disabilities)
- Must work on all types of browsers
- Must fit with users mental models about how they search papers
- Easy hopping through pages
- Limited information per page
- Clear uncluttered monotone layout
- Go back

Profiles

- Easy to add
- Personal account
- Uploading the papers
- Reference store

Search

- Combine any search
- Keyword weighting method
- Full text keyword search
- Paper status M.A, B.A, PHD
- Ability to search papers that cite a specific paper
- Efficient search
- Keywords in specific parts such as abstract title
- Associated subjects
- More than one keywords
- Boolean queries across search items
- Search within results
- Keywords of the time/authors

Paper characteristics

- Send feedback/comments
- Abstract
- Authors institution
- Language
- Download/print function
- The available papers
- Previous work of writers (subject areas)

- Length i.e. number of pages, number of words
- Indicate with or without images
- Links to authors home pages
- Date of publication
- Location maps related to university and subject body
- Keep case studies separated
- Other sources e.g. which journals if any has it been published in
- Information edition
- Format e.g. conference paper
- Number of times accessed/downloaded
- Links to other papers
- Fast track to bibliography information at end of each paper
- Citations reference

Bibliographic Activity 2 and 3: Paper-based prototypes and their presentation

The participants worked in pairs taking the findings of the requirement gathering into consideration to design an idea by applying some form of information visualisation.

Group 1

The focus of this group's design was to build a login facility for users.

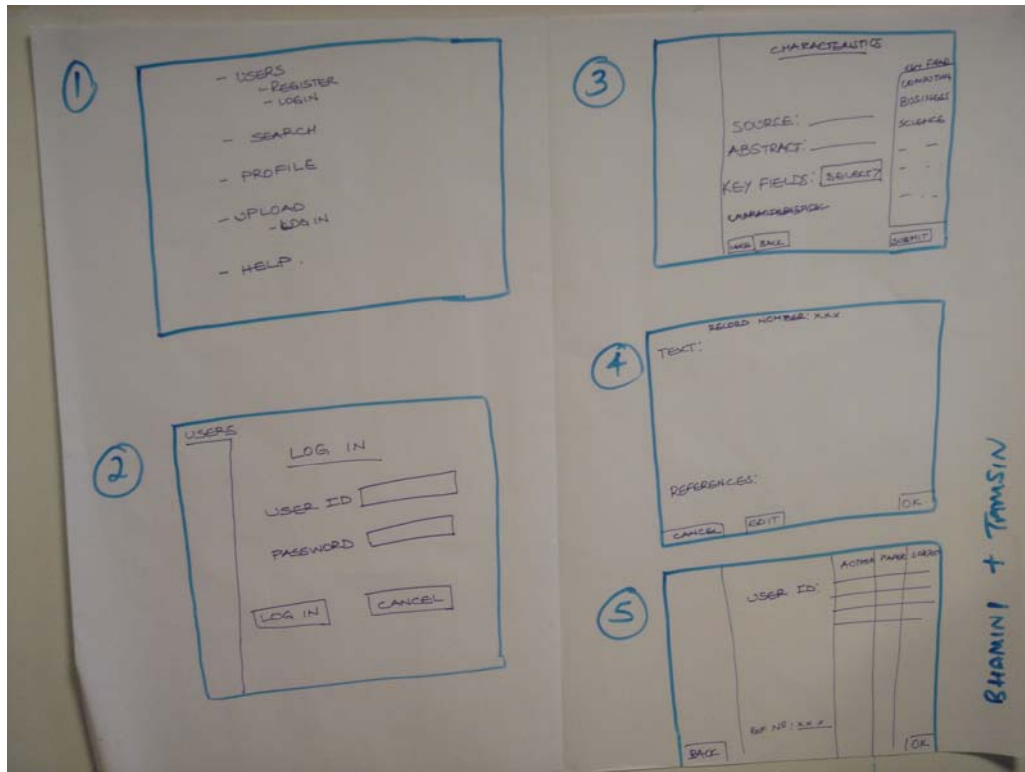


Figure 56: Bibliographical Prototype of Group 1

- This is unfortunately a static prototype and does not make use of information visualisation techniques.

Group 2

The purpose of this design was to focus on ways in which a user could search papers.

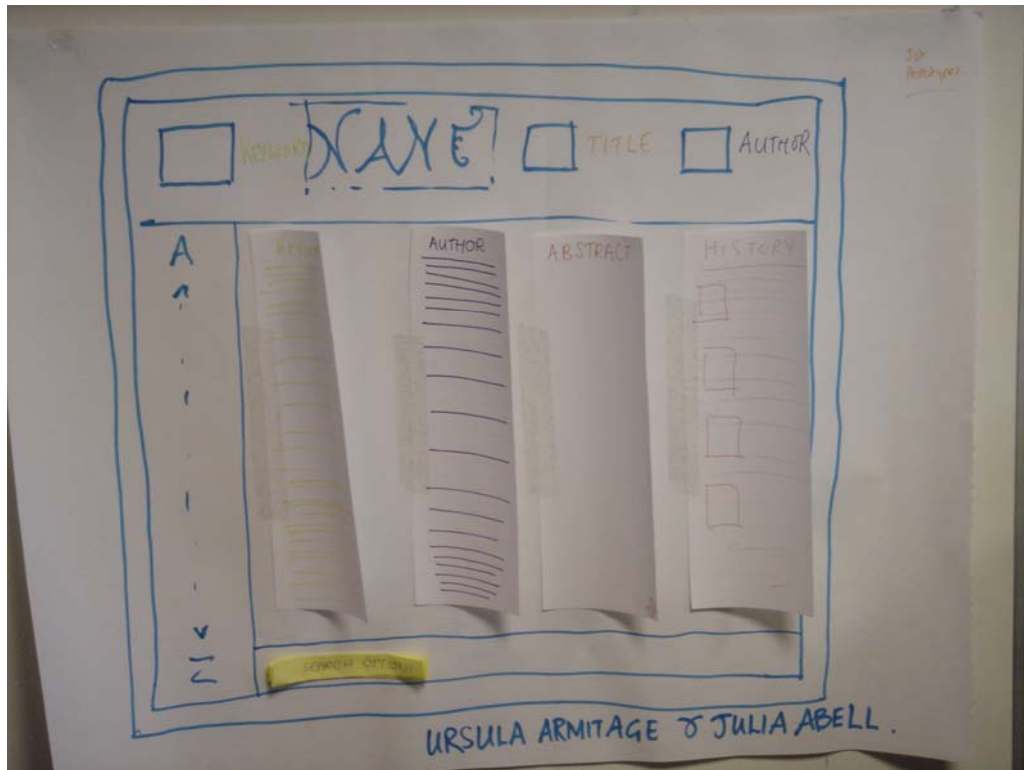


Figure 57: Bibliographical Prototype Group 2

- When the user first arrives to the page, the screen is empty.
- Firstly the user would need to select search options via Author or Title using the search options at the bottom of the page (yellow post-it note)
- Alternatively the user may search using the A-Z on the left-hand side, to refine the search criteria the user may select Author or Title and then the appropriate letter. The results will be displayed within the respective column.
- Fisheye Menus have been applied to the interface (columns).
- Depending on what the user has selected the relevant columns appears on the screen keyword, author, and/or title.
- The columns can be maximised so that it takes over the whole screen and minimised to enable users to return back to the results.
- A history of what the user has been searching will be logged and visible, so that the user can access different articles without having to wait. The thumbnails are like screen shots of the first page of the paper.

The design was inspired by the following information visualisation technique: Fisheye

Menus

Group 3

This design looked at methods to index information.



Figure 58: Bibliographical Prototype Group 3, screen 1

- A drop down box at the top of the screen allows the user to select a particular category.
- Sub categories of the main category are then displayed down the page on the left hand side. (e.g. main category is computing sub categories are internet, hardware, software etc.)
- The internet sub category is then broken down further, and is represented across the page.
- When a user highlights one of the internet categories the information is displayed on the right hand side. General and specific information is shown.
- On selecting a sub category from the internet category i.e. servers or selecting the specific information from the right hand side the user is presented with screen 2.

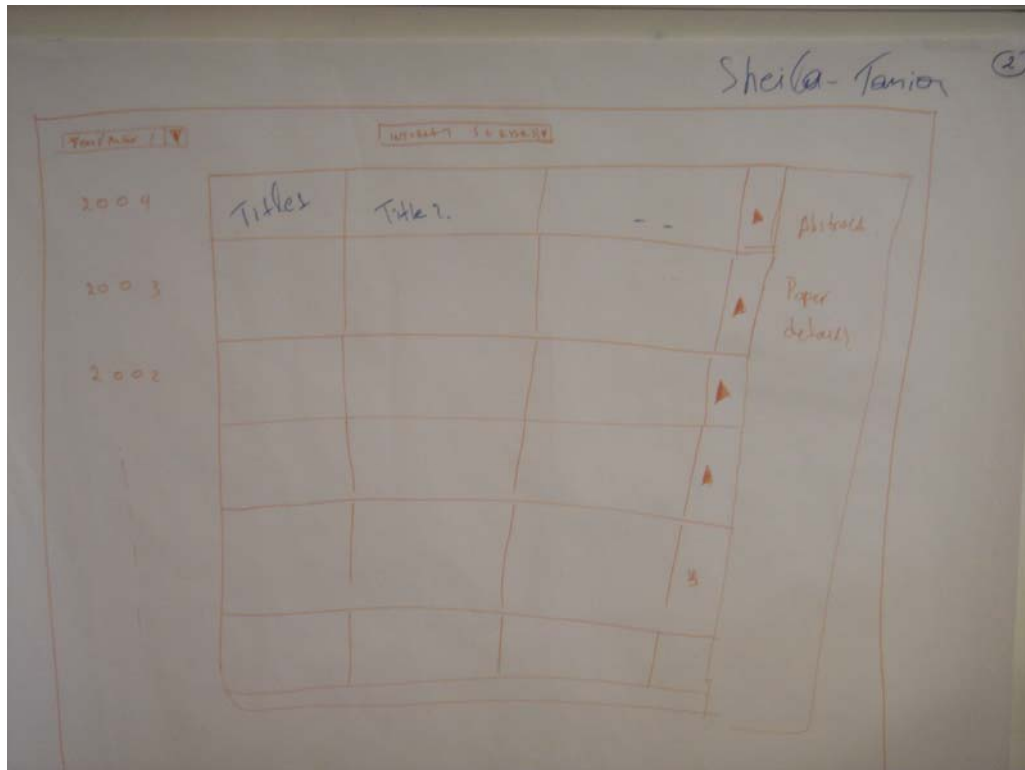


Figure 591: Bibliographical Prototype Group 3, screen 2

- This screen shows the year the papers were published down the left hand column and the titles of the papers across the page. The arrow indicates moving horizontally to see other titles.
- The user can view an abstract of the paper on the right of the screen by highlighting a paper.
- On selecting the paper the user is able to view the full copy.
- Options are available to change the criteria via subject category, author or year (drop down boxes).

The design was inspired by the following information visualisation technique: Graphical Interface for Digital Libraries

Bibliographical Activity 4: Final prototype

The whole group worked together, thinking of a new design to illustrate their ideas.

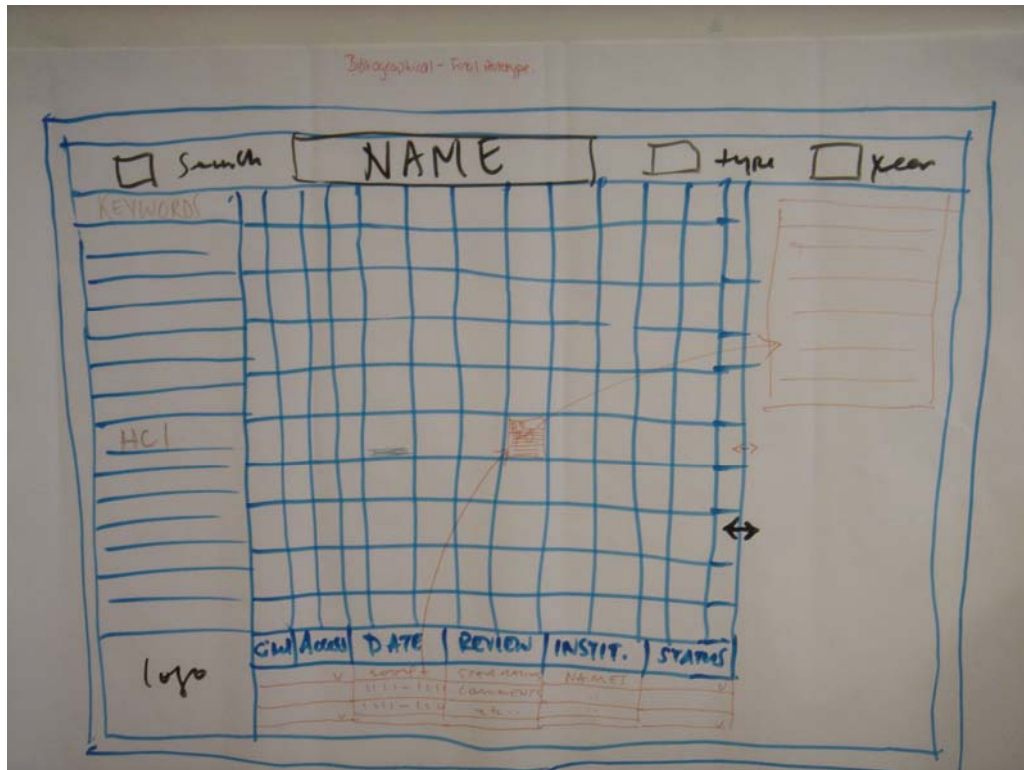


Figure 60: Bibliographical Combined Prototype

- Keywords listed in the left hand column
- Selection criteria presented at the bottom of the grid.
- For example, if a user wishes to view all papers published in 2004 for HCI, they would select the HCI keyword and select 2004 from the date field, the number of papers published will then be populated in the grid or a star rating would be given. On selecting the number, all titles of the papers will appear on the right hand side of the screen. The paper content can be viewed by clicking on the title.

The design was inspired by the following information visualisation technique: Graphical Interface for Digital Libraries

At the end of the session the participants were asked what considerations need to be taken into account to implement their designs on the web site:

- Who should be involved in the next stage, for moving this project forward?
 - Students

- Librarians
- Authors
- Researcher
- Stakeholders
- Graphic/web designers
- What type of software/technology would be needed to develop these designs?
 - Flash but not sure in terms of usability and compatibility
- What type of hardware would be required to run the sites?
 - High speed computer with a lot of disk space

PD Sessions Discussion

The participatory design sessions enabled the development of low-fidelity prototypes using existing information visualisation techniques. All except one prototype used some form of information visualisation for presenting a part of the site for a specific service.

Table 7 lists all used information visualisation techniques by the participants in the construction of low-fidelity prototypes:

Table 7: Table of techniques used

Techniques	The number of designs that utilised the technique
▪ Zooming	9
▪ Dynamps	6
▪ Excentric labelling	1
▪ FilmFinder	1
▪ Lifelines	1
▪ TreeMap	1
▪ Graphical Interface for Digital Libraries	4
▪ PhotMesa Image Browser	4
▪ Generalized Query Previews	2
▪ Visual Exploration of Time-series Data (TimeSearcher)	1

▪ PhotoFinder	1
▪ Fisheye Menus	2
▪ SpaceTree	1

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.

The following provides a breakdown of the techniques used per service and from which we can derive the types of techniques that are most suited to the particular services.

Table 8: Information visualisation techniques used by Portal participants

Techniques	The number of Portal designs that utilised the technique
▪ Zooming	5
▪ Dynamaps	5
▪ Excentric labelling	1
▪ FilmFinder	1

Table 9: Information visualisation techniques used by Image participants

Techniques	The number of Image designs that utilised the technique
▪ Zooming	1
▪ Dynamaps	1
▪ Lifelines	1
▪ Treemap	1
▪ Graphical Interface for Digital Libraries	2
▪ PhotoMesa Image Browser	2
▪ Generalized Query Previews	2

Table 10: Information visualisation techniques used by Geospatial participants

Techniques	The number of Geospatial designs that utilised the technique
▪ Zooming	3
▪ Visual Exploration of Time-series Data (TimeSearcher)	1
▪ PhotoFinder	1
▪ PhotMesa Image Browser	2
▪ SpaceTree	1
▪ Fisheye Menus	1

Table 11: Information visualisation techniques used by Bibliographical participants

Techniques	The number of Bibliographical designs that utilised the technique
▪ Graphical Interface for Digital Libraries	2
▪ Fisheye Menus	1

The participants were provided with information on 15 different types of techniques which represented a good cross section of what has been developed so far. Twelve of those techniques were used and one technique (FilmFinder) was recalled by a participant. Generally the participants did not restrict the design to just one technique they tended to combine a set of two or more techniques to define the interaction. Two of the final designs (Geospatial and Bibliographical service) made use of the History concept where users are presented with a log of what the user has visited (pathways) so that users can easily retrace their steps (Shneiderman, 1996).

One main problem that was highlighted with the use of information visualisation is information overload, too much information presented on one screen.

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

To take this study further it is suggested that a panel be formed to include a set of representative users from each domain, domain experts, designers and developers who have technical skills in Macromedia Flash, Java, JavaScript, PHP and DHTML. Using the above identified techniques the panel could develop an interactive prototype through iterative development either by selecting one or using a combination of techniques.

The participatory design method was an effective approach to get feedback on how information visualisation can be applied to web services. However, three hours were not enough for the participants to grasp the concepts, digest them and to develop prototypes. They needed more time to discuss and share their ideas. The provision of documentation on established techniques prevented the participants from exploring other ways to represent the information.

With hindsight it would have been ideal to schedule each session over a three day period so that the participants thoughts would have evolved over time as well as becoming comfortable within the group. The background of the participants and the size of the groups were appropriate. However, it would be more useful to have the end users of the service, domain experts and designers/developers within the group. Using the skills of the designers/developers they could have created an interactive prototype of the final design so that the participants could have visually seen how the design would be presented on screen, which may have stimulated further discussion.