



**Grant Agreement No.** ICT-2009-270082  
**Project Acronym** PATHS  
**Project full title** Personalised Access To cultural Heritage Spaces

## D5.3 Field Trials of the PATHS prototype

**Authors:** Jillian Griffiths (MDR)  
 Sheena Bassett (MDR)  
 Paula Goodale (USFD)  
 Jen Smith (USFD)  
 Eneko Agirre (UPV/EHU)  
 Arantxa Otegi (UPV/EHU)  
 Stein Runar Bergheim (Avinet)

**Contributors:** George Chryssochoidis (i-Seive)  
 Kate Fernie (MDR)  
 Samuel Fernando (USFD)

Project funded under FP7-ICT-2009-6 Challenge 4 – “Digital Libraries and Content”	
<b>Status</b>	Final
<b>Distribution level</b>	Public
<b>Date of delivery</b>	M36
<b>Type</b>	Report
<b>Project website</b>	<a href="http://www.paths-project.eu">http://www.paths-project.eu</a>
<b>Project Coordinator</b>	Dr. Mark Stevenson University of Sheffield

## Change Log

<b>Version</b>	<b>Date</b>	<b>Amended by</b>	<b>Changes</b>
0.1	22-11-2013	Jillian Griffiths	Document created with draft content
0.2	29-11-2013	Jillian Griffiths	Additional content added, amendments and edits
0.3	06-12-2013	Jillian Griffiths	Additional content added, amendments and edits
0.4	13-12-2013	Jillian Griffiths	Additional content added, amendments and edits
0.5	18-12-2013	Jillian Griffiths	Additional content added, amendments and edits
FINAL	19-12-2013	Jillian Griffiths	Additional content added, amendments and edits
Edits to FINAL	06-01-2013	Jillian Griffiths	Final edits arising from internal review

## Table of Contents

<b>1.</b>	<b>Executive Summary</b> .....	<b>8</b>
<b>2.</b>	<b>Introduction</b> .....	<b>10</b>
2.1	PATHS Evaluation Methodology .....	10
2.1.1	<i>Objectives of the evaluation</i> .....	10
2.1.2	<i>Development of the evaluation methodology</i> .....	11
2.1.3	<i>Strategy</i> .....	11
2.2	Field Trials .....	11
2.3	Project-wide evaluation .....	12
<b>3.</b>	<b>Implementation</b> .....	<b>13</b>
3.1	Evaluation protocol .....	13
3.2	Piloting.....	13
3.3	Field Trial participants and sampling approach .....	14
3.4	Ethics.....	14
3.5	Tasks used in the field trial evaluation .....	15
<b>4.</b>	<b>Results of the Prototype Field Trials</b> .....	<b>16</b>
4.1	Participant profile.....	16
4.2	Responses to the Prototype Diary Study .....	20
4.2.1	<i>Technical profile</i> .....	21
4.2.2	<i>Diary responses – quantitative</i> .....	23
4.2.3	<i>Diary responses – qualitative</i> .....	26
4.3	Responses to the Prototype Final Questionnaire.....	32
4.3.1	<i>Exploring and Searching Content</i> .....	32
4.3.1.1	<i>Exploring and Searching Content - Ease of Use</i> .....	34
4.3.1.2	<i>Exploring and Searching Content - Tool Usefulness</i> .....	34
4.3.1.3	<i>Exploring and Searching Content - Inventiveness</i> .....	35
4.3.1.4	<i>Exploring and Searching Content - Exploration Tools Preference</i> .....	36
4.3.2	<i>Finding and Following Paths</i> .....	37
4.3.3	<i>Creating Paths</i> .....	41
4.3.3.1	<i>General feedback</i> .....	48
4.4	Qualitative responses from the Field Trials – interview and focus group results .....	50
4.5	Responses to usability Semantic Differentials, Prototype Trials .....	54
<b>5.</b>	<b>Results of the Mobile Field Trials</b> .....	<b>56</b>
5.1	Participant profile.....	56
5.2	Responses to the Mobile Questionnaire .....	60
5.2.1	<i>Finding and following a path</i> .....	60
5.3	Qualitative responses to the Mobile application of PATHS .....	61
5.4	Additional functionality, viewing and sharing paths in the Mobile application .....	65
5.5	Responses to usability Semantic Differentials, Mobile Trials .....	69
<b>6.</b>	<b>Results of the project-wide activities</b> .....	<b>71</b>
6.1	System Architecture .....	71
6.1.1	<i>Hardware stability</i> .....	71
6.1.2	<i>Parallel development of front-end, back-end and processing of data</i> .....	71
6.1.3	<i>Diverging and numerous technologies</i> .....	71
6.2	Content analysis and enrichment .....	72

6.2.1	<i>Ontology extension</i> .....	73
6.2.2	<i>Intra-collection links – typed similarity</i> .....	73
6.2.3	<i>Recommender system experiments</i> .....	75
6.3	Review against the Functional Specification .....	77
<b>7.</b>	<b>Discussion</b> .....	<b>81</b>
7.1	Response to key functionality of PATHS.....	81
7.1.1	<i>Finding and following a path</i> .....	81
7.1.2	<i>Exploring with PATHS</i> .....	85
7.1.3	<i>Path Creation</i> .....	87
7.2	Overall response to PATHS .....	89
<b>8.</b>	<b>Conclusions</b> .....	<b>92</b>
<b>9.</b>	<b>References</b> .....	<b>93</b>

## **Appendices**

Appendix 1 PATHS Prototype Field Trial - User Profile.....	96
Appendix 2 PATHS Prototype Field Trial - Diary .....	99
Appendix 3 PATHS Prototype Field Trial – Final Feedback.....	102
Appendix 4 PATHS Prototype Field Trial – Focus Group/Interview Schedule .....	108
Appendix 5 PATHS Mobile Field Trial – Questionnaire .....	109

## List of figures

Figure 1 Evaluation Protocol.....	13
Figure 2 Gender, Prototype Trials .....	16
Figure 3 Native language, Prototype Trials .....	16
Figure 4 Age group, Prototype Trials.....	17
Figure 5 Level of internet experience, Prototype Trials .....	17
Figure 6 Level of web search experience, Prototype Trials.....	18
Figure 7 Searching for cultural heritage information, Prototype Trials.....	18
Figure 8 Roles in which cultural heritage information is used, Prototype Trials .....	19
Figure 9 Websites used for cultural heritage information, Prototype Trials .....	19
Figure 10 Familiarity with PATHS, Prototype Trials.....	20
Figure 11 Number of diary entries by participant, Prototype Trials.....	21
Figure 12 Cumulative diary entries over time, Prototype Trials .....	21
Figure 13 Type of computer used for diary sessions, Prototype Trials.....	22
Figure 14 Web browser used for diary sessions, Prototype Trials .....	22
Figure 15 Type of network used for diary sessions, Prototype Trials .....	23
Figure 16 Purpose for using PATHS during diary sessions, Prototype Trials .....	23
Figure 17 Goals of users during the diary sessions, Prototype Trials .....	24
Figure 18 Occurrence of new and continuing goals during the diary sessions, Prototype Trials .....	24
Figure 19 Activities undertaken in PATHS during the diary sessions, Prototype Trials.....	25
Figure 20 Extent to which goals were achieved during the diary sessions, Prototype Trials ..	25
Figure 21 Word cloud of responses to open-ended question on user goals, with 'path' term included, Prototype Trials .....	26
Figure 22 Word cloud of responses to open-ended question on user goals, without 'path' term included, Prototype Trials .....	26
Figure 23 Summary of responses to open-ended question on user goals, Prototype Trials ...	27
Figure 24 Word cloud of responses to open-ended question on steps taken to achieve goals, Prototype Trials.....	28
Figure 25 Examples of detailed steps of taking different approaches to finding content for their paths, Prototype Trials.....	29
Figure 26 Examples of detailed steps of taking different approaches to finding content for their paths, Prototype Trials.....	29
Figure 27 Word cloud of responses to open-ended question on difficulties encountered during the diary sessions, Prototype Trials.....	30
Figure 28 Summary of difficulties encountered by type, Prototype Trials.....	31
Figure 29 Word cloud of the responses to the open-ended question on other comments, Prototype Trials.....	31
Figure 30 Summary of the responses to other comments, Prototype Trials.....	32
Figure 31 Tools used to search for and explore content, Prototype Trials .....	33
Figure 32 Tools used for exploring content, Prototype Trials .....	33
Figure 33 Exploring and Searching Content - Ease of Use, Prototype Trials.....	34
Figure 34 Exploring and Searching Content - Tool Usefulness, Prototype Trials.....	35
Figure 35 Exploring and Searching Content - Inventiveness, Prototype Trials .....	36
Figure 36 Exploring and Searching Content - Exploration Tools Preference, Prototype Trials	36
Figure 37 Can Exploring and Searching be improved, Prototype Trials.....	37
Figure 38 Ease of finding paths, Prototype Trials .....	38
Figure 39 Usefulness of finding paths, Prototype Trials .....	39
Figure 40 Inventiveness of finding paths, Prototype Trials .....	39
Figure 41 Ease of following a path, Prototype Trials .....	40
Figure 42 Usefulness of following a path, Prototype Trials.....	40
Figure 43 Inventiveness of following a path, Prototype Trials .....	41
Figure 44 Number of paths created, Prototype Trials.....	41
Figure 45 Feature usefulness for creating paths, Prototype Trials .....	42

Figure 46 Feature usefulness for including items in paths, Prototype Trials .....	43
Figure 47 Information used for choosing items for paths, Prototype Trials .....	44
Figure 48 Criteria for item selection, Prototype Trials .....	44
Figure 49 Criteria for item order, Prototype Trials .....	45
Figure 50 Element creation, Prototype Trials .....	45
Figure 51 Ease of path creation, Prototype Trials .....	46
Figure 52 Usefulness of path creation, Prototype Trials .....	47
Figure 53 Inventiveness of path creation, Prototype Trials .....	47
Figure 54 Task support, Prototype Trials .....	48
Figure 55 Most likely tasks, Prototype Trials .....	49
Figure 56 Generalised Conceptual Model of User Interactions with Paths .....	50
Figure 57 Qualitative feedback, Prototype Trials .....	53
Figure 58 Initial and Final view, Prototype Trials .....	54
Figure 59 Gender, Mobile Trials .....	56
Figure 60 Age group, Mobile Trials .....	56
Figure 61 Level of internet experience, Mobile Trials .....	57
Figure 62 Familiarity with PATHS, Mobile Trials .....	57
Figure 63 Mobile devices owned, Mobile Trials .....	58
Figure 64 Level of tablet experience, Mobile Trials .....	58
Figure 65 Searching for cultural heritage information, Mobile Trials .....	59
Figure 66 Roles in which cultural heritage information is used, Mobile Trials .....	59
Figure 67 Ease of finding a path, Mobile Trials .....	60
Figure 68 Ease of following a path, Mobile Trials .....	60
Figure 69 Flexibility in following a path, Mobile Trials .....	61
Figure 70 Search results from the mobile app (Overview mode), Mobile Trials .....	61
Figure 71 Pop-up node in mobile app (Overview mode), Mobile Trials .....	62
Figure 72 Full node in mobile app (Following mode), Mobile Trials .....	63
Figure 73 Summary of most liked aspects of PATHS, Mobile Trials .....	64
Figure 74 Summary of least liked aspects of PATHS, Mobile Trials .....	64
Figure 75 Summary of suggested improvements PATHS, Mobile Trials .....	65
Figure 76 Whose path would you like to see? Mobile Trials .....	66
Figure 77 Additional information for inclusion in a path, Mobile Trials .....	67
Figure 78 Other media for sharing paths, Mobile Trials .....	68
Figure 79 Other media for sharing paths, Mobile Trials .....	68
Figure 80 Preference for sharing paths, Mobile Trials .....	69
Figure 81 First impressions of PATHS, Mobile Trials .....	69
Figure 82 Example of item annotation .....	74
Figure 83 Results of ranking by a single method .....	76
Figure 84 Results of combined rankings .....	77
Figure 85 Review against the Functional Specification .....	80
Figure 86 Full node in prototype (Following mode): note “Large overview” area outlined in orange .....	82
Figure 87 Large overview in prototype: note only half of the path is visible .....	83
Figure 88 Full node in prototype: note explanation in orange .....	84
Figure 89 Large overview in prototype .....	84
Figure 90 Overview in mobile app .....	84

## 1. Executive Summary

The aim of this report is to present the results of field trials of the PATHS prototype. This work forms part of a programme that began with the evaluation of the first prototype, *D5.1 Evaluation of the first PATHS Prototype (2012)*, continued with evaluation of the second prototype, *D5.2 Evaluation of the second PATHS Prototype (2013)* and concludes with the field trials and technical testing reported here.

Groups of target users were invited to take part in Field Trials of both the main Prototype and the Mobile Application. Data was collected in using a more naturalistic approach than previous evaluations, and provided an opportunity for the collection of qualitative data from focus group and interview discussions and quantitative feedback through questionnaires. Evaluation of the prototype system was also conducted by the technical development partners; i-Sieve, Avinet, The University of the Basque Country and The University of Sheffield. These evaluations were concerned with the system architecture, content processing and enrichment and user interface design and focussed on systematic, objective evaluation of the building blocks of the system as standalone entities.

As with previous evaluations of PATHS, it is evident that the majority of participants had an overall positive response to PATHS, finding it mostly Organised, Creative and Likeable. The system was also seen as offering novel functionality that could be useful in a number of different user scenarios.

The majority of participants indicated that PATHS supported Finding items related to a topic and Exploring what content is available in a collection and Creating resources from cultural heritage collections. Serendipity/discovering new things and Developing ideas were also well rated. The tasks that PATHS supported the least well were Fact-finding and Communicating with other users. The majority of users indicated that they would like to see paths created by cultural organisations and curators, with some interest also noted for Lecturers/Teachers and Museum/Gallery educators.

Whilst there have been positive responses to PATHS there are areas where further investigation could be undertaken, which centre around the system operation, presentation and the content. The most common issues appear to be related to the metadata, which needs to be improved at the source (and is outside the scope of this project), and the functionality of the Map tool. Participants also felt that additional onscreen Help would have been useful.

The main issues arose when participants actively engaged in information based tasks using the PATHS system. They provide a useful basis for discussion on the further development of systems which seek to develop new approaches to access to cultural heritage collections, and may inform future work in the wider research areas related to the project.

Project-wide evaluation activities also provided important assessment of PATHS, results of which are reported here and in individual reports related to the *PATHS system and its architecture*, the *Paths user interface* and *Content processing and enrichment*. Technical testing of the different elements of the system specifically sought to identify whether the specified functionality was present and working (as measured against *D1.5 Functional Specification for second prototype*, 2012); that system performance was robust and reliable



and, that the scalability and quality of content enrichment was good. These evaluation activities have enabled us to objectively measure PATHS to assess accuracy, reliability and scalability

Finally, results of the Field Trials, coupled with those reported in D5.1 and D5.2, have enabled us to confirm that the PATHS prototype does meet user requirements as identified in D1.1 User Requirements Analysis (2011). PATHS is viewed as an application that is best for *searching, exploring* and *creating resources* by individuals using cultural heritage collections. It allows users to create personalised stories within cultural collections and, if following a path from a cultural organisation, offers meaningful guidance about the interpretation of cultural works. Users are provided with innovative ways to access and utilise the contents of digital collections that enrich their experiences of these resources and facilitates innovative access to which better supports knowledge discovery and exploration.

### **Acknowledgements**

We wish extend our gratitude to all those individuals and organisations who took part or facilitated in the Field Trial activities; their input has been invaluable:

- Royal Institution, London, UK
- Department of History, Manchester Metropolitan University, UK
- Department of Languages, Information and Communications, Manchester Metropolitan University, UK
- Samuel Johnson Birthplace Museum, UK
- Archaeology Data Service, UK
- Students and staff of The University of Sheffield
- Participants recruited through i-Sieve, Greece

## 2. Introduction

The evaluation work in this deliverable forms part of a programme that began with the evaluation of the first prototype, *D5.1 Evaluation of the first PATHS Prototype (2012)*, continued with evaluation of the second prototype, *D5.2 Evaluation of the second PATHS Prototype (2013)* and concludes with field trials and technical testing to be reported here.

### 2.1 PATHS Evaluation Methodology

Overall, the PATHS evaluation activities needs to meet several requirements:

- to ensure that the system developed is fit for purpose;
- to evaluate PATHS against objective measures to assess accuracy, reliability and scalability;
- to engage with users to verify user requirements are being met;
- to provide feedback to partners after each Prototype has been released; and,
- to demonstrate the feasibility and desirability of integrating PATHS into existing cultural heritage digital library services.

The project defined a broad approach to evaluation, which incorporates laboratory testing along with demonstrations and focus groups.

In this section, we define the specific methodology that has been employed in this round of evaluation activities.

#### 2.1.1 Objectives of the evaluation

A number of objectives were identified as the cornerstones of the PATHS system evaluation at its various stages, including:

- 1) To confirm that the user requirements expressed within the most recent functional specification have been met.
- 2) To ensure that system performance falls within acceptable limits.
- 3) To assess the design of the system and its interface against best practice guidelines.
- 4) To assess the design of the system against other systems supporting similar functionality.
- 5) To measure the usability of the system from the perspective of key user groups in support of simulated and natural (real-life, user-defined) tasks including domain-specific work tasks.
- 6) To assess the quality of the system and user experience from the perspective of key user groups.
- 7) To assess and further describe the validity and utility of the PATHS user interaction model in support of domain-specific work tasks.
- 8) To examine and further explore the information behaviour of different user groups with regard to exploratory search and path creation.
- 9) To test hypotheses relating to users' information behaviour in using the system, with regard to their cognitive styles.
- 10) To examine changes in information behaviour and use of the PATHS system over time.
- 11) To identify areas for improvement in future iterations of the system.

### 2.1.2 Development of the evaluation methodology

The evaluation methodology was developed in two phases, coinciding with the delivery of the two prototypes of the PATHS system.

- Phase One, months 10-16  
The initial methodology for the evaluation of the first PATHS prototype was defined by MDR and USFD based on the user requirements identified for the system in the initial research and includes validation criteria, objective measures and defined test tasks and queries for the database.
- Phase Two, months 25-27  
Further development and refinement of the Evaluation Methodology took place during months 16-25 and includes validation criteria, objective measures and defined test tasks and queries for use with PATHS during demonstration and laboratory activities and field trials.

### 2.1.3 Strategy

Evaluation of PATHS has largely followed a strategy derived from the interactive information retrieval paradigm, incorporating a mix of system and human-centred evaluations in both laboratory and field-based settings. These evaluations have varied somewhat between the stages of the project, as different functionality was available in each prototype.

- The first Prototype (P1) included the core functionality to support the PATHS user interaction model. Evaluation related to objectives 5-8 and 11.
- The second Prototype (P2) includes updated core functionality based upon feedback from P1 plus additional personalisation and support for collaborative work. Evaluation has been extended to cover objectives 9 and 10 in addition to continued evaluation of objectives 5-8 and 11 (including comparison between P1 and P2 results).

## 2.2 Field Trials

The Field Trials consisted of two main sets of activities, the *Prototype Trials* and the *Mobile Application Trials*. These were more naturalistic than previous evaluation undertaken with P1 and P2, where a series of demonstrations were given to groups of potential users in the UK, Spain, Italy and Greece and laboratory work was conducted at the University of Sheffield.

For the Prototype Trials participants were recruited to enable quantitative and qualitative data to be collected to assess the usability and usefulness of PATHS *Prototype*. These activities were undertaken in the participants' own time, in their own preferred environment and using their own technology.

For the Mobile Trials participants were again recruited to enable quantitative and qualitative data to be collected to assess the usability and usefulness of PATHS *Mobile Application*. In some instances these activities were undertaken in the participants' own time, in their own preferred environment and using their own technology. Some participants undertook this in the presence of Moderators from the project, using iPads provided for them.

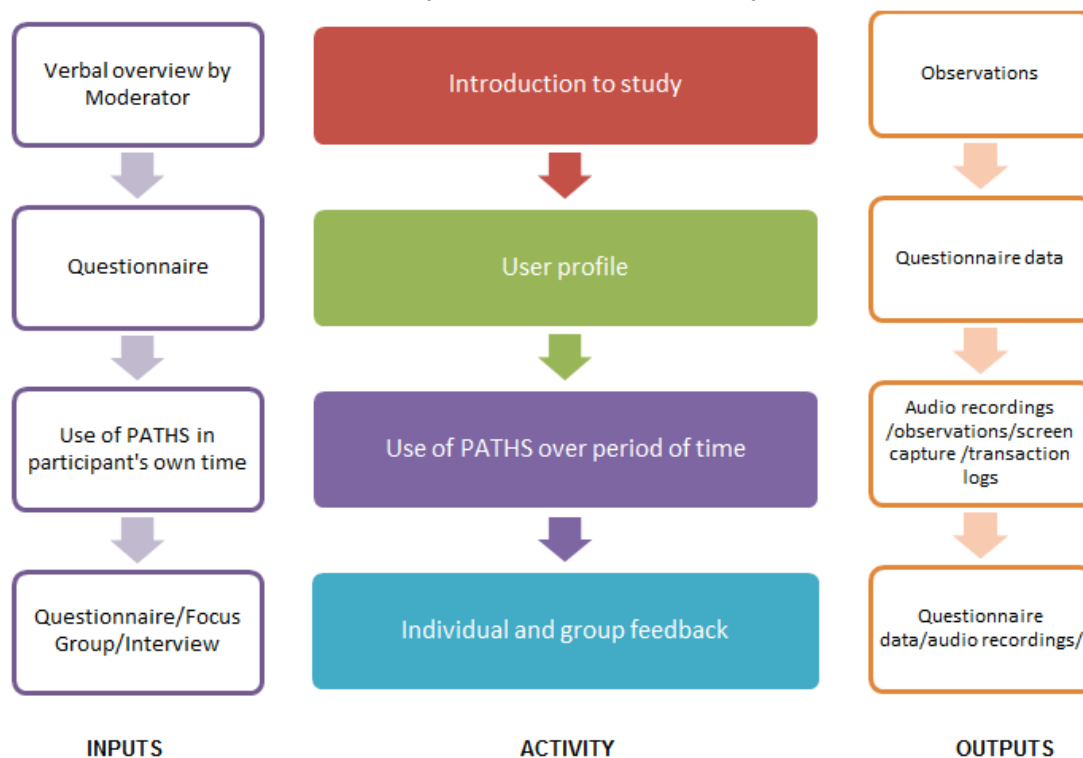
### **2.3 Project-wide evaluation**

Specific and localised evaluation of the different elements of the PATHS system have also been conducted by the technical development partners, i-Sieve, Avinet, The University of the Basque Country and The University of Sheffield. These evaluations are concerned with the system architecture, content processing and enrichment, and user interface design, and are specifically focussed on systematic, objective evaluation of the building blocks of the system as standalone entities.

### 3. Implementation

#### 3.1 Evaluation protocol

An evaluation protocol was employed to ensure consistency of approach across the field trials:



**Figure 1 Evaluation Protocol**

This overarching protocol was employed to ensure consistency of approach across the partners conducting evaluation in different countries. This diagram illustrates the main stages of the process, along with data instruments and other inputs, and an indication of the data collected as outputs of each of the evaluation activities. Recording equipment was used to capture discussions and transcription of these undertaken locally by the host partner. Manual analysis of these discussions has been undertaken, whilst questionnaire data have been analysed using Excel and xlstat.

#### 3.2 Piloting

A number of different data collection instruments and materials were developed in order to undertake the different evaluation activities:

- Prototype Field Trial - User Profile (Appendix 1)
- Prototype Field Trial - Diary (Appendix 2)
- Prototype Field Trial – Final Feedback (Appendix 3)
- Prototype Field Trial – Focus Group/Interview Schedule (Appendix 4)
- Mobile Field Trial – Questionnaire (Appendix 5)

These materials were extensively piloted by project partners and by a selected number of external participants. These materials, tasks and demonstration activities were modified in accordance with this feedback.

### 3.3 Field Trial participants and sampling approach

User profiles and a user interaction model were developed early in the project and have been reported in *D1.1 User Requirements Analysis* (2011). This work formed the basis of several example use cases detailing typical use of the PATHS system in context and has informed the identification of participants for both the field-based demonstration sessions and the laboratory-based evaluations. Evaluation of the second prototype was also informed by activities undertaken for evaluation of the first prototype, reported in *D5.1 Evaluation of the first PATHS prototype*. The PATHS system needs to support:

- Path creation - expert
- Path creation - non-expert
- Path facilitation (e.g. teacher/museum educator)
- Path consumption (e.g. Student/visitor)

Participants from these categories were engaged for evaluation activities for P1 and P2. More targeted recruitment of participants to the Field Trials resulted in recruitment of path creators and path consumers. To this end, 34 participants engaged the Field Trials overall, 15 participants for the Prototype Trials and 19 participants for the Mobile Trials. During the Prototype Field Trials 10 of these participants took part in the Diary Study, with a further 5 providing feedback via interview. Participants and organisations included:

- Royal Institution, London, UK
- Department of History, Manchester Metropolitan University, UK
- Department of Languages, Information and Communications, Manchester Metropolitan University, UK
- Samuel Johnson Birthplace Museum, UK
- Archaeology Data Service, UK
- Students and staff of The University of Sheffield
- Participants recruited via i-Sieve, Greece

A non-probability convenience sample was used (Bryman, 2012:202), with host partners (The University of Sheffield, i-Sieve and MDR) each identifying potential participants. Invitations to participate in the project were sent out and local arrangements made to run the field trials.

### 3.4 Ethics

The field trial evaluation work was undertaken according to good ethical practices in line with the ethical procedures and requirements of the University of Sheffield. To this end participants were provided with an information sheet about the study, were required to give informed consent relating to the use of the data collected before their session began, and were provided with the opportunity to withdraw at any stage if they so wished. All data has been reported in aggregate form, with no individual user identifiable from the results provided.

### **3.5 Tasks used in the field trial evaluation**

In contrast to the evaluation of P1 and P2 reported in *D5.1 Evaluation of the first PATHS Prototype* (2012) and *D5.2 Evaluation of the second PATHS Prototype* (2013) set tasks were not used in the Field Trials.

Instead, a more naturalist approach was adopted where participants were given a brief demonstration of the PATHS system and provided with only minimal instructions, to use it to meet any ongoing information requirements they may have, to create a path of their own design and to meet a realistic need. Participants were then asked to use the system over an extended period of time (no more than two weeks). This enabled users to engage in more complex information tasks (e.g. creating a path), without the time constraints inherent in the earlier laboratory-based evaluations (reported in D5.1 and D5.2).

Testing of the mobile iPad application of PATHS was carried out with a simple task-based activity, followed by a feedback questionnaire. At the time of this evaluation, the functionality of the iPad application was limited to finding and following paths that had been created by users of the main PATHS prototype.

Tasks therefore focused on these two activities. Users were required to find and follow one specific path, and one of their own choosing, with a list of topics provided for guidance. The questionnaire collects data on the user profile (including experience with mobile platforms), experience of using the PATHS application, and feedback on potential future developments.

## 4. Results of the Prototype Field Trials

The following section presents results from the Prototype Field Trials. It is divided into five parts and begins with a description of the participant profile before moving to responses to the Diary Study, then responses to the Prototype Trial questionnaire, then qualitative responses from the Prototype Trials and finally responses to the semantic differentials usability questions. Targeted recruitment of participants to the Field Trials resulted in recruitment of path creators and path consumers. To this end, 34 participants engaged the Field Trials overall, with 15 participants for the Prototype Trials (results reported in this section) and 19 participants for the Mobile Trials (results reported in section 5). During the Prototype Field Trials 10 of these participants took part in the Diary Study, with a further 5 providing feedback via interview.

### 4.1 Participant profile

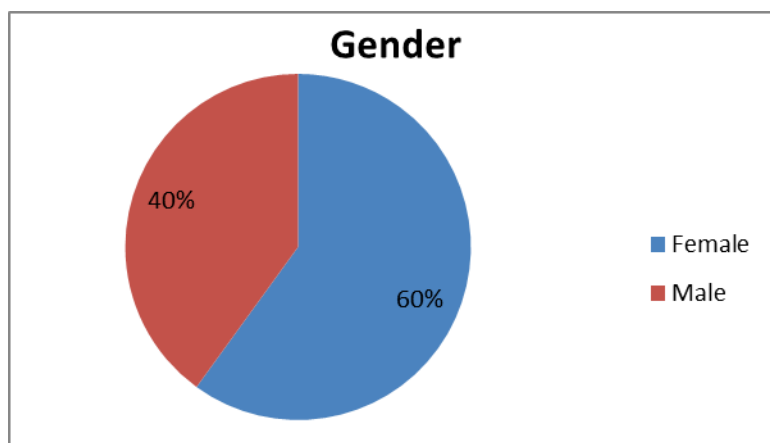


Figure 2 Gender, Prototype Trials

There were a slightly greater proportion of female participants, 60%, in the Field Trials. Participants were recruited individually by invitation and through cultural heritage and education organisations.

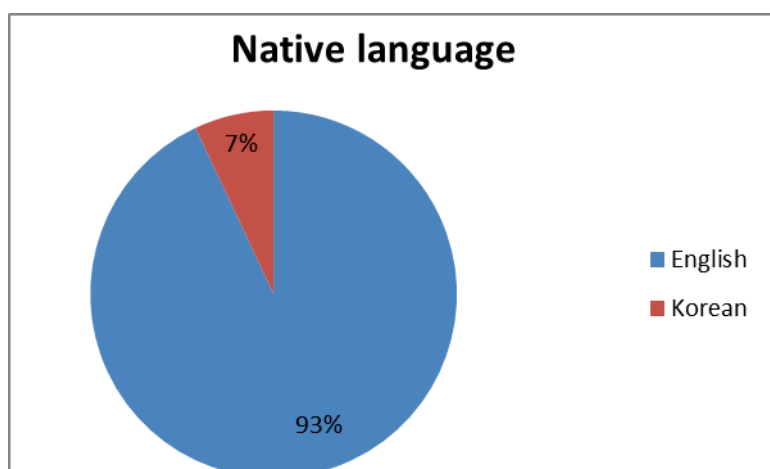
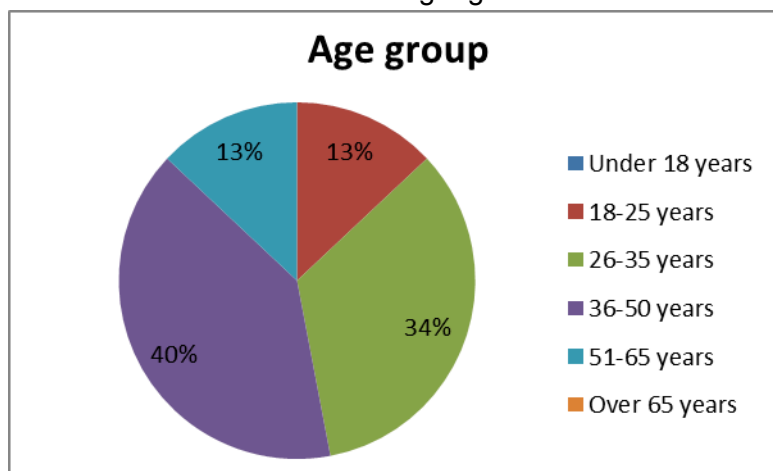


Figure 3 Native language, Prototype Trials

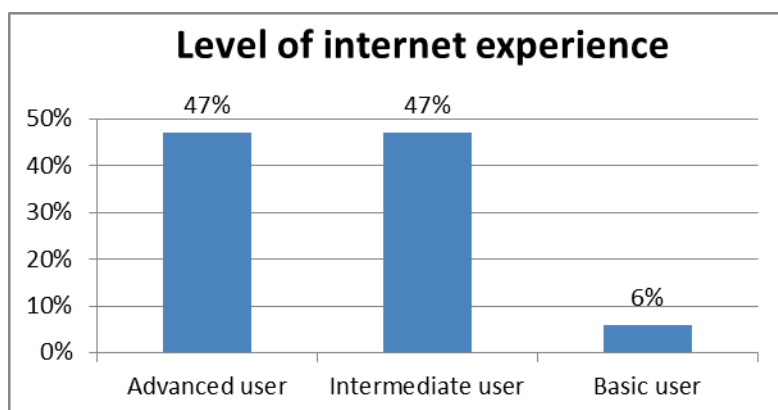


Almost all, 93%, of the sample responded that English was their native language, 1 responded that Korean was their native language.



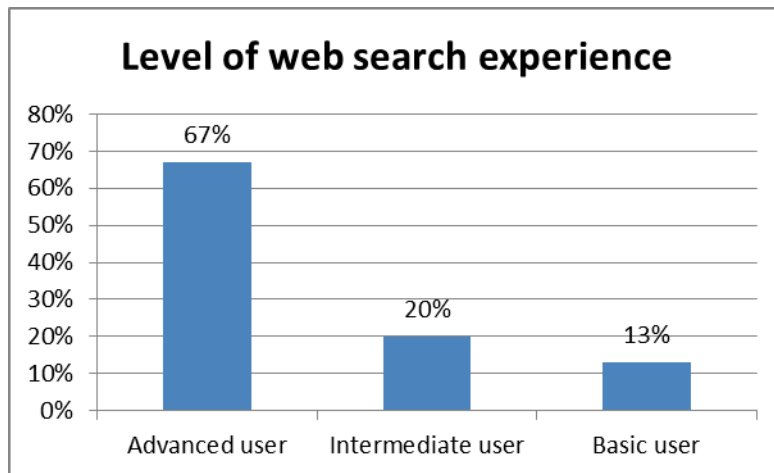
**Figure 4 Age group, Prototype Trials**

The majority, 40%, of participants were aged between 36-50 years, followed by 34% aged between 26-35 years, and 13% each for 18 and 25 years old and 51-65 years. Overall, all age groups were represented across the evaluation activities, with the exception of those over 65 years.



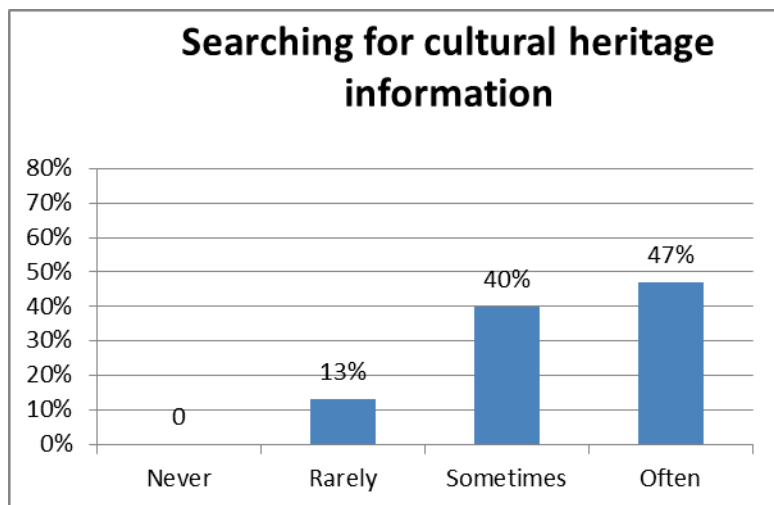
**Figure 5 Level of internet experience, Prototype Trials**

The level of Internet experience reported by participants is important as an indicator of confidence and ability in using online tools such as PATHS. A large majority of participants (94%) saw themselves as either Advanced or Intermediate in their level of Internet experience, with only a very small minority of participants identifying themselves as Basic users.



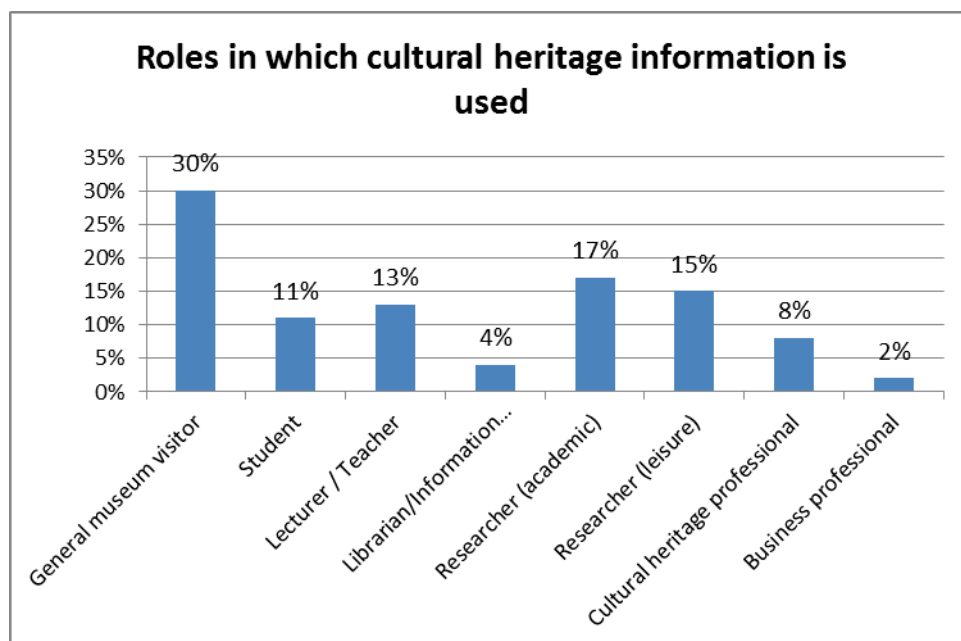
**Figure 6 Level of web search experience, Prototype Trials**

As one of the main features of PATHS is its search interface, it was also important to be aware of participants' level of searching and information retrieval experience. Participants were similarly confident about their levels of web search experience. Again, the majority of participants reported that they were Advanced or Intermediate searchers, with only 13% of participants identifying themselves as Basic users.



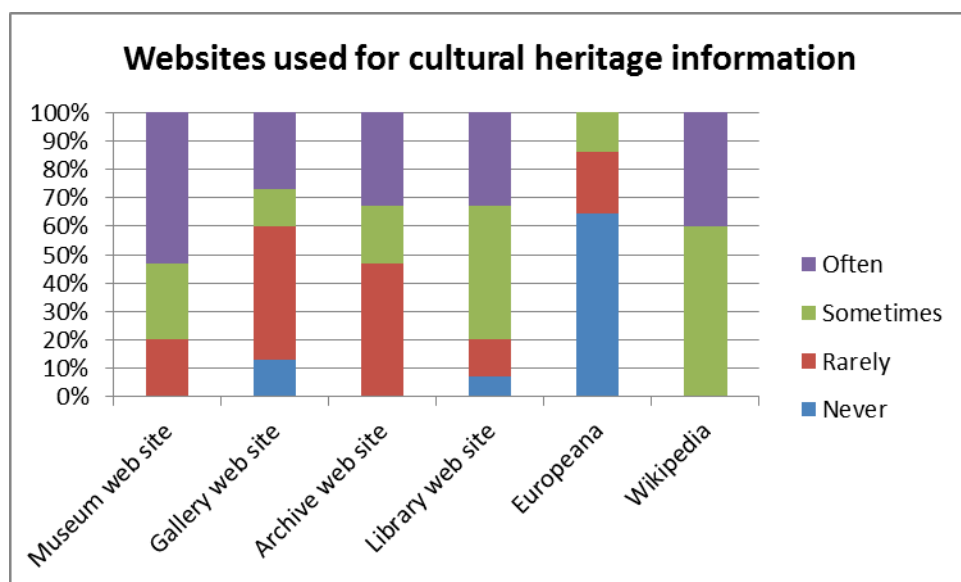
**Figure 7 Searching for cultural heritage information, Prototype Trials**

Frequency of searching for information online was very high with 47% of participants reporting that they searched for information online Often (almost every day) and 40% Sometimes. Only 13% said that they only searched online Rarely, and zero said Never.



**Figure 8 Roles in which cultural heritage information is used, Prototype Trials**

Participants use cultural heritage information in a variety of roles, most frequently as Museum Visitors at 30%. The next most popular roles were as Academic Researchers, 17%, then Leisure Researchers at 15%. Lecturers/Teachers was a role identified by 13% of the sample and 11% for Students. Note: Participants were encouraged to select all applicable options, so the overall percentage total is greater than 100%.



**Figure 9 Websites used for cultural heritage information, Prototype Trials**

Museums and Wikipedia were used extensively by many of the participants, along with library and archive websites. A number of other websites used for information on cultural heritage were identified and included:

- English Heritage NMR
- Tourism websites

- Portable Antiquities Scheme
- Archaeology Data Service x 2
- British & Irish Archaeological Bibliography
- Library of Congress
- Personal amateur pages

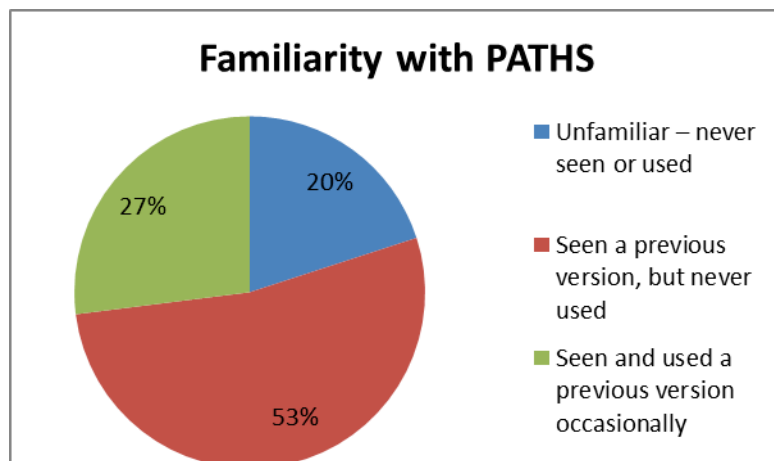
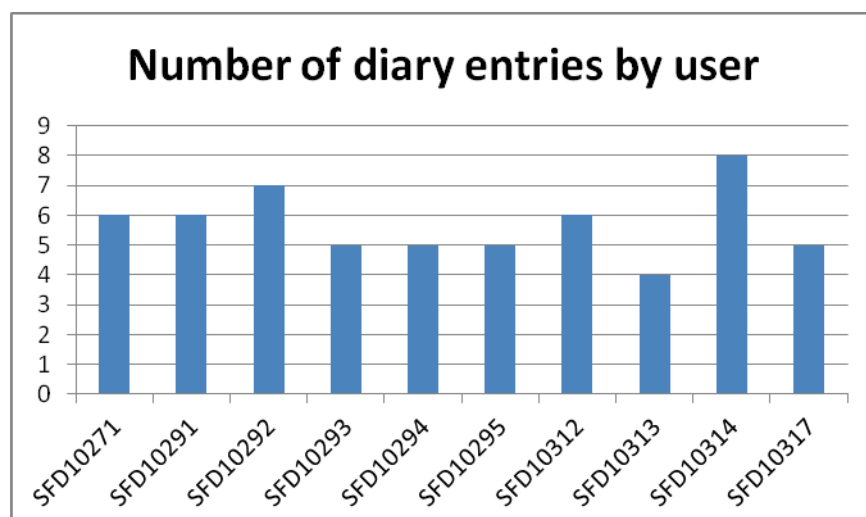


Figure 10 Familiarity with PATHS, Prototype Trials

The majority of participants had some familiarity with PATHS, 53% had seen a previous version but never used it themselves. A further 27% were familiar and had used PATHS, whilst 20% had never seen or used the system.

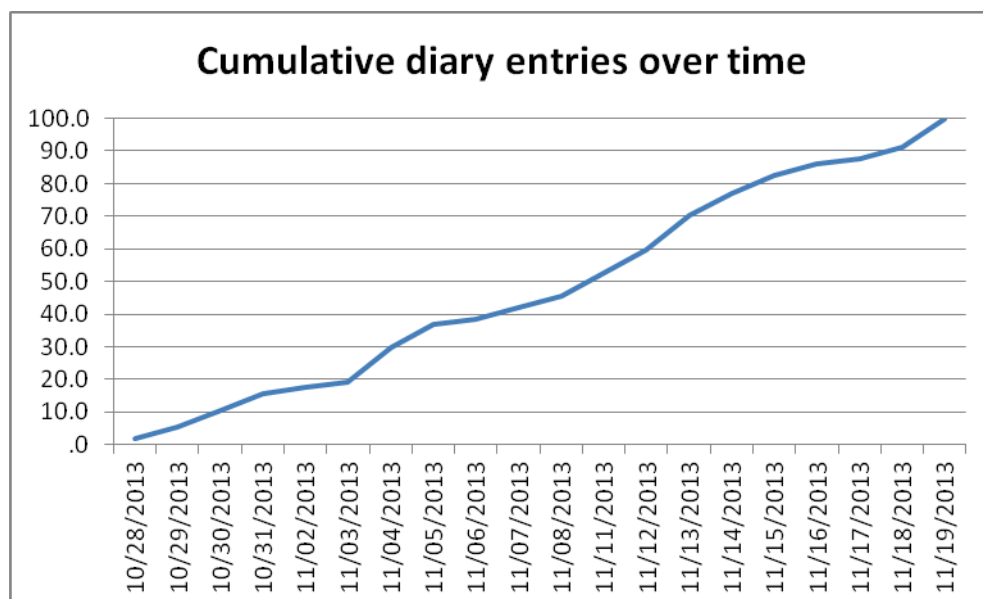
#### 4.2 Responses to the Prototype Diary Study

The diary element of the PATHS field study follows an initial briefing session, at which participants were given a brief demonstration of the PATHS system and completed the profile and introductory feedback questionnaire. Each person was invited to use PATHS over a 2-week period, and to fill in a diary questionnaire; comprising responses to quantitative and more qualitative open-ended questions, each time they used the system. Only minimal instructions were given; to use PATHS in their everyday tasks (work, study or leisure) on at least 5 occasions during the two-week period, and to create at least one path. Ten participants took part in the Diary Study, with a further 5 providing feedback via interview.



**Figure 11 Number of diary entries by participant, Prototype Trials**

A total of 57 diary entries were completed by 10 users who had also completed a profile questionnaire. All except one user completed at least 5 paths, with a minimum of 4 and a maximum of 8 sessions. The mean number of sessions is 5.7 and the median is 6 sessions.

**Figure 12 Cumulative diary entries over time, Prototype Trials**

Participants started the study at different dates within a one-week period, and the diary entries therefore span from 28<sup>th</sup> October 2013 to 19<sup>th</sup> November 2013. Due to technical problems at the start of the study, some users completed their diaries over longer than the specified 2 weeks. The accumulated diary entries show a relatively even growth over the period of the study, with no evidence of large start and end peaks.

#### 4.2.1 Technical profile

At the start of each diary entry participants were asked to provide details of their technical profile for that individual session, allowing us to review user experience and difficulties according to the computer type, operating system, browser and network connectivity. For the majority of sessions, users indicated they were using the same equipment, with only 18% of sessions using a different setup to the previous session. These instances of using different computer equipment were split over 6 of the 10 diary participants, and the instances of using different network connections were attributed to 3 out of 10 users, indicating that it may be fairly common for users to switch between two or more types of equipment over time.

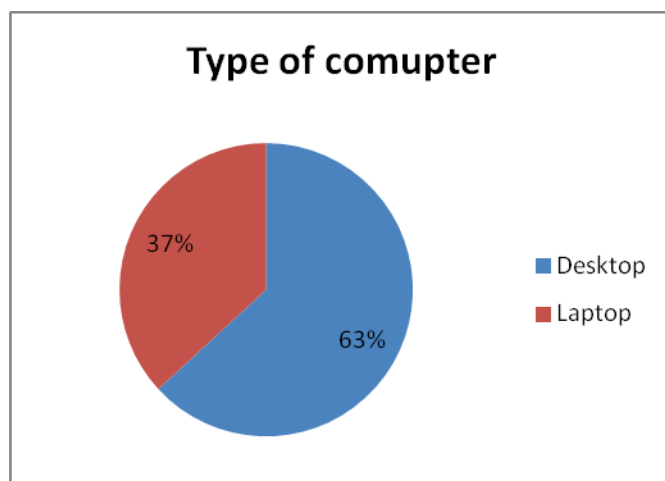


Figure 13 Type of computer used for diary sessions, Prototype Trials

Most sessions were completed using a desktop PC (63%), with 37% completed on a laptop. The main indication here is on screen size, as in general PCs have larger screen sizes than laptops. In the PATHS system, smaller screen sizes require additional scrolling, particularly with regard to item records, path overviews, search results and the path creation workspace, which may impact on the user experience. In addition, 95% of sessions were undertaken using a Microsoft Windows operating system, with remainder by one participant using Chrome OS for 3 sessions. None of the sessions were completed using a Mac computer setup.

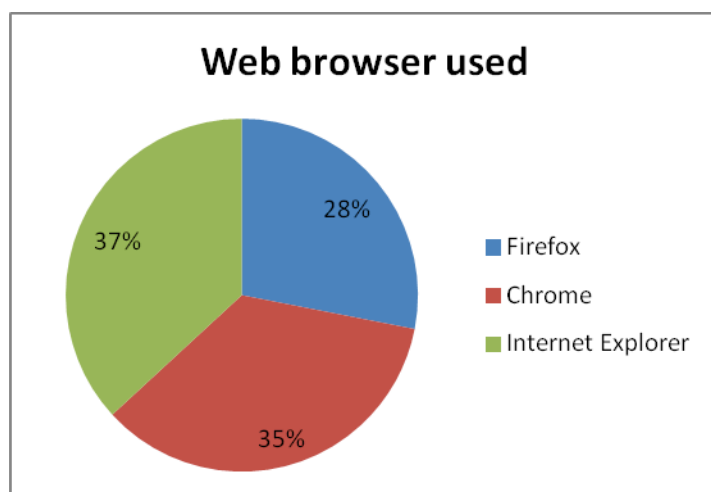
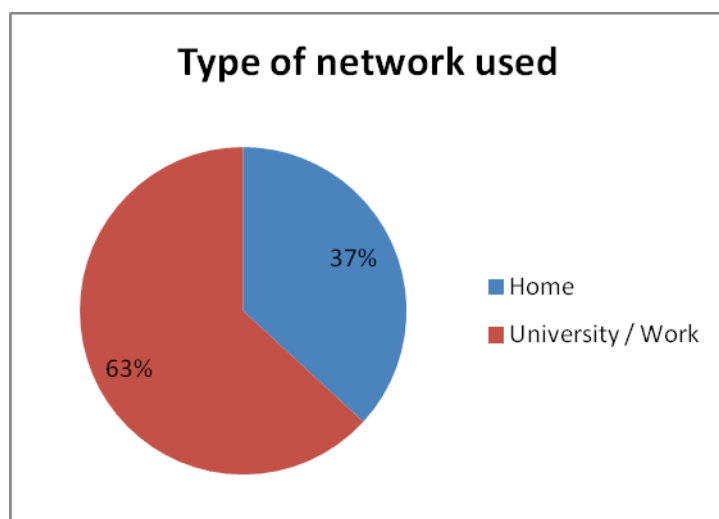


Figure 14 Web browser used for diary sessions, Prototype Trials

According to the type of web browser used, sessions were split between Internet Explorer (37%), Google Chrome (35%) and Firefox (28%). The PATHS system had been tested and optimised primarily for Chrome and Firefox, and it may therefore be useful to review user difficulties by type of browser, given the significant proportion of IE sessions.

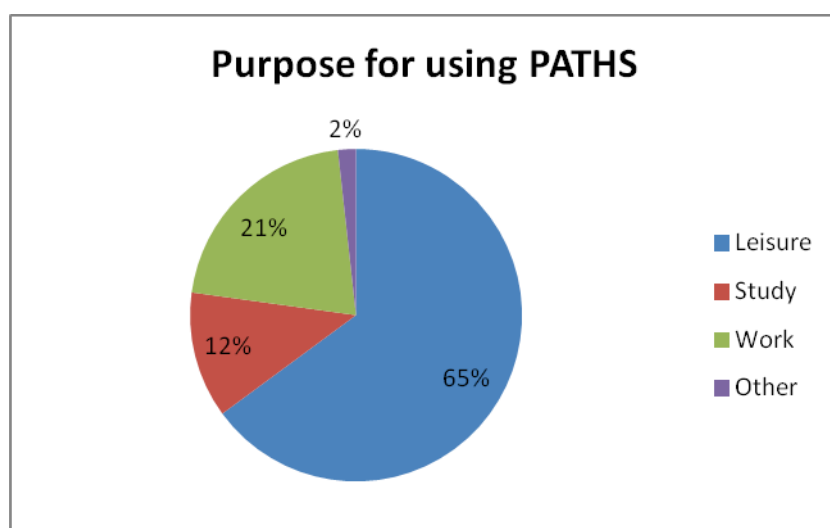


**Figure 15 Type of network used for diary sessions, Prototype Trials**

Network connectivity can potentially dramatically affect the performance of any system, including PATHS, with differences in experience related to speed and continuity of the connection. The majority of these sessions were completed via a high-speed university or work network (63%), with only 37% completed via a home network. In addition, 60% of sessions were completed using a cabled connection, 25% over a Wi-Fi connection, and 15% where the connection type was not known. None of the sessions were completed over a mobile network.

#### 4.2.2 Diary responses – quantitative

Participants were asked a series of quantitative questions, with responses selected from a pre-defined list. These questions provide structured information about the participants' goals, activities and overall experience.



**Figure 16 Purpose for using PATHS during diary sessions, Prototype Trials**

The majority of sessions (65%) were completed primarily for leisure purposes, with a much smaller proportion for study (12%) and work purposes (21%). Despite the imbalance between the three categories, these should nevertheless give a reasonable indication of the type of activity undertaken in each area.

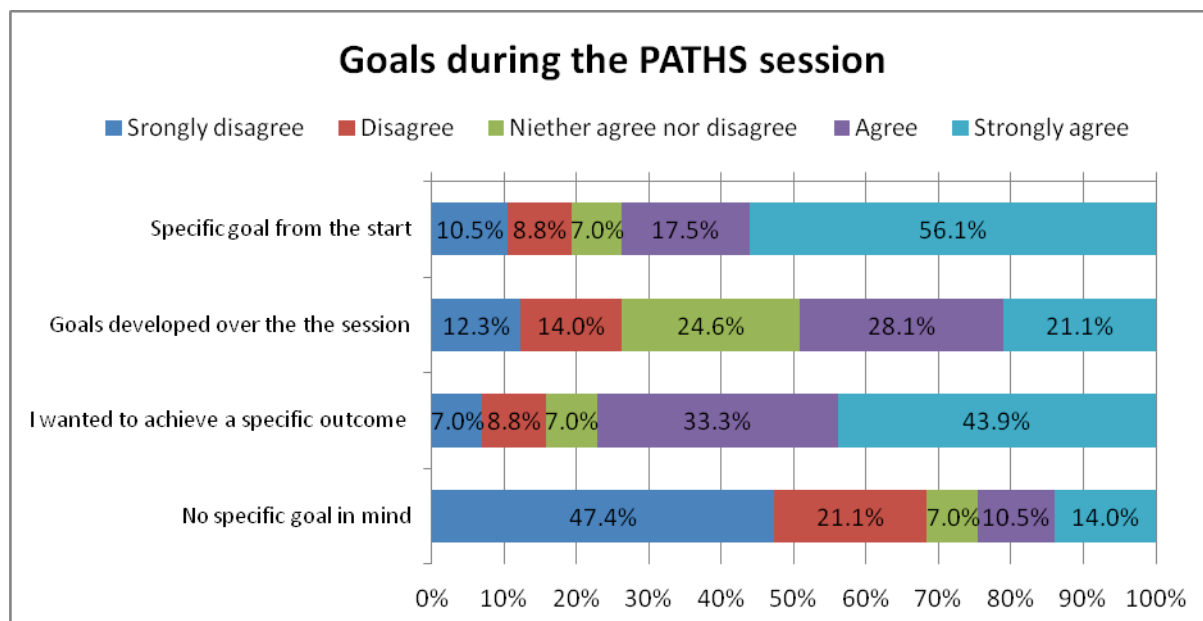


Figure 17 Goals of users during the diary sessions, Prototype Trials

Overall, most sessions (74% strongly agree or agree) were completed with a specific goal or information need in mind from the outset, and a broadly corresponding number (77%) wanted to achieve a specific outcome from the session, whilst in only 25% of sessions (strongly agree or agree) users were just looking around, with no specific goal in mind. Active engagement with the task can be seen in that during 49% of sessions (strongly agree/agree) participants found their goals or information needs developed further during the course of the session.

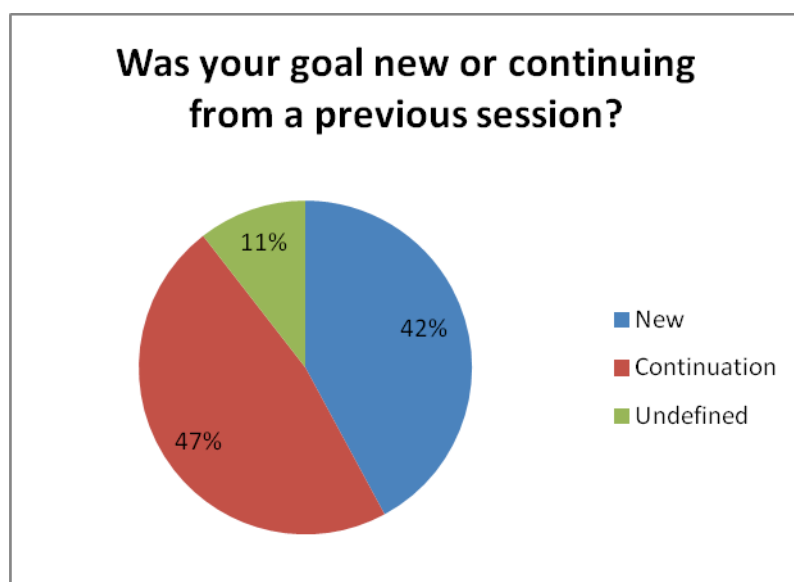


Figure 18 Occurrence of new and continuing goals during the diary sessions, Prototype Trials

The split between sessions with a new goal and those where the goal was continuing from a previous session is fairly evenly split at 42% and 47% respectively, with only 11% of sessions where the goal is undefined. This is a useful indicator on the nature of task completion in a more complex system like PATHS, in that many tasks are apparently completed over multiple sessions, and additional insight into the progression of tasks over time can be gained from the responses to the qualitative questions in section 4.2.3.



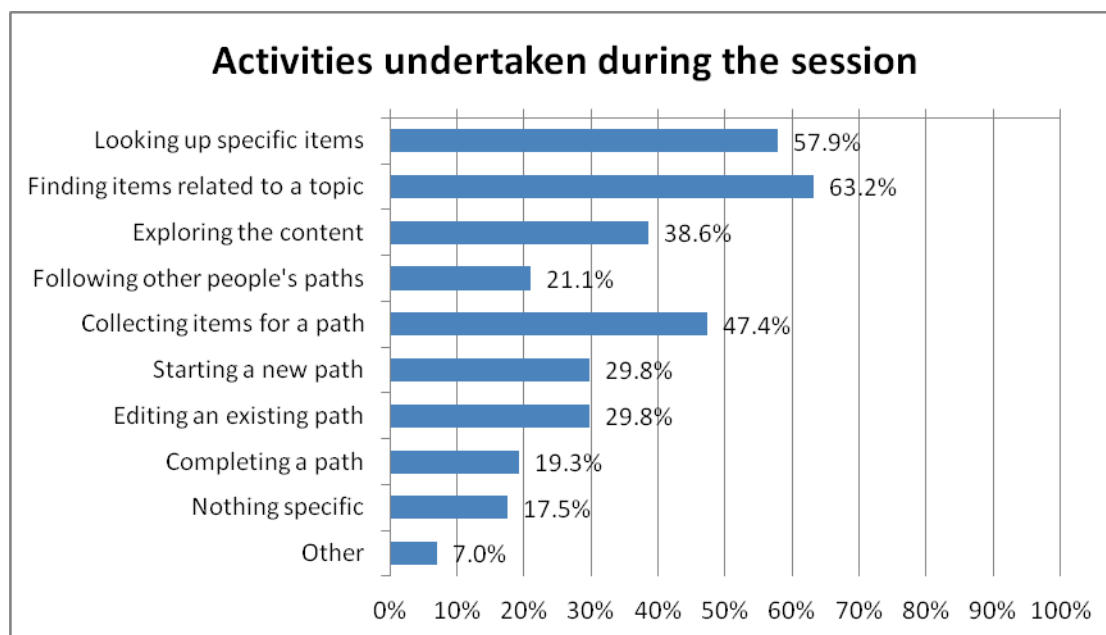


Figure 19 Activities undertaken in PATHS during the diary sessions, Prototype Trials

The most frequent activities reported are finding items relating to a topic (63% of sessions) and looking up specific items (or known item searching) (58%). Collecting items for a path (47%) is also common and relates to the two previous activities, as well as to exploring the content (39%). Given that participants were asked to make at least one path, it is not surprising that these activities occur frequently. Other activities relating to creating a path (starting, editing, completing) are less frequent, indicating that a path is created over several sessions, rather than during a single session.

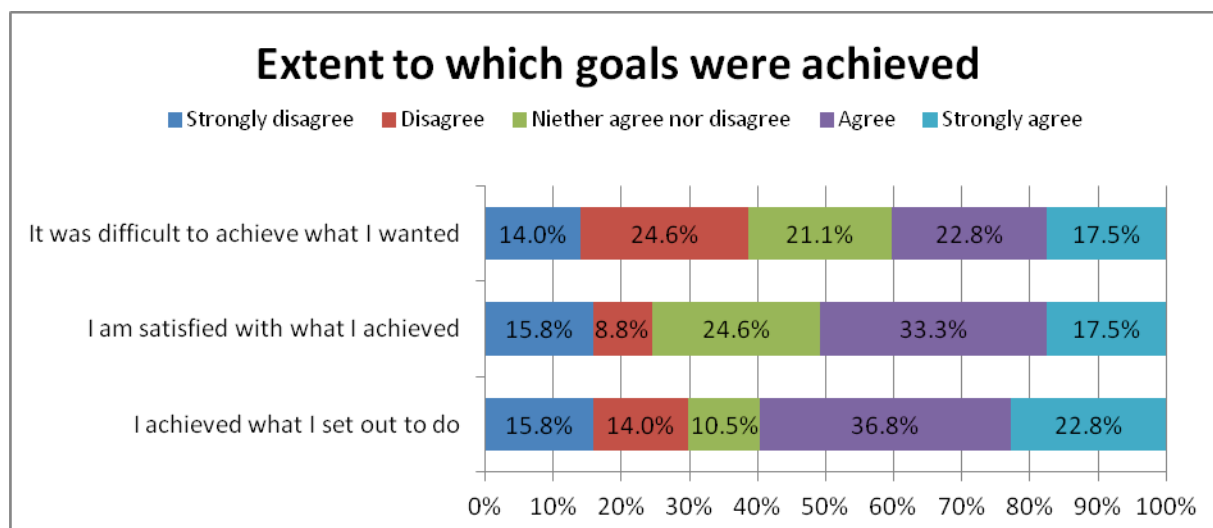


Figure 20 Extent to which goals were achieved during the diary sessions, Prototype Trials

Overall, participants achieved what they set out to do in a majority of user sessions (60% strongly agree or agree) and were satisfied with what they achieved (51%). There is a higher neutral response for satisfaction (25%) than for achievement (11%), but a lower negative response (disagree, strongly disagree) for satisfaction (25%), than achievement (30%). In 40% of sessions (strongly agree, agree), users found it difficult to achieve what they wanted.



word cloud, the nuances of the goal and task can be seen more clearly. It is evident that there is a stronger focus on 'images' than on 'information', which matches the indications from the research literature that cultural heritage information seeking has a strong visual element. More specific information seeking goals can be seen in terms such as 'find', 'look(ing)', 'search', 'browsing', 'explore', and 'collected'. More specific to the creating a path task (following on from collecting content for the path) are terms such as 'create(d)', 'make', 'build', 'develop', 'workspace' and 'use(d)'. Cognitive processes are evidenced by terms such as 'try(ing)', 'thought', 'check', 'sure', 'interest', and temporal aspects of the task can be seen in 'today', 'start', 'time', 'previous(ly)', 'prior', 'month', 'first', 'later', 'new' and 'update'.

Looking at the full text responses in more detail, the goals can be categorised into several main types, with verbatim examples given below:

Goal	Comment	Example
Collecting items on a topic	As a precursor to making a path	"I wanted to look up information and images regarding the history of the docklands in London"
Starting a new path	The topic is often identified	"Creating a path to hypothetically use in an English secondary school lesson on War Poetry for year 9"
Continuing with a previous path	Occurs more frequently than starting a new path, indicating multiple sessions per path	"The main goal was to put the items i had collected in to some sort of narrative."
Browsing and exploring the collection	To see what is there and generate ideas	"The main goal for this session was not defined. I was just searching for different topics"
Browsing and exploring existing paths	To see what others have created	"I was just browsing. I intended to follow a path - the arts and crafts movement"
System familiarisation	Early stages of the study, usually once only	"I decided to investigate the thesaurus tagging system"
Recovering from technical problems	Re-doing previous work	"I wanted to check if the path I had made (and thought lost) was still there - and then put more items onto it."

Figure 23 Summary of responses to open-ended question on user goals, Prototype Trials

**Q: Describe what steps you took to achieve this. [For example, WHAT you looked for, WHAT you did to find it, WHAT you selected and WHY, HOW you used it, etc...]**

Following the previous question about overall goals, we asked the users to explain in detail how they used PATHS to try to achieve this.



User 3

“I typed very vague words into the engine: war, then world war 2, then military uniform. The last search yielded the most hits. lot and lots from WW1 so I've opened up the search from mid-20th to the first half of the 20th century, and good quality photo or a unique one I just added to the workbook to go through later.”

**Figure 25 Examples of detailed steps of taking different approaches to finding content for their paths, Prototype Trials**

Examples of the detailed steps taken by three users taking different approaches to their paths are given below:

User A

“Saved a selection of posters to my workspace and created the path; edited text node box and was a little confused that when saved it didn't automatically close. I saved it a couple of times without needing to because I assumed that it would automatically close when saved.

Found the drag and drop method of creating paths really intuitive and useful, although it's occasionally imprecise. Much faster loading and reaction time than previously, but the scroll bar on the right of the workspace was incredibly slow and difficult to manipulate.”

User B

“After collecting the images I started to build the path- starting with a text node - but I found that I wanted an image in this (not possible) to start the path.

I did an introductory text first as a text node then moved it to the description of the path when I realised this was possible, leaving an image as the first node.

I then made three groupings for the items and began to place the images in the path one by one (it would have been helpful to be able to multiple add).

I then added the date of construction of each bridge into the text for each item.

Then I previewed the path to make sure it was okay, added some extra images to some of the items.”

User C

“I wandered around a bit. The Edit Path Metadata isn't obvious as a way to start, and the process didn't seem intuitive. I seem to have forgotten a lot of what I learned from the session months ago. It would be nice to have a help button.

So far, I used the text path box because that was available on the screen and easy to use. I wanted to use some images from the internet, but couldn't remember how to load them”

**Figure 26 Examples of detailed steps of taking different approaches to finding content for their paths, Prototype Trials**

It is evident from the level of detail provided that these users are actively engaged with the task and the system. Others were less detailed and specific. The process indicated by the PATHS user model – develop a Concept, Collect items, Create a path – seems to be followed by a majority of users, and this may be due to the interaction design and the way that it flows through this process. There are however some attempts at using PATHS in the context of other web-based tools (e.g. Google and Wikipedia) is also seen, and there is perhaps a need to look at whether these should be more closely integrated.



Type of Difficulty	Examples
Technical	<ul style="list-style-type: none"> <li>• Slow running</li> <li>• Paths disappearing from the workspace</li> <li>• Unable to rename a path (in path metadata dialog)</li> <li>• Missing node edit buttons in the path workspace</li> <li>• Text formatting in path nodes not displayed in the final path</li> <li>• Error messages when accessing content</li> <li>• Persistent prompting to allow for cookies in the same session</li> <li>• Not able to login – this may be a browser issue</li> <li>• Incorrect display of Share/Add to Workspace buttons, and path following buttons</li> <li>• Unable to get from a Thesaurus topic to the Items list – this should load automatically when you reach the lowest topic level</li> <li>• Problems with loading and viewing the map</li> </ul>

Figure 28 Summary of difficulties encountered by type, Prototype Trials

**Q: Please give any other comments about your experience of using PATHS today**

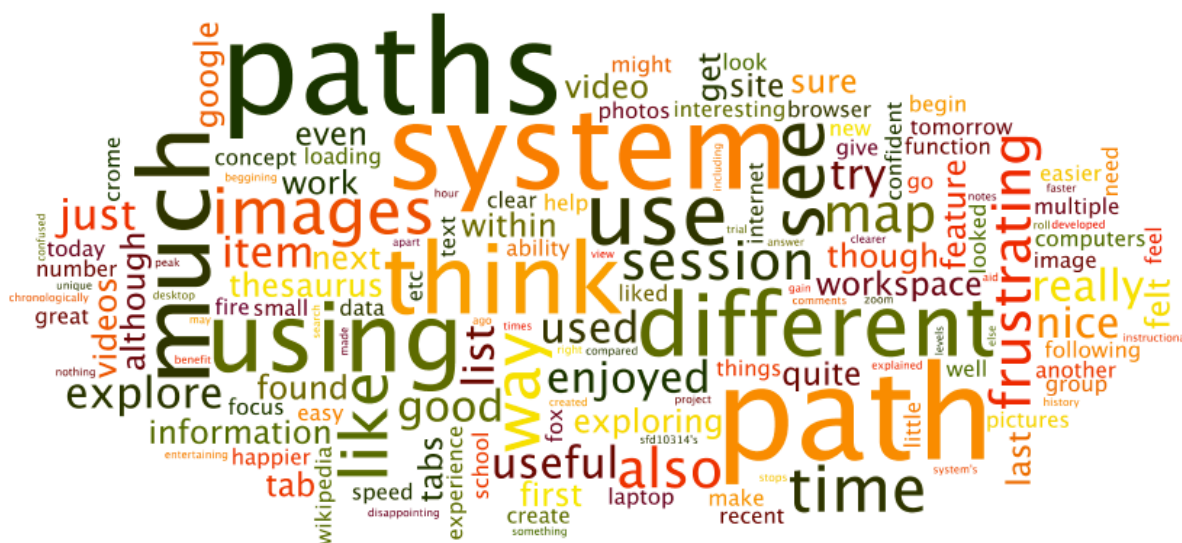


Figure 29 Word cloud of the responses to the open-ended question on other comments, Prototype Trials

This optional question gained 44 responses from the 57 user sessions, equivalent to a 77% response rate. As can be seen from the word cloud, there is a mix of positive and negative responses. A summary of the main types of comment with verbatim examples is given below:

Type of comment	Examples
Re-emphasis of difficulties	<p>“Frustrated - will start again tomorrow”</p> <p>“Disappointing that that tag wouldn't load”</p>

Type of comment	Examples
	<p>“Next time, I might need to try with different computers with different Internet access points such as chrome or firefox.”</p>
<p>Suggestions for improvement</p>	<p>“I wish the pictures were bigger! I think the strength of paths is the visual element, but the images are too small.”</p> <p>“I think the system could do more to aid the user in exploring Paths. It's quite noticeable that whilst there are several ways to explore the collection's content (Thesaurus, Map, Tabs etc), the list of Paths is just that - a list. It is not clear how the list is ordered”</p> <p>“My other comment relates to the Paths themselves. I can see the benefit of being able to create paths that split into multiple levels. There are some great example of users who've used this to distinguish different themes etc within the Path. In practice though I found myself jumping around quite a lot. I felt like I wanted some better visualisation of where I was within the Path”</p> <p>“it would be nice to see pictures from URLs in the nodes.”</p>
<p>Help requirements</p>	<p>“It would be nice to have a written step-by-step tutorial in addition to the video. I get impatient with instructional videos, since I want to get a specific answer. An indexed help box would be nice.”</p> <p>“I'd still like a spell checker!”</p>
<p>Positive experiences</p>	<p>“Hurrah, I can build a path!”</p> <p>“the site was up to full speed, it was just an hour or so on an image collecting mission”</p> <p>“The most entertaining and informative session I have had so far. I enjoyed finding out about the history of the city in which I live.”</p>

Figure 30 Summary of the responses to other comments, Prototype Trials

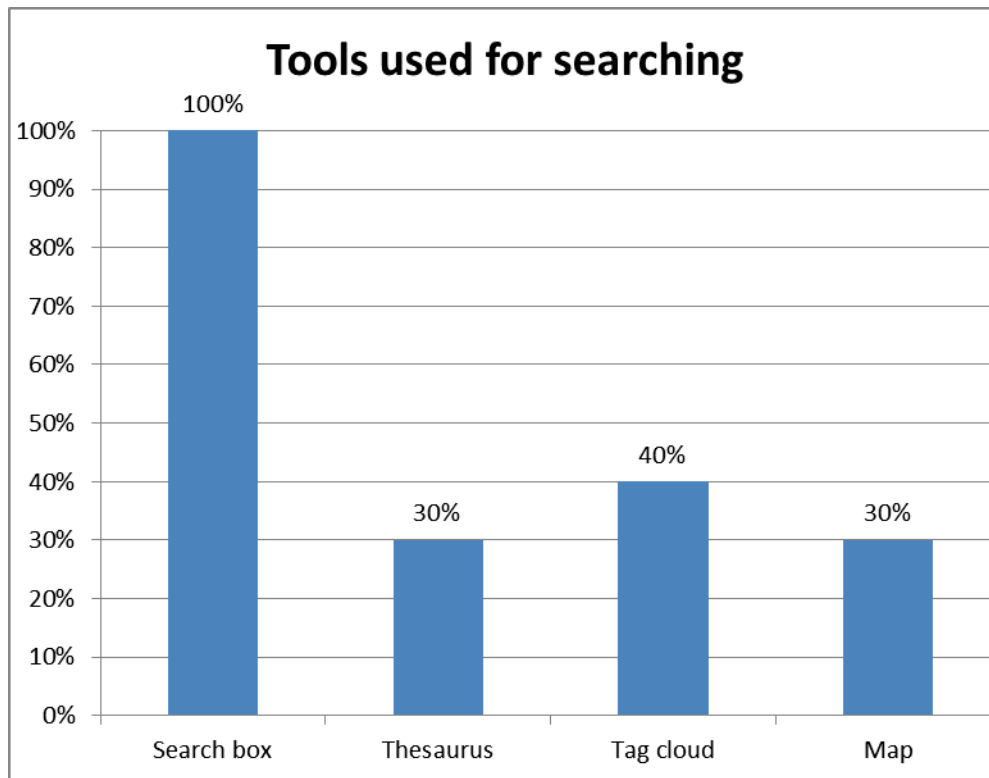
### 4.3 Responses to the Prototype Final Questionnaire

#### 4.3.1 Exploring and Searching Content

In the Final Questionnaire, which participants completed after the field trial, several questions were asked about the tools supplied for searching and exploring content.

*During the last two weeks, which tools have you used to search for and explore the content available in PATHS?*

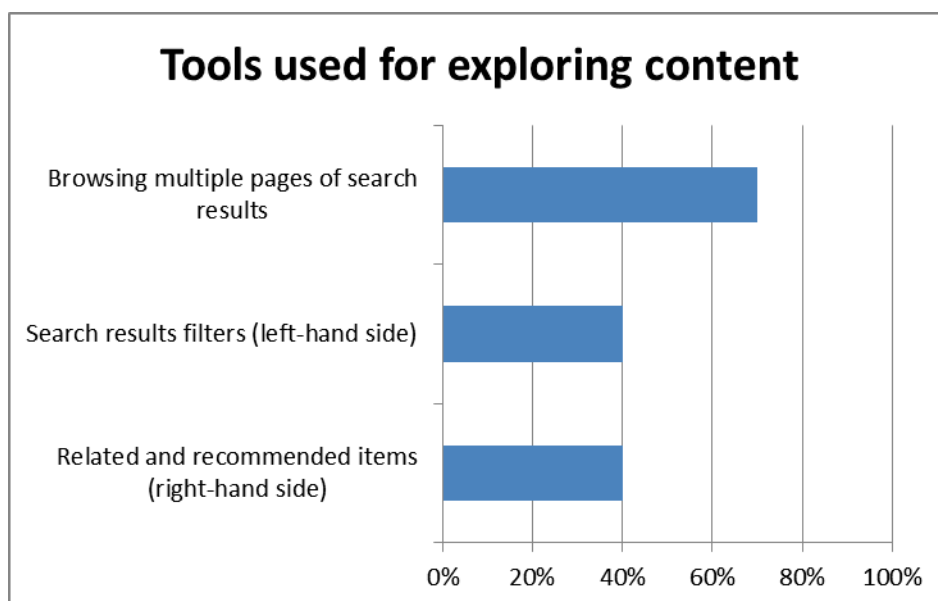




**Figure 31 Tools used to search for and explore content, Prototype Trials**

All the trial participants used the 'Search box' to find content. After the search box, it appears that the 'Tag cloud' was the next most popular method for searching for content whilst the 'Thesaurus' and the 'Map' were slightly less popular search options.

For exploring content, 70% of the users browsed the search results, and half this number used the other methods equally, i.e. 'Related and recommended items' and the 'Search results filters'.



**Figure 32 Tools used for exploring content, Prototype Trials**

The Other methods used were:

- it only allows me three options but I have used all of the above plus paths made by other users
- ALSO Map, Thesaurus and Tag Cloud (system only lets me select 3 options!)

For each of the tools, users were asked to rate three aspects:

- How easy the tool was to use
- How useful the tool was
- How inventive the tool was

The results are presented by the three aspects in order for comparisons to be made between the tools.

#### 4.3.1.1 Exploring and Searching Content - Ease of Use

The 'Search box' was rated as very easy and easy by 80% of the users with only 10% rating this as 'complicated'. The Thesaurus and the Related and recommended items likewise did not present any problems for users, although these were the least used tools.

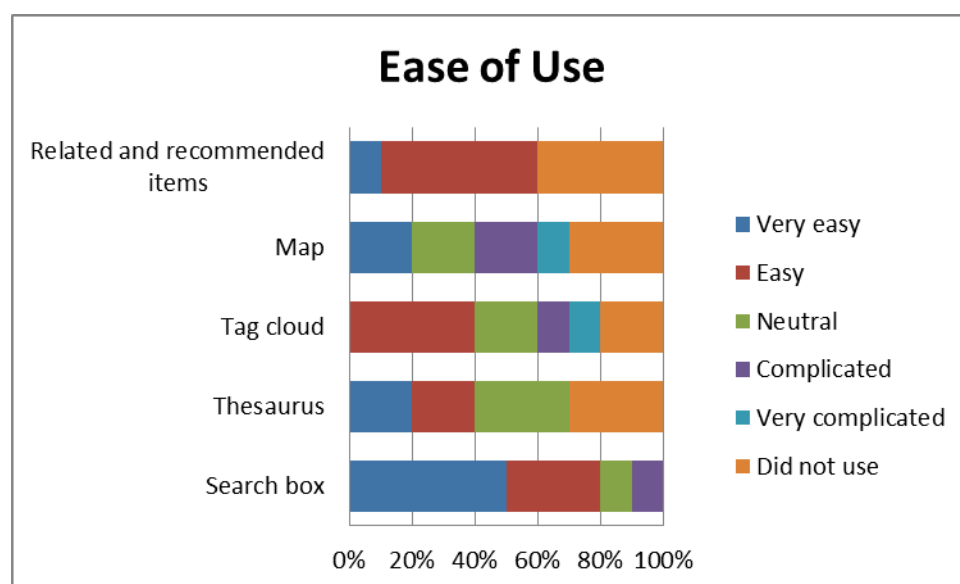


Figure 33 Exploring and Searching Content - Ease of Use, Prototype Trials

The Tag Cloud, however, presented more of a challenge – there were no 'Very easy' ratings although four people found it 'Easy' and a further two were Neutral. However, two people rated the Tag Cloud as 'Complicated' and another as 'Very complicated'. The Map also produced a wide range of ratings (from two 'Very easy' to one 'Very complicated'). Whilst the mixed ratings for the Tag Cloud might be expected (this is a relatively new approach), the ratings for the map are more surprising as these to range from 'Very Easy' to 'Very Complicated' in equal measure.

#### 4.3.1.2 Exploring and Searching Content - Tool Usefulness

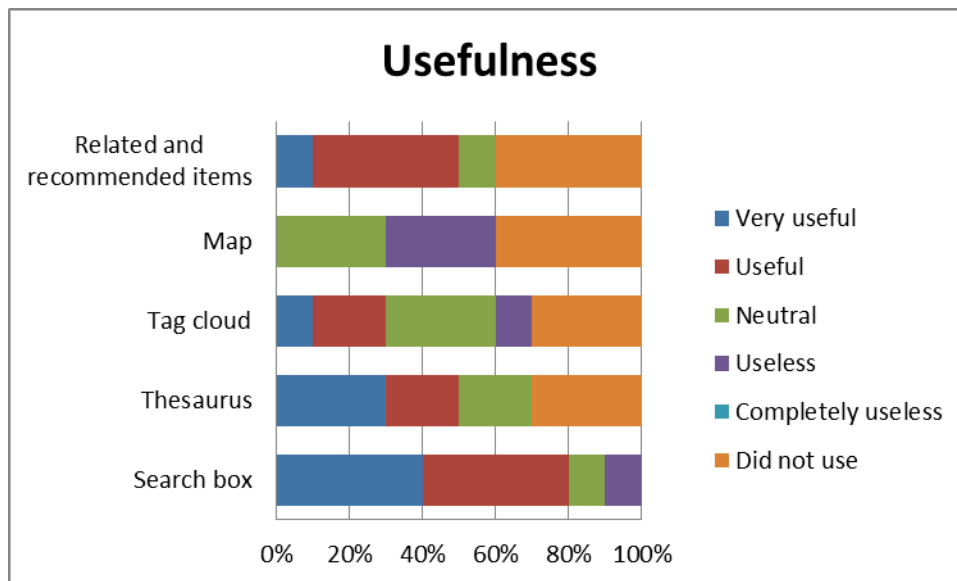


Figure 34 Exploring and Searching Content - Tool Usefulness, Prototype Trials

The 'Search Box' was rated the most useful (80%) with 10% rating it as 'Useless' (at odds with the majority). The 'Thesaurus' and the 'Related and recommended items' were the next most useful tools. The 'Tag cloud' produced a mixed reaction, from one 'Very useful' to one 'Useless' whilst the 'Map' fared badly – the best ratings were 'Neutral' with three people rating the Map as 'Useless'.

#### 4.3.1.3 Exploring and Searching Content - Inventiveness

The ratings for inventiveness are not quite what might be expected. Given that the 'Search box' is a ubiquitous tool and the 'Tag cloud' is much more unusual and that the participants appeared to have problems with the Map, it is the Map that gets two 'Very Inventive' ratings whilst the Tag Cloud gets none. When 'Very inventive' and 'Inventive' are considered together, the Thesaurus rates slightly higher than the Map and Tag cloud. Overall, the 'Search Box' and 'Related and recommended items' have the most 'Conventional' ratings with the latter being the only tool with 'Very conventional' (two people) which is in line with expectations.

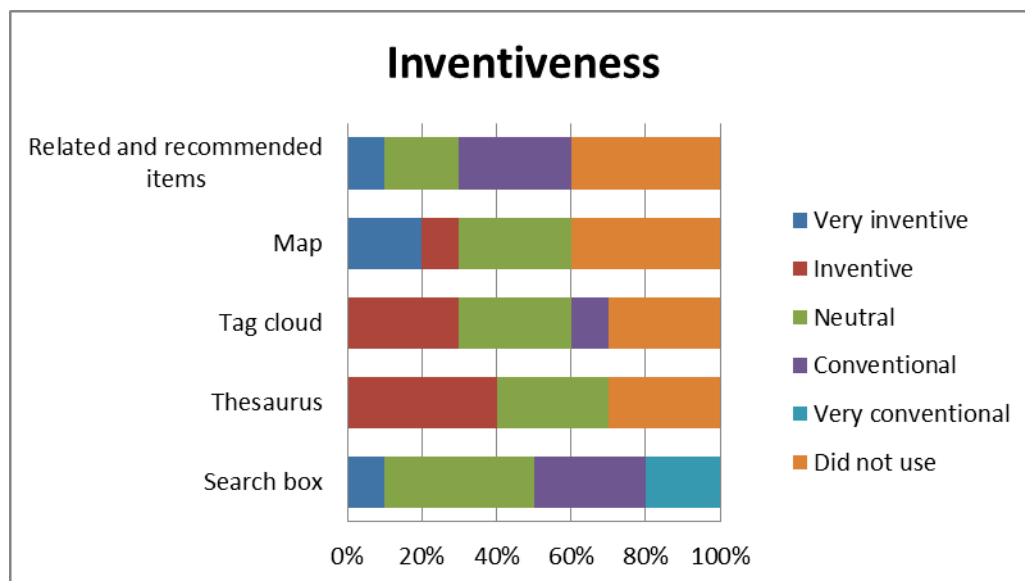


Figure 35 Exploring and Searching Content - Inventiveness, Prototype Trials

#### 4.3.1.4 Exploring and Searching Content - Exploration Tools Preference

The participants were asked: “Which search and exploration tools did you most prefer? [SELECT THREE ONLY - Rank 1st, 2nd, 3rd]”.

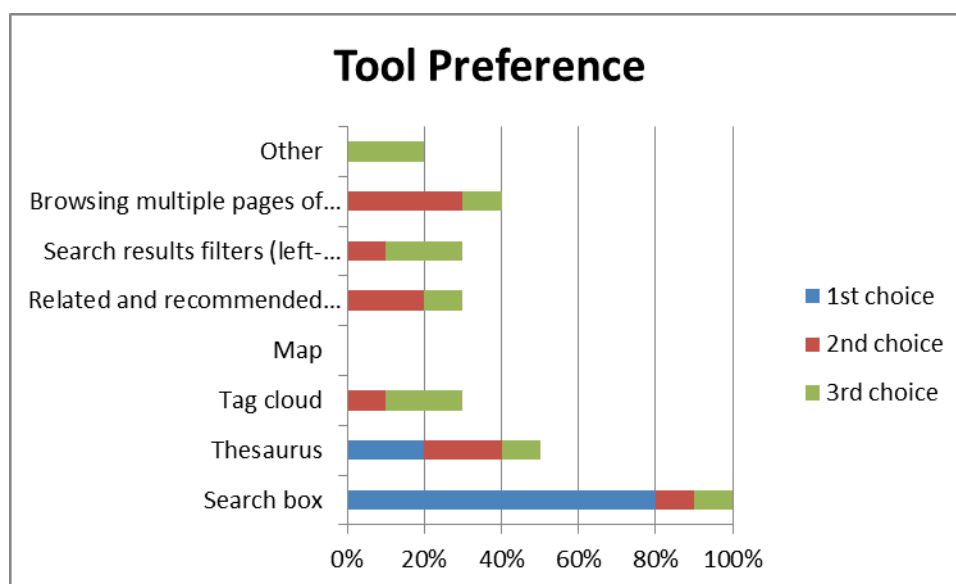
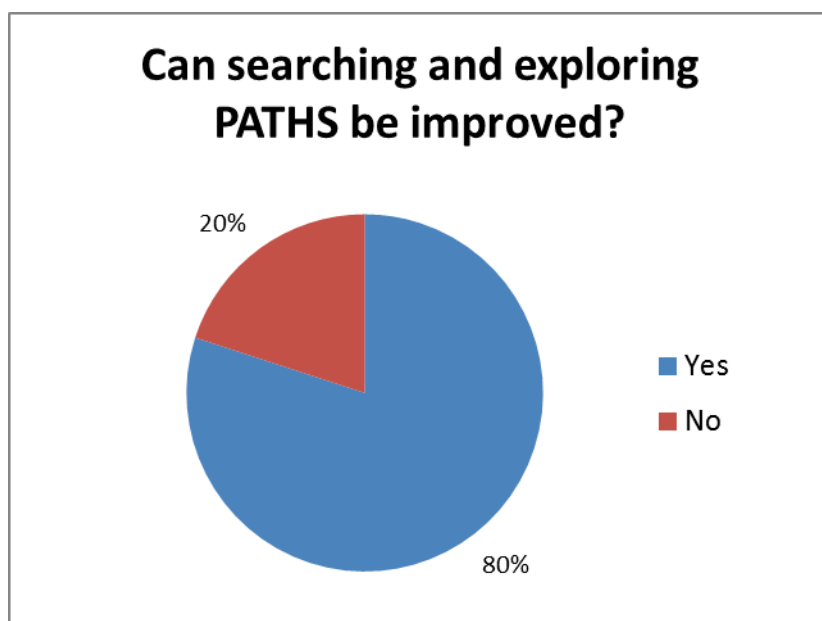


Figure 36 Exploring and Searching Content - Exploration Tools Preference, Prototype Trials

The ‘Search box’ was by far the most popular first choice of tool (80%) and was chosen as one of the top three tools by all the participants. The Thesaurus was the second most popular first choice and also second most popular tool overall, closely followed by ‘Browsing multiple pages of search results’. The other methods were chosen as second or third choices with the exception of the map which did not feature at all. There were two ‘Other’ third choices, these presumably being the Workspace and Paths created by other users.

The final question for Exploring and Searching for content was “Could we improve searching and exploring content in PATHS?” Most participants thought it could be improved.



**Figure 37 Can Exploring and Searching be improved, Prototype Trials**

Suggestions for improvement included:

- Software is very 'clunky' and not at all intuitive
- It is slow to respond
- Sometimes difficult to read all of what comes up - there is often a layout problem - too much extraneous material left on the screen so the display area usable is quite small
- I could not search for the category name
- Somehow or other my searches kept getting refined, and I don't know why
- Needs more content
- Needs better metadata. It was hard to find and judge relevance
- Show more of the paths. It was a tiny window and at times I wanted to see more of the path
- Some topics are not available and others have very limited information
- Making the map clickable x 2
- Using a controlled vocabulary for tags as many seemed very subjective
- Removing paths with missing links
- Ranking and coverage of search results could be better
- Add user generated tags etc.
- Spell checking system might useful
- I think key words and tags could be more comprehensive. The search I was doing was predominately VADS and the had only one key word to click on for all of them, so it was hard to surf away from that archive

These comments are very varied and indicate that there are still several issues to be addressed not just with the tools but with the system operation, presentation and the content. The most common issues appear to be related to the metadata, which needs to be improved at the source and is outside the scope of this project, and the functionality of the Map tool.

#### **4.3.2 Finding and Following Paths**

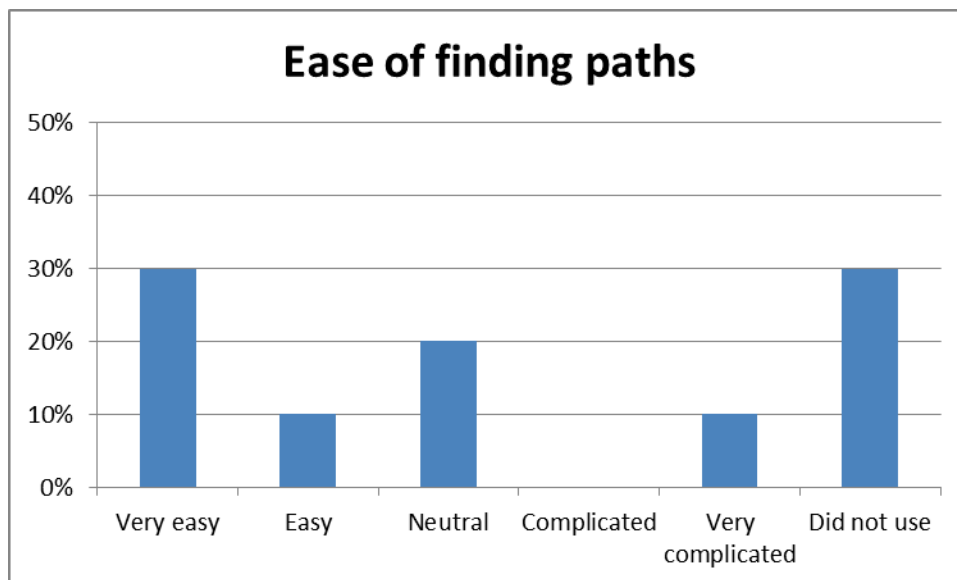
Participants were asked “*Did you attempt to find and follow other people’s paths during the last two weeks?*” 70% of participants responded ‘Yes’.

Those who replied 'No' were asked: "*Please comment on why you did not attempt to find and follow paths*". Three people made comments:

1. I've looked at other people's paths before, I'm more interested in discovering things in the collections myself.
2. Didn't find any that were relevant to what I was researching.
3. I was too busy trying to create my own for myself to worry about other people's.

These are all valid reasons and not directly related to the Paths application (lack of relevant paths is to be expected with a prototype with limited content).

The participants were asked about their experience in finding and following paths using the same ratings as for the previous section.



**Figure 38 Ease of finding paths, Prototype Trials**

The majority of participants responded Finding paths 'Very easy' or 'Easy', 20% were neutral and 10% reported finding paths as 'very complicated'.

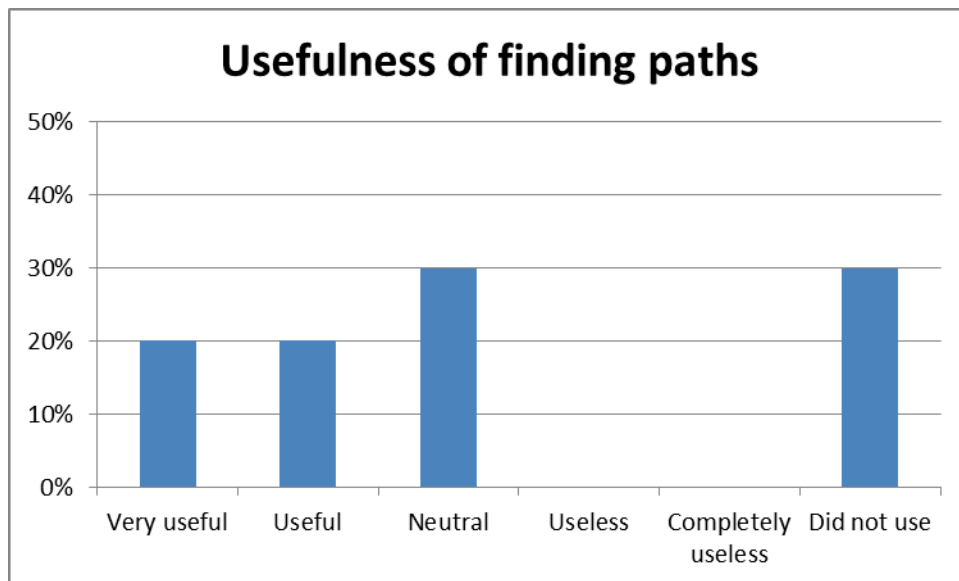


Figure 39 Usefulness of finding paths, Prototype Trials

The ratings range from 'Very useful' to 'Neutral' so there were no problems with the usefulness of finding paths.

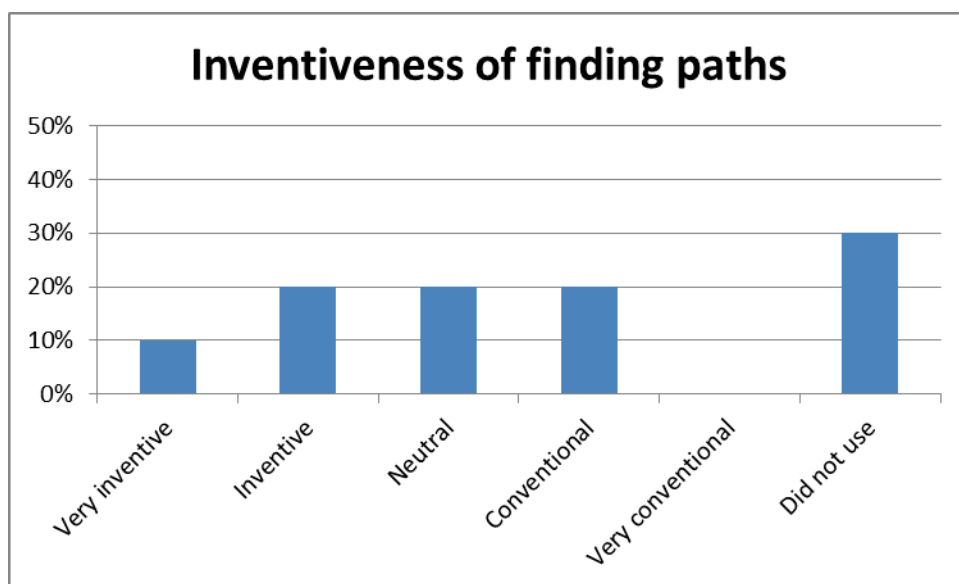


Figure 40 Inventiveness of finding paths, Prototype Trials

The responses on the Inventiveness vary more or less evenly across the respondents from 10% for 'Very inventive' to 20% for 'Conventional'; there is no consensus here.

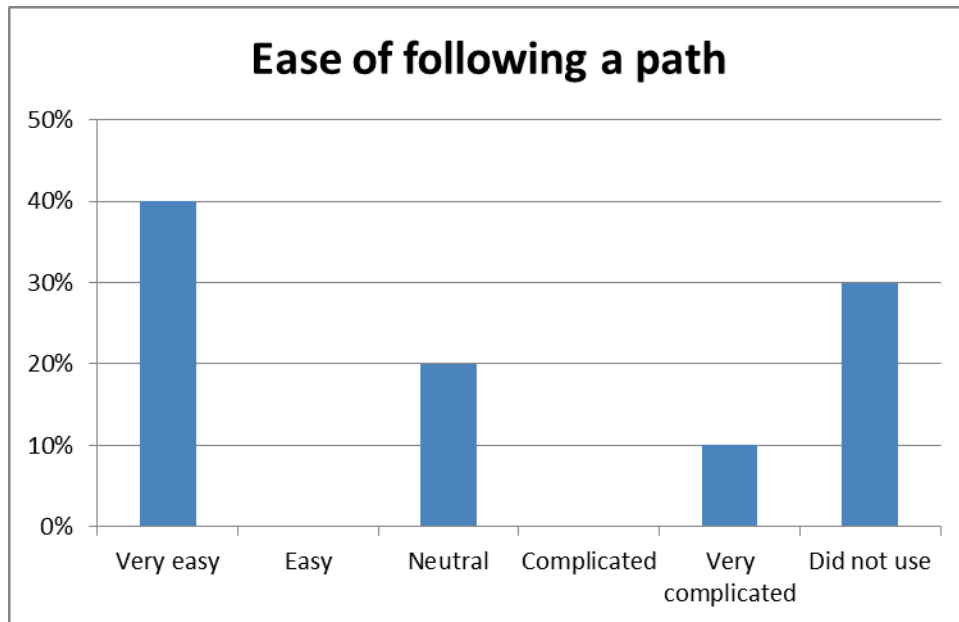


Figure 41 Ease of following a path, Prototype Trials

40% of people found following a path 'Very easy', 20% were neutral and 10% found it 'Very complicated'. It is not clear why there is this one extreme viewpoint as there is no corresponding explanation in the suggestions for improvement.

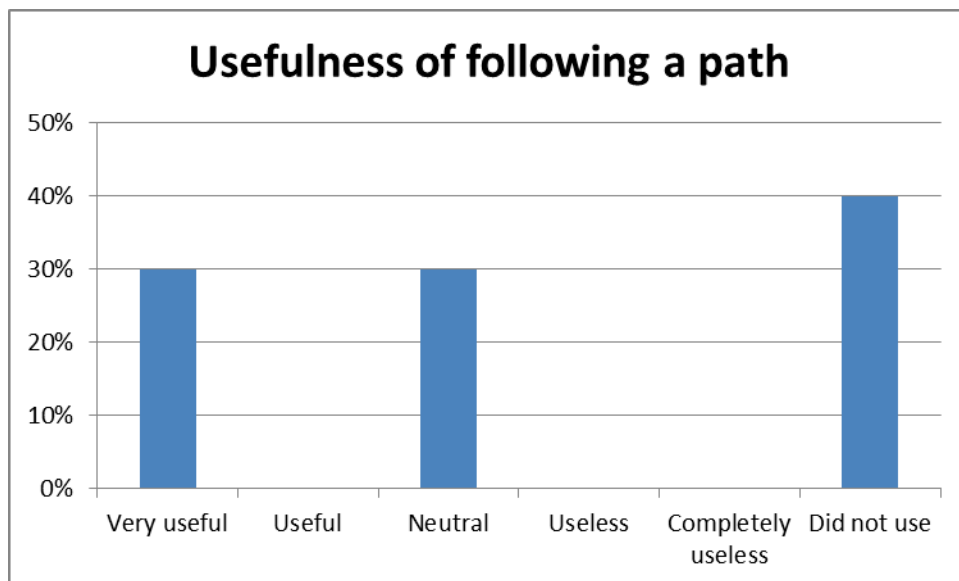


Figure 42 Usefulness of following a path, Prototype Trials

The usefulness of following a path was mixed (but not negative) with responses equally split between 'Very useful' and 'Neutral'.



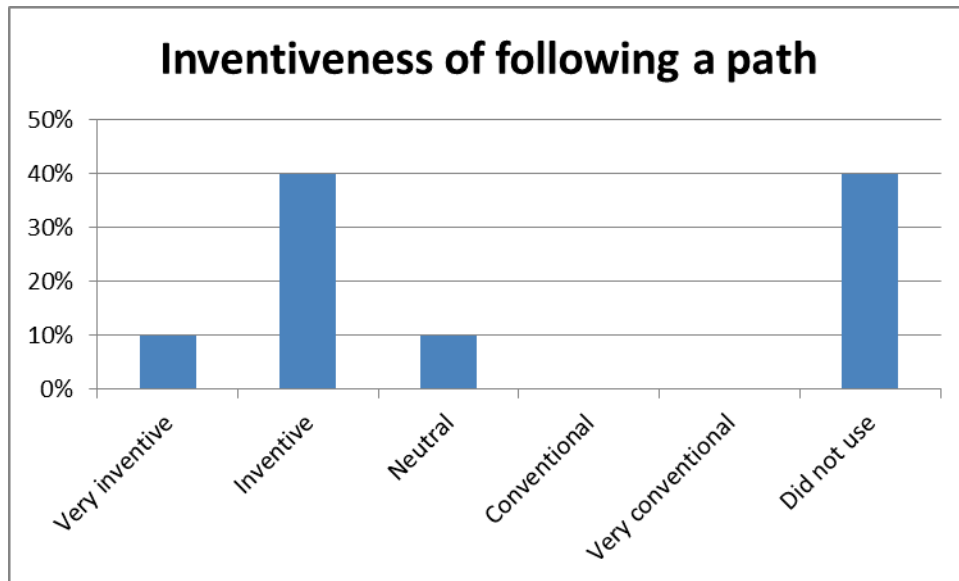


Figure 43 Inventiveness of following a path, Prototype Trials

The response to the inventiveness of following a path was positive with 40% of people rating it as 'Inventive', one as 'Very inventive' and one 'Neutral'.

*Could we improve following a path?*

Only 20% of participants thought that following a path could be improved. Their suggestions were:

1. Some indication of which nodes in a Path have been visited.
2. Could be more colourful

**4.3.3 Creating Paths**

The participants were asked "How many paths did you create during the last two weeks?"

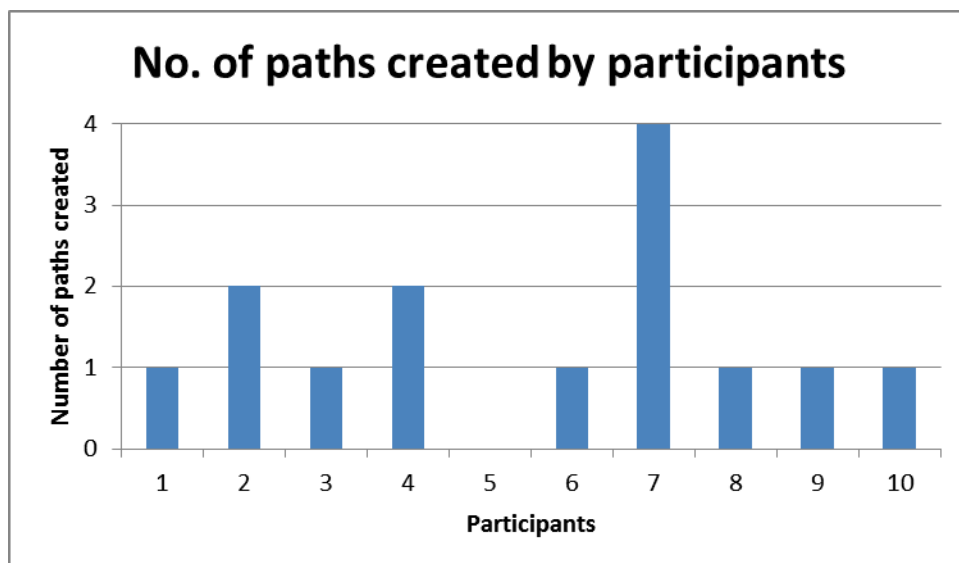


Figure 44 Number of paths created, Prototype Trials

Most people created one path, two people created two paths and one person managed four. One person did not create any paths – this was the same person had difficulties finding and following paths. However, it should be noted that technical problems meant that the field trial participants probably attempted to create more paths but were not able to publish them. One user commented: “I created loads and loads of paths, but because of system error only one got saved.”

Titles of paths created by the participants:

- River Thames crossings in Greater London
- Garrett sisters
- Dodos
- Bronze Age Metallurgy
- War propaganda
- The peak district
- Italian Cities
- The Love Song of J. Alfred Prufrock
- Lord Kitchener

The titles indicate that the participants managed to create a wide and varied selection of paths from the content available.

One person had technical problems whilst others had memory problems!

- I couldn't get the titles to be saved - I seem to have lost my first attempts
- I did not create a path. This is due to time constraints (academics) as well as I did not find an interesting topic to use to create a path.
- Unable to remember last two!
- I do not remember well but it about the coins in Korea

*How useful did you find the following features for finding items to include in your path?*

Users were asked to rate the usefulness of the tools for creating paths.

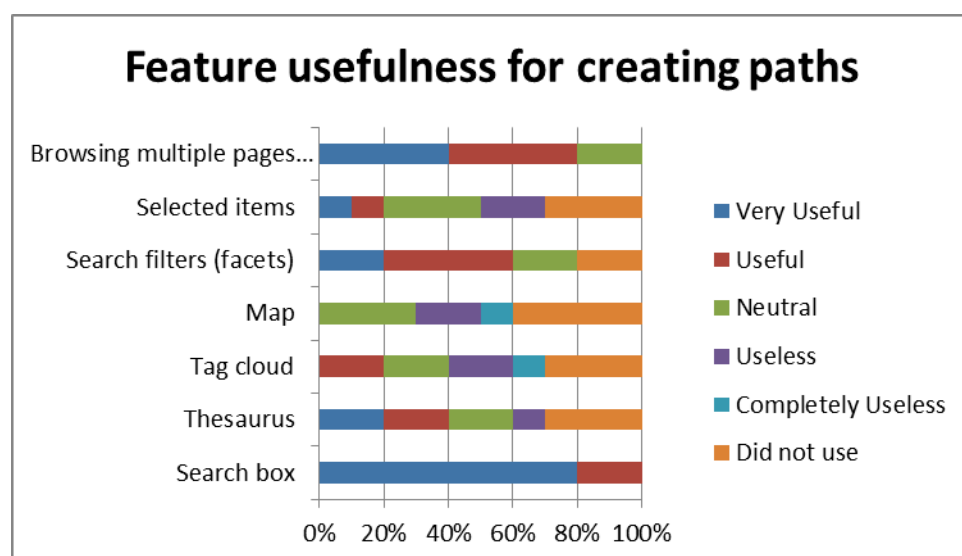


Figure 45 Feature usefulness for creating paths, Prototype Trials

The top features in terms of usefulness were the 'Search box' (80% rated as 'very useful'), 'Browsing multiple pages of items' and 'Search filters (facets)' - all rated 'Very easy' or 'Easy' with 10% Neutral for the last two features. The features rated the next most useful was the Thesaurus. The other three features had mixed ratings with the Map rated the worst, receiving 'Neutral', 'Useless' and 'Completely useless' ratings. 'Selected items' and the 'Tag cloud' had a wide range of ratings.

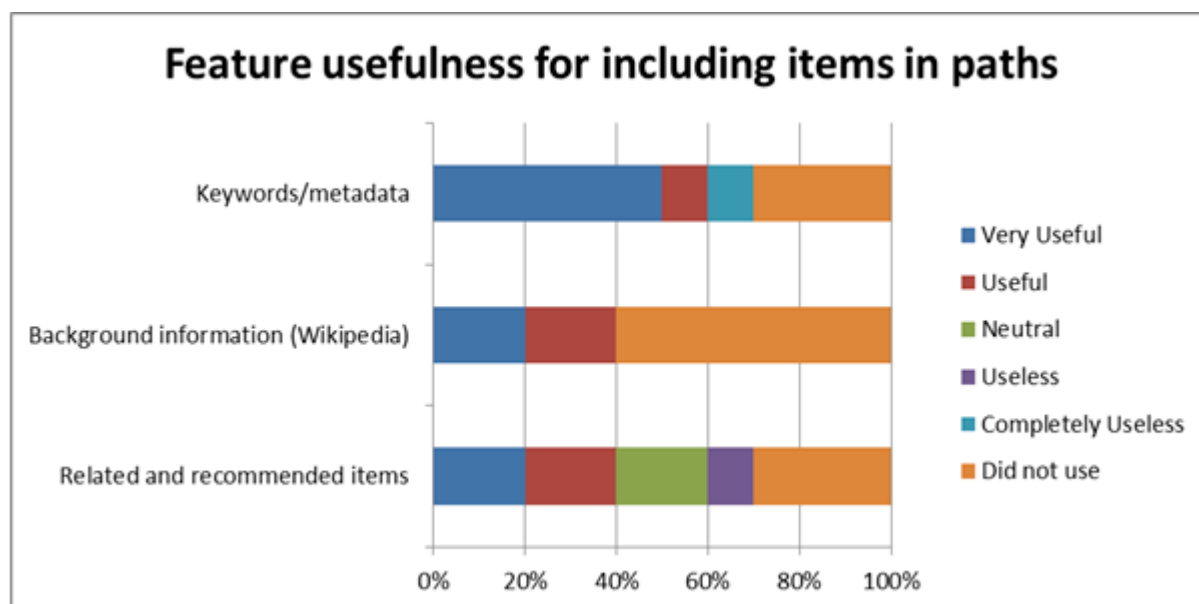


Figure 46 Feature usefulness for including items in paths, Prototype Trials

Of the people who used Keywords and Metadata, 70% rated this feature as 'Very useful', 10% as 'Useful' and 10% as 'Completely useless'. Despite this one negative rating, it appears that the majority of participants rated this feature highly.

Background information from Wikipedia was used by 40% of people who rated this as 'Very useful' or 'Useful'.

Related and recommended items had a slightly more mixed response. More people (70%) used this feature, which received the same number of positive ratings as the Background information feature with 20% 'Neutral' and 10% 'Useless' ratings.

Participants were asked which information items they used for creating their path.

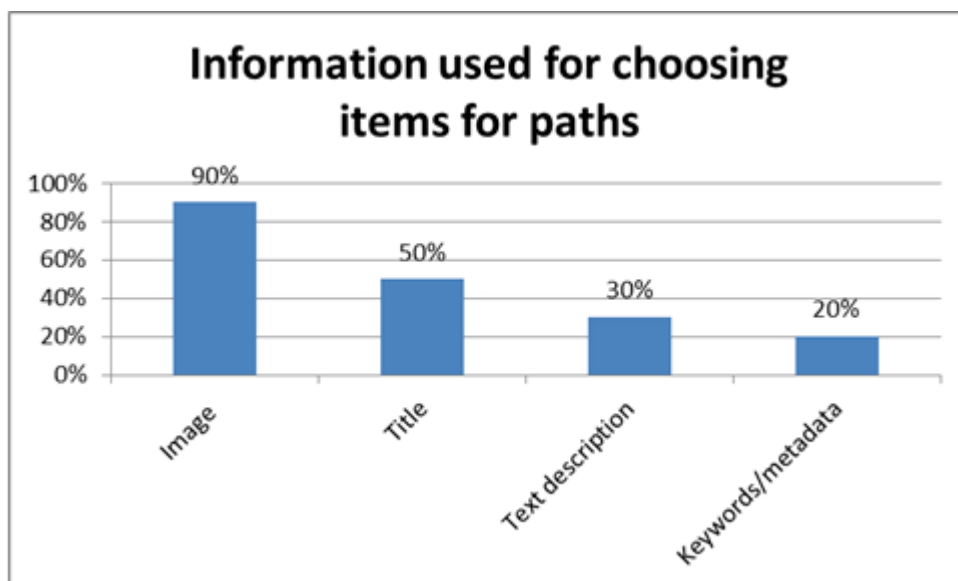


Figure 47 Information used for choosing items for paths, Prototype Trials

Images were the most popular feature used for selecting items for inclusion in paths (90% of the participants chose these). The title was the next most popular (50%), followed by the text description (30%), with the keywords and metadata being the least used (20%). This concurs with the previous comments about the poor metadata – if the provided metadata were improved, it is likely this feature would be used more.

Participants were asked what criteria they used when choosing items for their path.

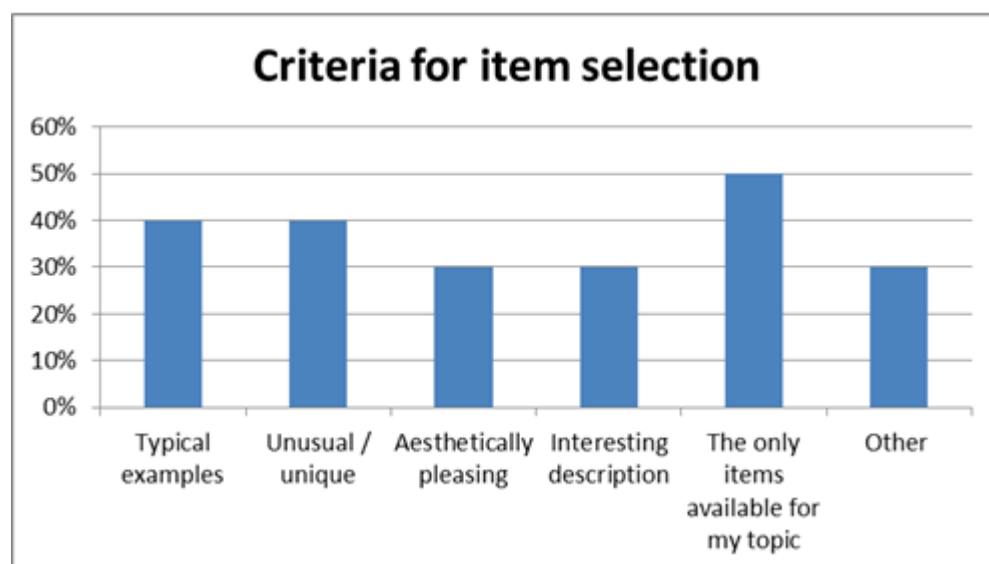


Figure 48 Criteria for item selection, Prototype Trials

The other criteria were:

- Anything that I could relate to my topic (this user had also selected “The only items available for my topic”).
- Relevant to curriculum.

Participants were asked to select the main method used for ordering the item in their path.



Figure 49 Criteria for item order, Prototype Trials

The most popular method was by Narrative (50%), then by Theme (30%), with 10% opting for 'Interestingness'. The Other comment was 'Did not complete a path'. No one opted for Chronological or Geographical ordering by Importance or 'No particular order'.

Participants were asked to rank each of these elements of path creation from 'Very easy' to 'Very complicated'.

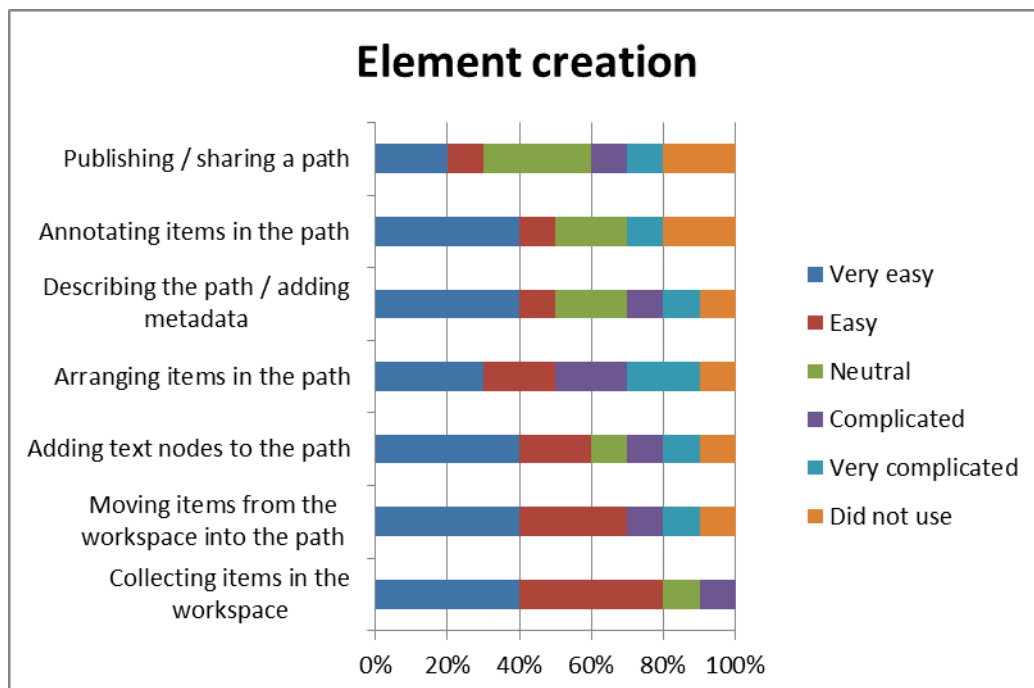
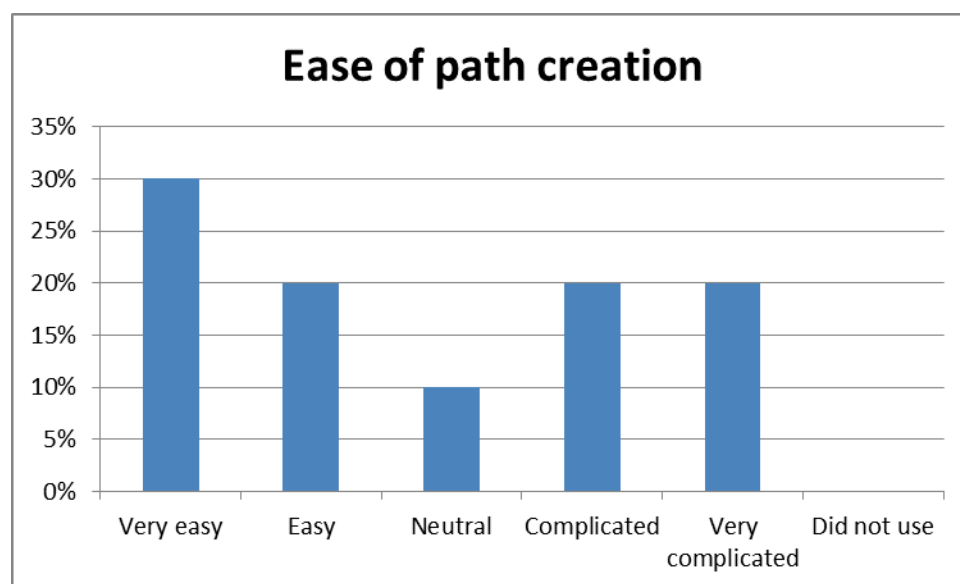


Figure 50 Element creation, Prototype Trials

Nearly everyone (80%) found collecting items in the Workspace ‘Very easy’ or ‘Easy’. Moving items from the Workspace into the path was nearly as well rated, with 10% finding this ‘Complicated’ and 10% ‘Very complicated’. Adding text nodes was similarly rated, as is Describing the path/adding metadata and Annotating items in the path (in these cases, there are 10%-20% less ‘Easy’ and 10%-20% more ‘Neutral’ ratings). The two most difficult operations for users were arranging items in a path: 40% of the users found this to be ‘Complicated’ or ‘Very complicated’, whilst Publishing/sharing a path had the least ‘Very easy/Easy’ ratings (30%), the same number of ‘Neutral’ ratings (30%) and 10% each for ‘Complicated’ and ‘Very complicated’. Note, that the same participant rated all the options as ‘very complicated’ (except Collecting items, which was rated ‘Complicated’). Another person was unable to create a path (Did not use).

Participants were asked to rate their path creation experience according to the three previously defined rating scales.



**Figure 51 Ease of path creation, Prototype Trials**

There appears to be a very mixed set of opinions regarding how easy it was to create a path. Half (50%) the participants found this to be ‘Very Easy’ or ‘Easy’, 20% were Neutral, and 40% people rated the process as ‘Complicated’ or ‘Very complicated’.

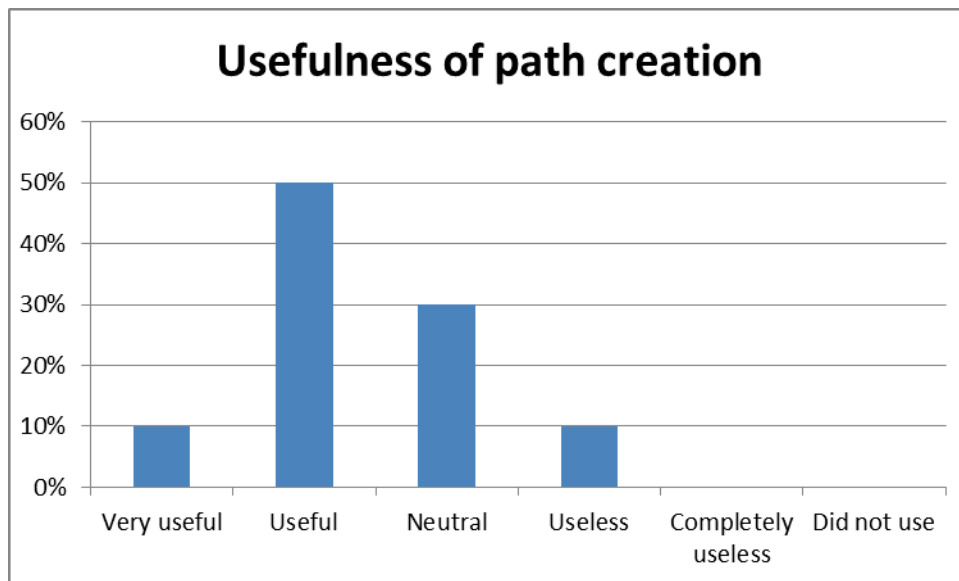


Figure 52 Usefulness of path creation, Prototype Trials

The response to the usefulness of creating a path was more positive – half found this to be ‘Useful’ with 10% more person rating it as ‘Very useful’. Thirty percent of people rated it as ‘Neutral’ with 10% of people rating it as ‘Useless’.

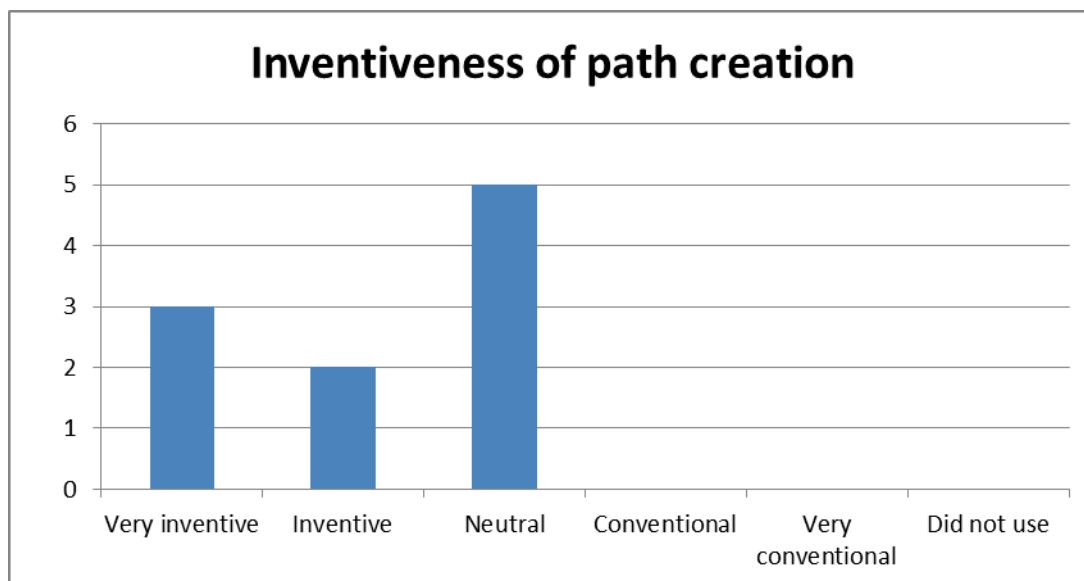


Figure 53 Inventiveness of path creation, Prototype Trials

Likewise, the ratings for the Inventiveness of path creation was also quite positive. 30% of people rated this as ‘Very inventive’, a further 20% as ‘Inventive’ with the other 50% of ratings being ‘Neutral’.

Participants were asked if the path creation could be improved, comments included:

- Make it easier to find for a start!
- When adding nodes it's a bit of trial and error dropping them into the path!
- It's so hard to use, must be made easier.

- Make it less fiddly. Adding nodes is not intuitive.
- Having a help menu.
- More instructions that could be turned on or off as needed. I needed a fair amount of help getting started, but was fine once I figured things out. Getting to that point was frustrating at times.
- I was not able to use this function. I did find the process quite complicated.
- Default view should allow a node to be dropped into the right-hand side of the Path.
- Size of boxes could be flexible
- I found it awkward to split the path at a certain item. It didn't explain very well how to position the items in the path.

It seems that many of the users had problems with manipulating the paths and that more help onscreen could have helped with the process.

#### 4.3.3.1 General feedback

The participants were asked their opinion on how well PATHS supported each of the tasks listed in the chart below.

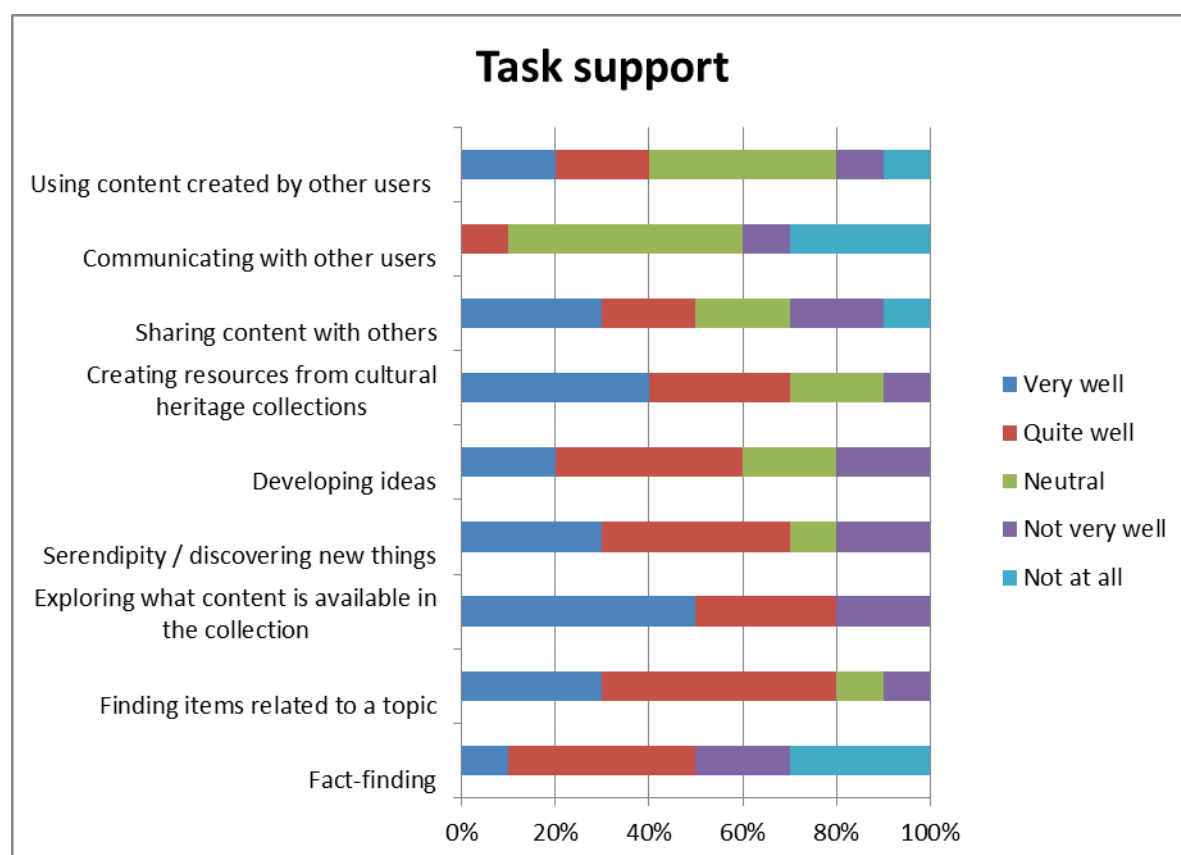


Figure 54 Task support, Prototype Trials

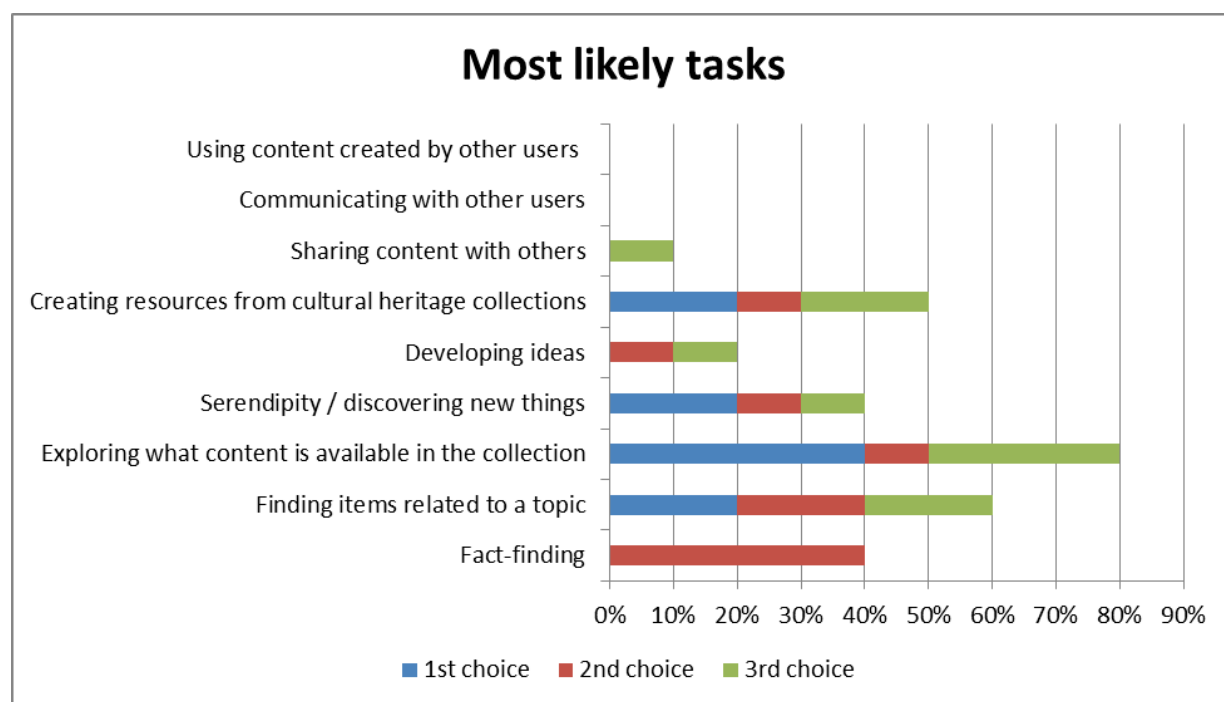
Overall, most of the participants indicated that PATHS supported Finding items related to a topic and Exploring what content is available in a collection either 'Very well' or 'Quite well' (with one and two ratings of 'Not very well' respectively). The same applied to the task of Creating resources from cultural heritage collections. Serendipity/discovering new things and Developing ideas were also well rated (80% 'Very well', 'Quite well' or 'Neutral').



There were very wide ranges of opinion regarding Using content created by others and Sharing content with Others. Overall, there were slightly more positive ratings than negative ones.

The tasks that PATHS supported the least well were Fact-finding (mixed ratings here- half 'Very/quite well' and half 'Not very well/at all') and Communicating with other users where half the participants rated this 'Neutral' with four negative ratings.

Users were asked: *Which tasks would you be most likely to use PATHS for? [select THREE CHOICES ONLY, numbered 1-3, where 1 is most likely].*



**Figure 55 Most likely tasks, Prototype Trials**

Nearly everyone (80%) chose '*Exploring what content is available in the collection*' as one of their three tasks. Forty percent of people had this as their 1<sup>st</sup> choice, one as their 2<sup>nd</sup> choice and one as their 3<sup>rd</sup>.

The next most popular task appears to be '*Finding items related to a topic*' with 60% of people selecting this as one of their three tasks. This was closely followed by '*Creating resources from cultural heritage collections*'.

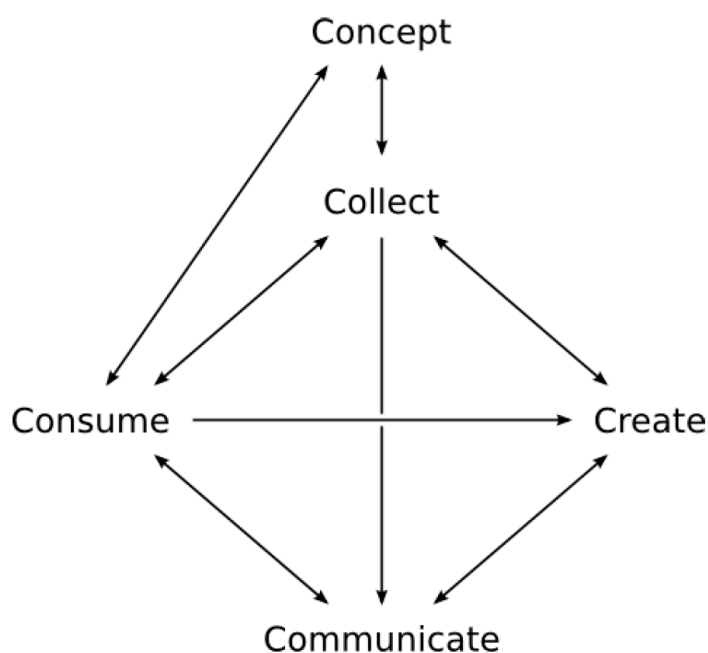
'*Serendipity/discovering new things*' was a 1<sup>st</sup> choice for 20% of people, and a 2<sup>nd</sup> and 3<sup>rd</sup> choice for two more. The slightly surprising result is that 40% of people chose '*Fact-finding*' as a 2<sup>nd</sup> choice – of the 50% of people who gave this a positive rating as an activity that PATHS supported, the majority obviously think that PATHS is good for fact finding.

Twenty percent of people chose '*Developing ideas*' as a 2<sup>nd</sup> and 3<sup>rd</sup> choice and one as a 3<sup>rd</sup> choice '*Sharing content with others*' whilst no-one chose '*Using content created by others*' or '*Communicating with other users*' as any of their preferred top three tasks.

In all, PATHS is viewed an application that is best for searching, exploring and creating resources by individuals.

#### 4.4 Qualitative responses from the Field Trials – interview and focus group results

After completing the two-week diary study, all of the Diary Study participants took part in a focus group discussion or were interviewed. Additionally five Expert participants were also interviewed, using the same schedule of questions as used in the focus group for the Diary Study participants. Questions asked centred on the conceptual model of user interaction first proposed in *D1.1* (2011: 114). The model is reproduced below as Figure 56.



**Figure 56 Generalised Conceptual Model of User Interactions with Paths**

Participants were invited to reflect on their experience of using the system through the activities of consuming pre-existing paths, conceiving their own path topics, collecting items and information for their paths, creating their paths, and communicating the results of their work. Finally, participants were asked about the most significant difficulties affecting their use of the system. Findings and recurring themes from these sessions are summarised in the table below.

Questions	Feedback
<b>Consume: Did you follow any paths?</b>	<ul style="list-style-type: none"> <li>• Most of the people who followed paths did so for structural examples (e.g. to see how nodes were laid out, to compare the balance of image and text nodes, to see the “journey” between the nodes, and to see how paths were “introduced”)</li> <li>• Many previous users of PATHS did not follow any paths during the field trial</li> <li>• A few users followed paths to gain confidence and “reassure” themselves that their paths were “in the ballpark”</li> <li>• Users did not find it rewarding to follow paths because many of the paths are incomplete and have nodes with missing image links</li> <li>• Users found it difficult to differentiate between problems with the system and a lack of material within the system when trying to judge usefulness</li> </ul>
<b>Concept: How did you develop the idea for your path?</b>	<ul style="list-style-type: none"> <li>• Some participants came to the evaluation with an idea in mind; others spent a great deal of time exploring the collection before deciding on a topic</li> <li>• Some participants based their topic choice purely on the availability of material within the system</li> <li>• A few participants completed authentic work tasks (preparing students for a field trip and facilitating a class discussion about poetry)</li> <li>• One participant was inspired by a picture on the wall</li> <li>• A previous PATHS user asserted that “narrative” and “meaning” are prerequisites for a “good” path as opposed to “a mass of things I really like”</li> </ul>
<b>Collect: Which parts of the system did you use to help you find items for your path?</b>	<ul style="list-style-type: none"> <li>• Search was the most popular feature</li> <li>• Some users browsed for items in the thesaurus</li> <li>• The thesaurus feature is ideal for true browsing (with no specific goal)</li> <li>• Very few participants found the tag cloud or map useful</li> <li>• A few users filtered their search results by using the left-side facets; likewise, a few followed the right-side recommended items</li> <li>• Several users collected items over a series of sessions</li> <li>• Users searched across different systems (Wikipedia, Google) simultaneously by opening several tabs</li> <li>• Many users reflected on their collection and creation strategies outside their system sessions and changed their behaviour accordingly</li> </ul>

Questions	Feedback
<b>Create: How did you create your path?</b>	<ul style="list-style-type: none"> <li>• Users enjoyed “playing around” with different structures and node organisation concepts</li> <li>• Most users created their paths in a single session, but some developed an outline structure first and filled in items later</li> <li>• Some participants structured their paths only after collecting all of their items, and the content of the items they collected influenced the structure</li> <li>• Structures were determined by narrative flow, item type, and representation of physical path (tour guide through historic buildings)</li> <li>• Users who had had difficulties finding items (collecting) created shorter paths out of frustration</li> <li>• Several users added text nodes, but very few of them changed the descriptions of image nodes</li> <li>• Users had a fluid idea of when their paths were “finished”: most of them see paths as open-ended and always ready for further development, if more content were to be added to the system</li> </ul>
<b>Communicate: Are there any contexts in which you think PATHS would be a useful communication tool?</b>	<ul style="list-style-type: none"> <li>• Users mentioned “teaching” most frequently as the activity for which they could imagine using PATHS in the future</li> <li>• Users suggested that group work and collaborative activities would be facilitated well by PATHS</li> <li>• Many users compared the system to PowerPoint or Prezi, and would like to use their paths as the basis for presentations</li> <li>• When thinking about a mobile application, users would welcome the ability to have a path based on a physical collection that they could bring with them through a museum for additional information</li> <li>• Users would like the ability to rate paths, comment on paths, and add Wikipedia-style “citation needed” tags</li> <li>• Users felt that ordering the paths by “most recent first” would facilitate interaction more smoothly</li> </ul>
<b>Improvements: Consume</b>	<ul style="list-style-type: none"> <li>• Forward navigation is simple, but backward and cross-branching navigation are difficult, because users cannot remember which nodes they have already looked at from the small, abbreviated titles in the overview—users suggested changing the colour of nodes as they are visited</li> <li>• Users suggested adding a hovering box with a thumbnail, title, and description for the overview nodes</li> </ul>
<b>Improvements: Collect</b>	<ul style="list-style-type: none"> <li>• Users were frustrated by having to perform separate repeated searches for variants (plurals, misspellings, etc.)</li> <li>• Users would like to see changes to the location and behaviour of the collection workspace, including being able to “pin” it open or closed (rather than having it toggle automatically)</li> <li>• Many users report using advanced search techniques in other systems and would welcome it in PATHS as well</li> </ul>

Questions	Feedback
<b>Improvements: Create</b>	<ul style="list-style-type: none"> <li>• All users found the path workspace too small, which impinged on the shape and structure of the paths they created</li> <li>• A zoomable overview, similar to the map, would help users get a clearer and fuller picture of the paths that they are creating and following</li> <li>• Rather than the vertical and horizontal scrolling bars in the path workspace, users would prefer a “hand”-type cursor to move the space while constructing their paths</li> </ul>
<b>Improvements: General</b>	<ul style="list-style-type: none"> <li>• Items without images and broken links are a major source of frustration and lack of engagement with the system</li> <li>• One user (who did not notice the videos on the front page or help text on the right-hand side) felt they never fully understood the system, and would like a “help button”</li> <li>• There was confusion regarding the term “Tags”—some participants thought it indicated user-generated content, while others understood that it was derived from the original metadata</li> <li>• Many users were interested in the map at a conceptual level, but they were confused about its functionality and purpose</li> <li>• Hierarchy within the thesaurus is difficult for users to understand—they would prefer further indentation or colour coding</li> <li>• Users do not understand the green “You are here” topic structure—they assume it to be their own history and are confused by the box titles that do not match the pages they have looked at</li> <li>• Users ignored the carousel of “Related items” because the continuous movement made the images seem like advertisements</li> </ul>
<b>System errors</b>	<ul style="list-style-type: none"> <li>• Paths disappeared when users tried to save them</li> <li>• Items disappeared from workspaces between sessions</li> <li>• Other user IDs appeared when saving paths</li> <li>• Users could edit nodes but not path metadata</li> <li>• Users could not log in to their accounts at various times throughout the study</li> <li>• Text editor did not work—formatting added to node description texts did not display in the published path</li> </ul>

**Figure 57 Qualitative feedback, Prototype Trials**

Overall, the participants in the focus groups and interviews can see the potential of the PATHS system, and they are interested to see it develop in the future. As long as the creators of paths are clearly identified, participants are interested in following paths by all levels of creators. An interesting reason that participants would prefer to follow paths written by amateurs or enthusiasts rather than professionals is that participants fear professional content would be driven by commercial interests. Some participants tried out all of the features when they were familiarising themselves with the system and choosing a topic for their paths, but once they had decided on a topic, they used the search function exclusively to collect items.

The need for more in-depth help menus, comprehensive documentation, and step-by-step tutorials is clear from users at all levels, including those who had participated in previous PATHS evaluations. A few participants watched the tutorial videos again in their own time, but many users had specific questions that they would have preferred to find answers to through an FAQ page or other searchable text format. These findings corroborate those of the final questionnaire in the field trials. As with previous evaluations of the system, participants are enthusiastic about what they could achieve if there were more content available to them.

#### 4.5 Responses to usability Semantic Differentials, Prototype Trials

Participants were asked at two points (after a brief overview and then at the end of their use of PATHS) for their responses to a series of semantic differential scales, rating polar opposite experiences on a 7-point scale of +3 to -3, with a neutral 0 (zero) position at the centre. In this way initial impressions and final views of PATHS were captured.

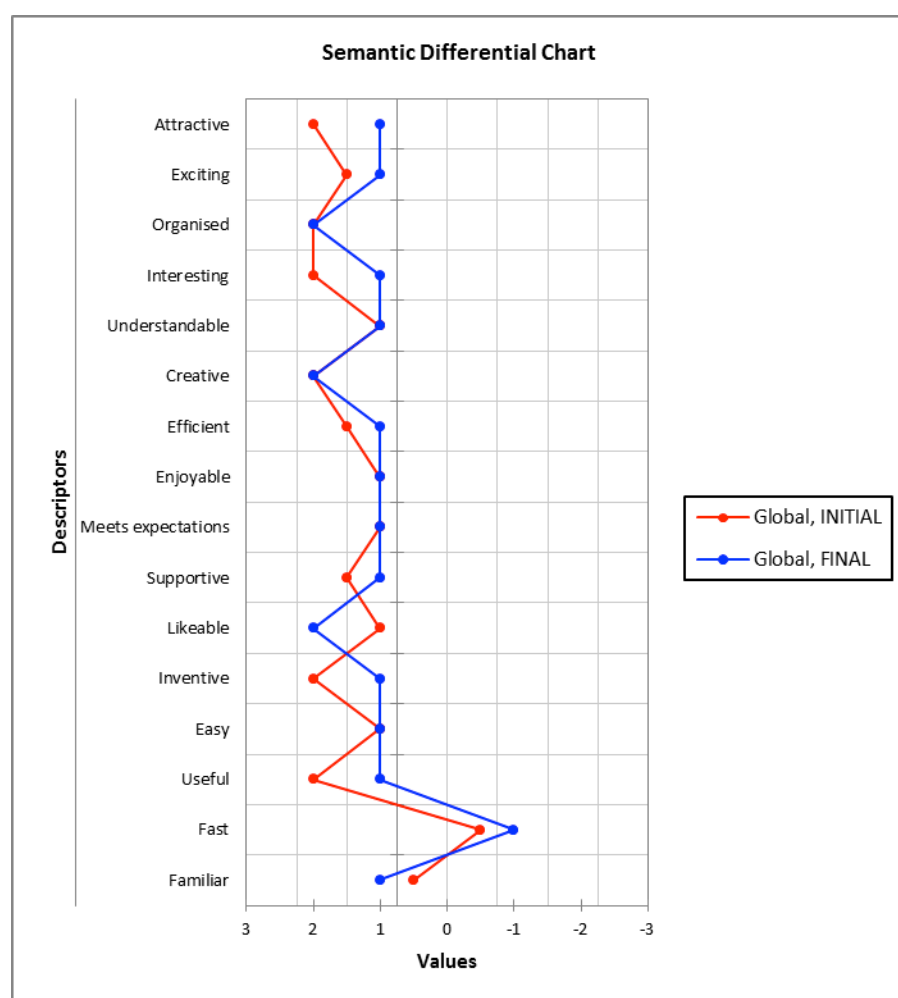


Figure 58 Initial and Final view, Prototype Trials

Results to the sixteen semantic pairings by the Prototype Field Trial participants show a positive response to *most* aspects of usability evaluated, ranging from +1 to +2. Most participants rated Familiarity as one of their lowest points; this is to be expected in a prototype system. Speed of the system was also scored lower, and for the majority of participants this

became worse as they completed their use of the system. Initially most highly rated usability aspects were:

- Attractiveness
- Organised
- Interesting
- Creative
- Inventive
- Useful

Final views rated the following most highly:

- Organised
- Creative
- Likeable

Almost all of the scores are slightly lower for final than initial responses, which would imply that the participants encountered some difficulties which impacted on their perception of the system.

## 5. Results of the Mobile Field Trials

The following section presents results from the Mobile Field Trials. It is divided into five parts and begins with a description of the participant profile before moving to responses to the Mobile Trial questionnaire, then qualitative responses to the Mobile application, responses to additional functionality, viewing and sharing paths in the Mobile application and finally responses to the semantic differentials usability questions. As with the Prototype Field Trials targeted recruitment of participants resulted in recruitment of path creators and path consumers, of which 19 participants took part in the Mobile Trials, results of which are presented here.

### 5.1 Participant profile

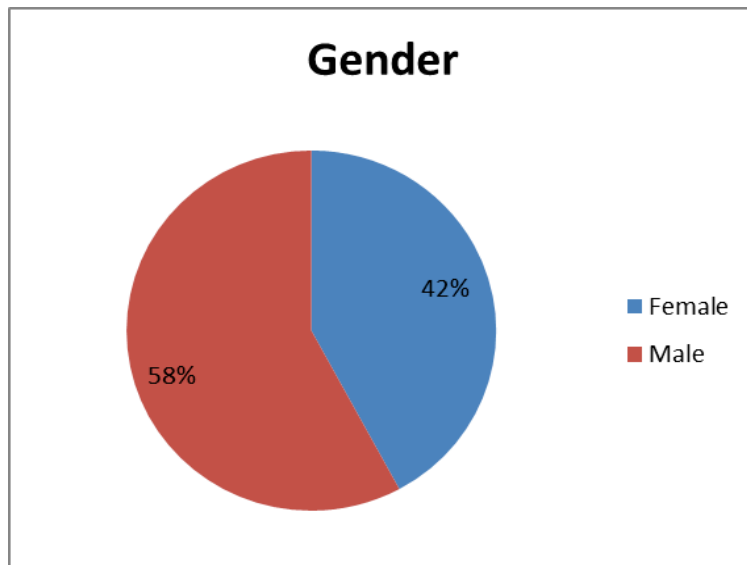


Figure 59 Gender, Mobile Trials

The gender split for the mobile trials was almost a reverse of that for the field trials with almost third thirds male to two thirds female participants.

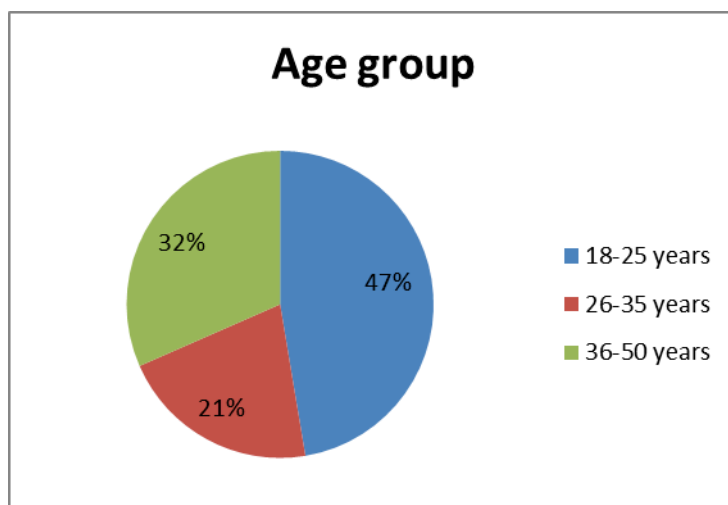


Figure 60 Age group, Mobile Trials



The age group range for the mobile trials is less wide with no over-50 year olds who made up 13% of the field trial participants. However, the youngest age group (18-25) makes up nearly half of the mobile trial participants (as opposed to 13%) with around one third being in the 36-50 age group, so there is a higher proportion of younger users with fewer users in the two older age bands (but still with good representation for the oldest age group).

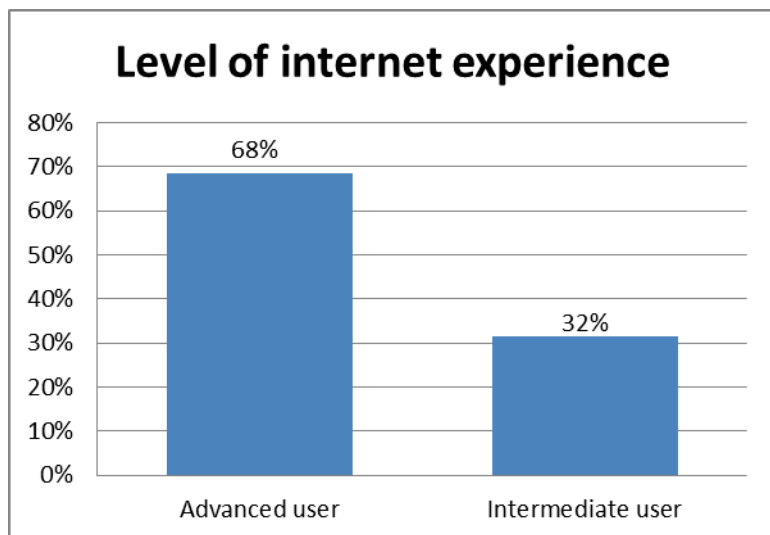


Figure 61 Level of internet experience, Mobile Trials

There were no Basic users in the mobile trial, with two thirds (68%) rating themselves as Advanced users to one third Intermediate users. There are 21% more Advanced users than for the field trials (where there was a 47%/47% split, the remaining 6% being Basic users). Mobile trials participants were asked how familiar they were with PATHS.

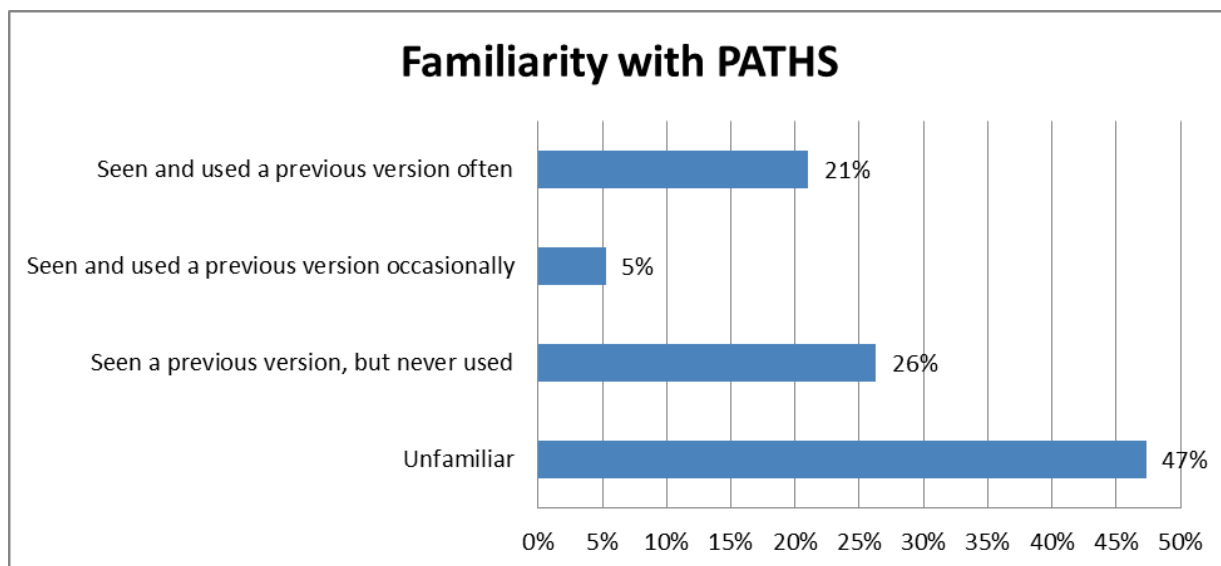


Figure 62 Familiarity with PATHS, Mobile Trials

Nearly half (47%) had not used PATHS previously with a further quarter (26%) having seen a previous version but not used it. Of the remaining quarter, 21% had used PATHS often with the other 5% having used it occasionally. So around three quarters of the mobile trial

participants have no or little experience, while most of the remaining users have good experience of the application.

Participants were asked which mobile devices they owned.

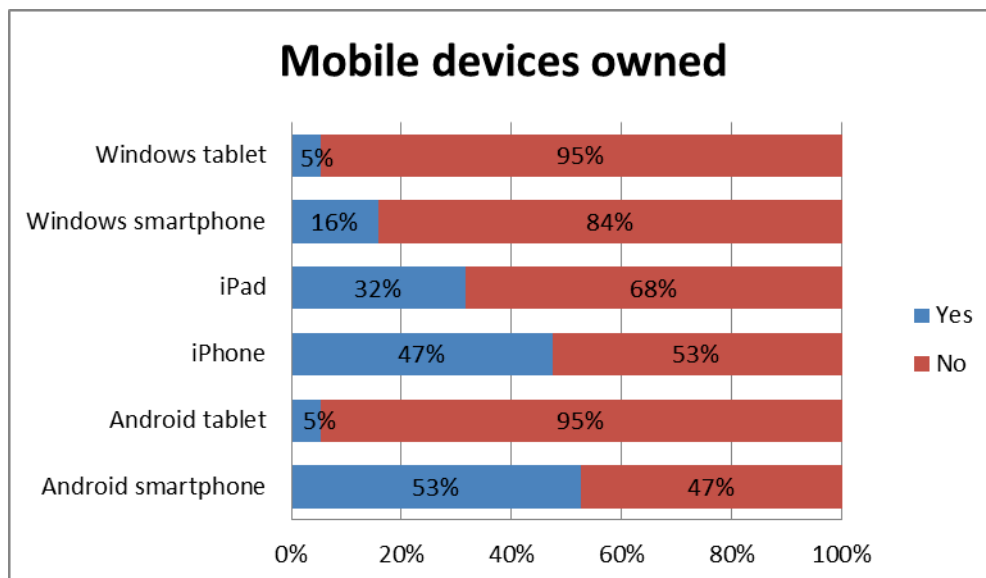


Figure 63 Mobile devices owned, Mobile Trials

All but one of the participants owns a smartphone, and 21% of participants own more than one. Slightly more participants own an Android (53%) phone than an iPhone (47%) and a small number (16%) own a Windows smartphone. After mobile phones, the iPad was the most popular device (around third) with a few owning an alternative OS based tablet (10% in total).

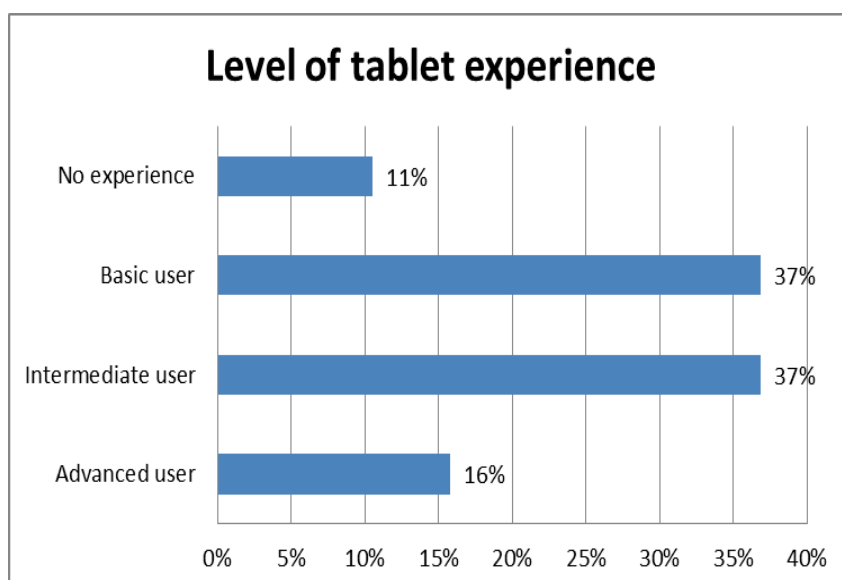
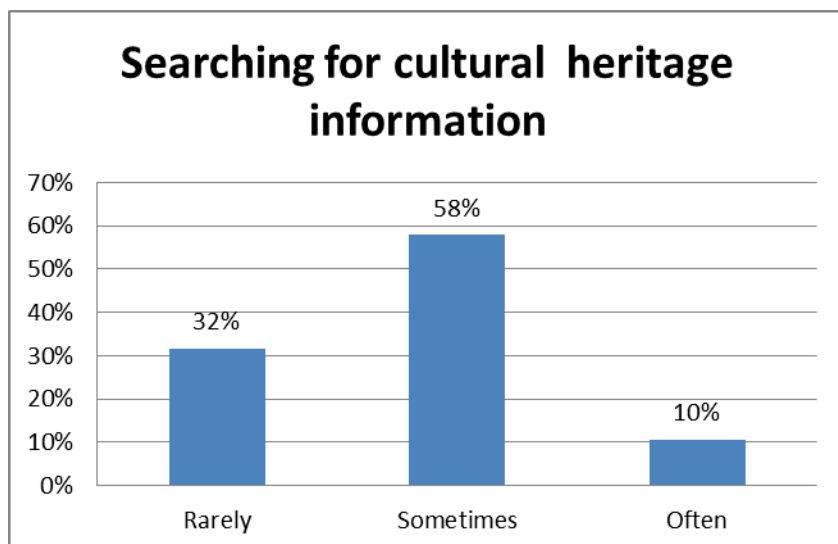


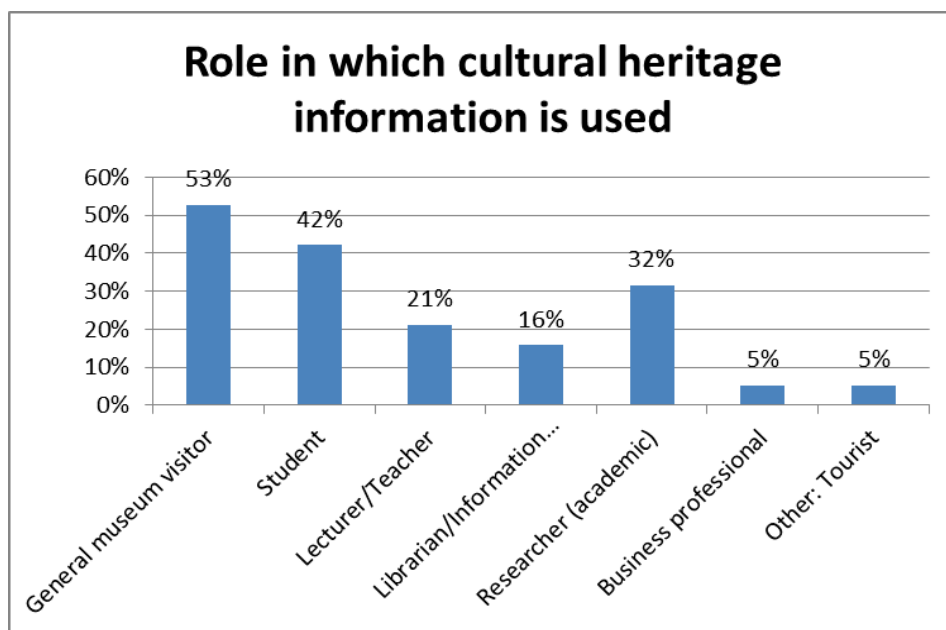
Figure 64 Level of tablet experience, Mobile Trials

Despite the universal mobile phone use and 42% tablet ownership, only 16% of the users rated themselves as Advanced users with a further 37% rated as Intermediate users. A further 37% are Basic users with 11% having no experience at all. So, the majority of tablet users have some experience with a few users having either lots or none.



**Figure 65 Searching for cultural heritage information, Mobile Trials**

When asked about the frequency of searching for cultural heritage information online, most of the users responded Sometimes (58%) with a further 10% saying 'Often'. Around a third (32%) searched Rarely, and zero searched Never.



**Figure 66 Roles in which cultural heritage information is used, Mobile Trials**

The main roles for which cultural heritage information was used online were as a general museum visitor (53%), then as a student (42%) followed by as an academic researcher (32%). These categories (along with Lecturer/Teacher and Librarian/Information specialists) had higher proportions than the field trials, with many more students in the mobile trials.

Two categories had no members:

- Researcher (leisure)
- Cultural heritage professional

These made up 15% and 8% respectively in the field study trial.

## 5.2 Responses to the Mobile Questionnaire

### 5.2.1 Finding and following a path

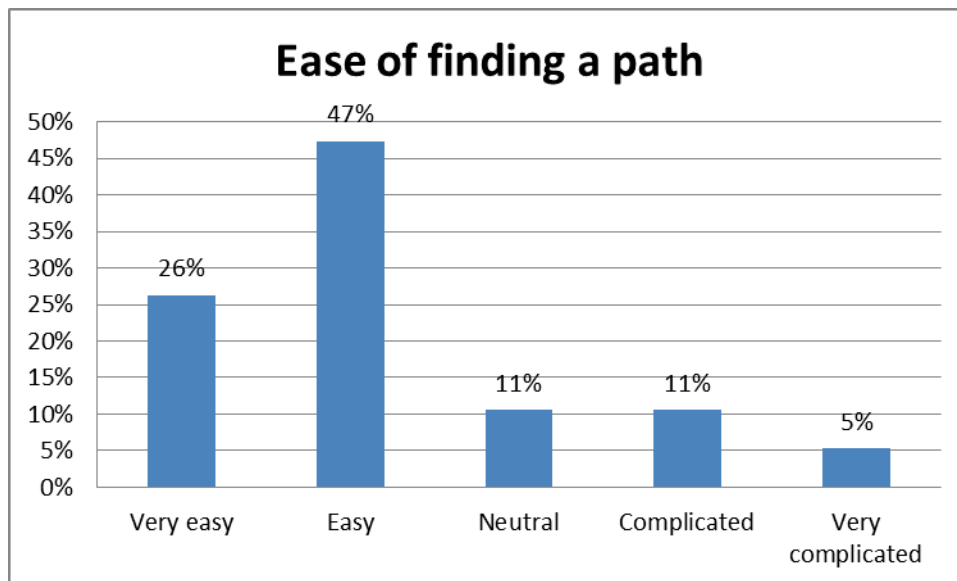


Figure 67 Ease of finding a path, Mobile Trials

Participants were asked to rate their experience of finding a path. Nearly half the users rated finding a path as Easy (47%) with a further 26% as Very easy. On the positive side, 11% of users were Neutral so 84% rated of users their experience positive/neutral with 73% of these as Very easy/Easy. 11% found PATHS to be complicated with 5% Very complicated (so 16% rate PATHS negatively).

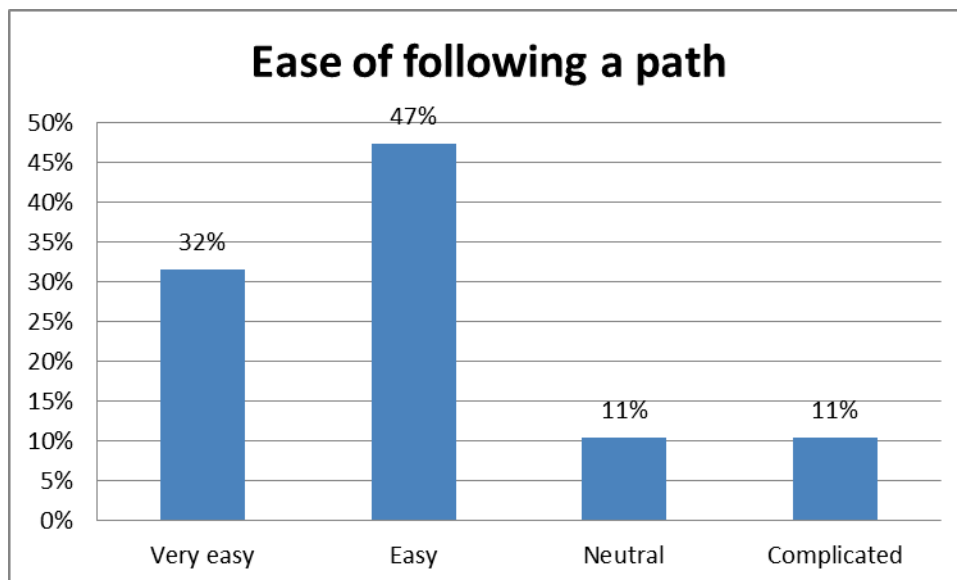


Figure 68 Ease of following a path, Mobile Trials

The results were similar when asked about following a path. Most users (77%) rated this as Very easy/ Easy with 11% Neutral and 11% rating it as Complicated.

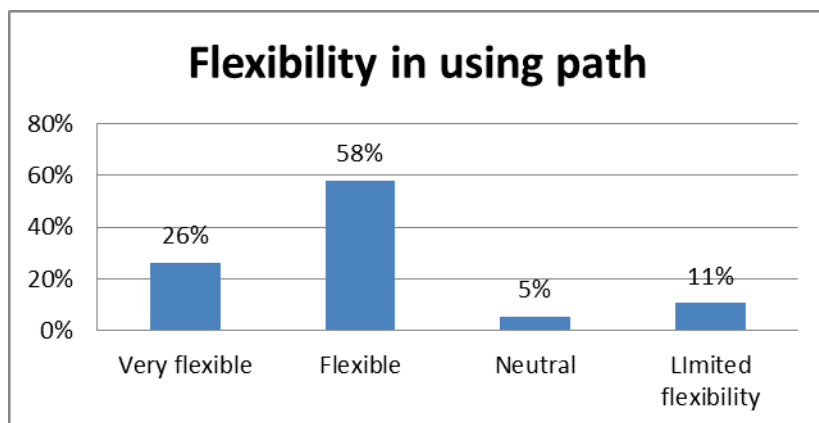


Figure 69 Flexibility in following a path, Mobile Trials

The participants were asked *What degree of flexibility did you feel there is in how you can follow a Path?* Again, the majority of the PATHS users rated their experience as Flexible (58%) or Very flexible (26%) so 84% in total. Only 5% were Neutral with 11% rating 'Limited flexibility'.

### 5.3 Qualitative responses to the Mobile application of PATHS

During the evaluation of the mobile app, users were asked three questions with free-text response areas: "What did you like most about the PATHS mobile app?", "What did you like least about the PATHS mobile app?", and "What could we improve in the PATHS mobile app?"

When asked what they liked most about the mobile app, users appreciated the clear, simple layout, and they also liked the colours and design (see Figure 70 below).

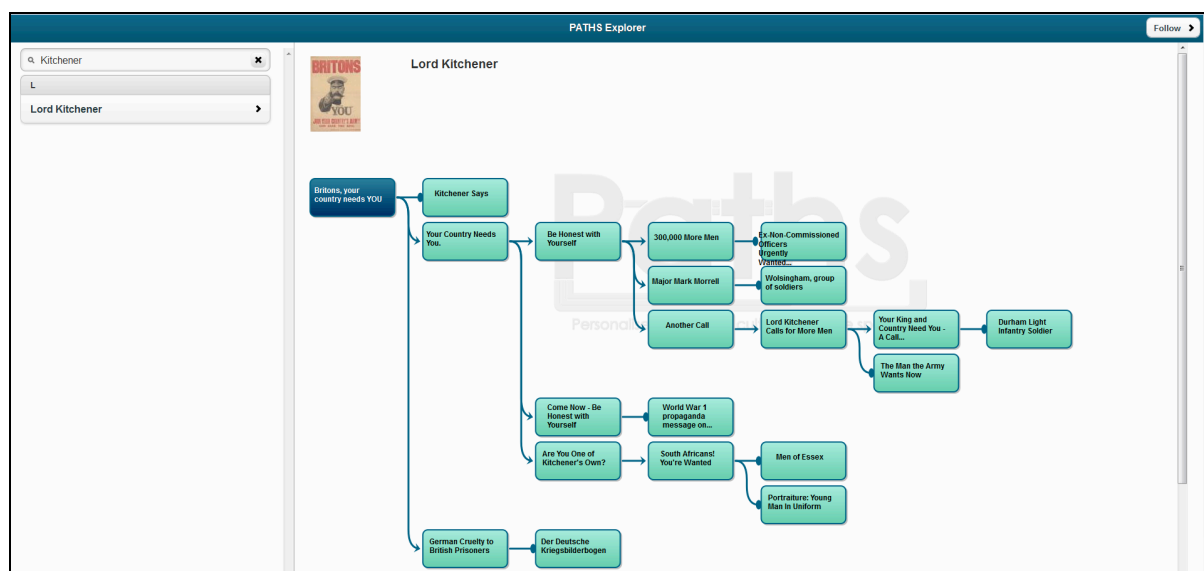


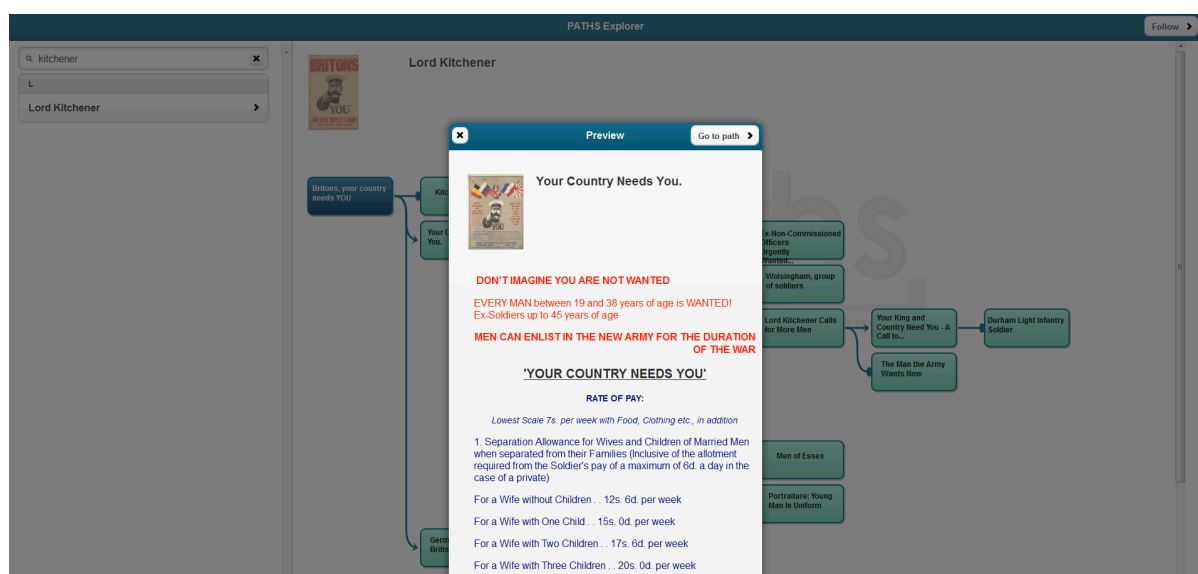
Figure 70 Search results from the mobile app (Overview mode), Mobile Trials

Users were interested by the idea of "paths", and they generally found it easy to follow the paths and navigate between items. A few users mentioned that they thought it would be useful for students in a classroom environment.

With regard to what they liked least about the mobile app, some users had difficulty finding paths initially. If there are no results for a query, the screen remains blank, rather than displaying a message such as “No results found”. One user noted, “I found it hard to get started finding the paths. I searched for things but nothing came up and there were no instructions”. This issue could be solved by addressing a comment from other users, who suggested that being able to browse all of the paths would be better than only being able to search them, since the users were not familiar with the contents of the collection. The user who asked for “better ways of finding paths when you don’t know what is in there” would likely have benefited from the alternative exploration options in the main prototype, such as the thesaurus, map, and tag cloud features.

Furthermore, users were frustrated by the lack of functionality, content, and context. As one user expressed it, “I’m not sure what I’m looking at. Where did the pictures come from? Who wrote the descriptions? Why are there so many without descriptions?”. Another user was confused by the fact that all of the paths have different structures.

One user did not like the individual node pop-ups, but this suggests that she followed the path overview’ and didn’t go deeper. If a user clicks on a node from the Overview, then the information about the node pops up with a button in the top right corner to “Go to path” and a button in the top left to close the pop-up and return to the overview (see Figure 71).



**Figure 71 Pop-up node in mobile app (Overview mode), Mobile Trials**

These pop-ups appear only when the app is in Overview mode. If the user clicks on the “Go to path” button from the pop-up or clicks the “Follow” button from the full Overview screen, then the description of the item takes up the left half of the main screen and the overview of the rest of the path takes up the right half; there is no pop-up (Figure 72).

The screenshot displays a mobile application interface titled "Lord Kitchener". On the left, there is a historical document titled "Your Country Needs You." with a small image of a recruitment poster. The document text includes: "DON'T IMAGINE YOU ARE NOT WANTED", "EVERY MAN between 19 and 38 years of age is WANTED! Ex-Soldiers up to 45 years of age", "MEN CAN ENLIST IN THE NEW ARMY FOR THE DURATION OF THE WAR", and "YOUR COUNTRY NEEDS YOU!". Below this, it lists "RATE OF PAY:" with various allowances for families and dependents.

On the right, a navigation path is shown as a series of connected boxes. The path starts with "Your Country Needs You." and branches into several options: "Be Honest with Yourself", "Come Now - Be Honest with Yourself", "Are You One of Kitchener's Own?", "German Cruelty to British Prisoners", "300,000 More Men", "Major Mark Morrell", "Another Call", "World War 1 propaganda message on...", "South Africans? You're Wanted", "Der Deutsche Kriegsbilderbogen", "Ex-Non-Commissioned Officers Urgently Wanted", "Walsingham, group of soldiers", "Lord Kitchener Calls for More Men", "Men of Essex", "Portrait of a Young Man in Uniform", "Your King and Country Need You - Call In.", and "The Man the Army Wants Now".

Figure 72 Full node in mobile app (Following mode), Mobile Trials

These errors in navigation were compounded by the most common request in users' responses to the final free-text question: more help and instructions are required to make the app "user friendly". Also, echoing every evaluation ever done on the PATHS system, users want more content, including videos. In addition, they want more information about every aspect: what the system does, what the system is for, where the pictures came from, who made the paths, and more information in the paths themselves. It is clear that while participants like the look and feel of the mobile app, they cannot comprehend its context without reference points to the prototype system.

The participants were asked: *What did you like most about the PATHS mobile app?*

The comments included:

- Links :-)
- clear structure
- well, it is a very interesting idea and it is easy for people to get used to it.
- informative and straight forward
- google app
- Easy to use, clean interface
- "the structure is very clear, and various contents of different formats are included"
- The colours are nice. It's easy to find a path if you know what you're looking for.
- Liked the paths, could be useful for classes as well as for general enjoyment.
- Following paths could be useful, especially with a group of students. I liked the links out to other resources.
- It was easy to move between things
- It looked nice, the paths were clear
- The layout was simple
- I like the idea of the paths
- interactivity and time of response
- design
- functional
- the screen is uncluttered.

To summarise:

Comment category	Count (number of comments)
Design and navigation	10
Easy to use	5
Useful	2
Links	2

**Figure 73 Summary of most liked aspects of PATHS, Mobile Trials**

The participants were asked: *What did you like least about the PATHS mobile app?*

- Not about the paths but if I had a manual with instructions it would've been amazing
- colour
- the contents in the app might be not that interesting
- cannot think of any
- interface
- Limited functionality.
- going back to the main page is slightly not convenient
- I'm not sure what I'm looking at. Where did the pictures come from? Who wrote the descriptions? Why are there so many without descriptions?
- Found it difficult to search for the paths. Didn't get any clues as to how to do it.
- There was very limited information about each item. Finding paths wasn't easy.
- Wasn't sure what I was supposed to do with it. Some paths had lots of things, but others had hardly anything
- Not much information about it
- The paths all looked different which was confusing
- I found it hard to get started finding the paths. I searched for things but nothing came up and there were no instructions
- quantity of context and articles
- content, lack of images
- less content that expected
- popups for information - prefer this in the main window.
- can't browse topics for paths without doing a search first

To summarise:

Comment category	Count (number of comments)
Interface design, functionality and navigation	6
Lack of help or instructions (or a manual)	5
Content issues	3
Searching	3
Paths issues	3

**Figure 74 Summary of least liked aspects of PATHS, Mobile Trials**

There were also comments relating to paths such as lack of descriptions, limited information and quality of paths but these should not be considered as part of the PATHS application.

The participants were asked: *What could we improve in the PATHS mobile app?*

The responses were:



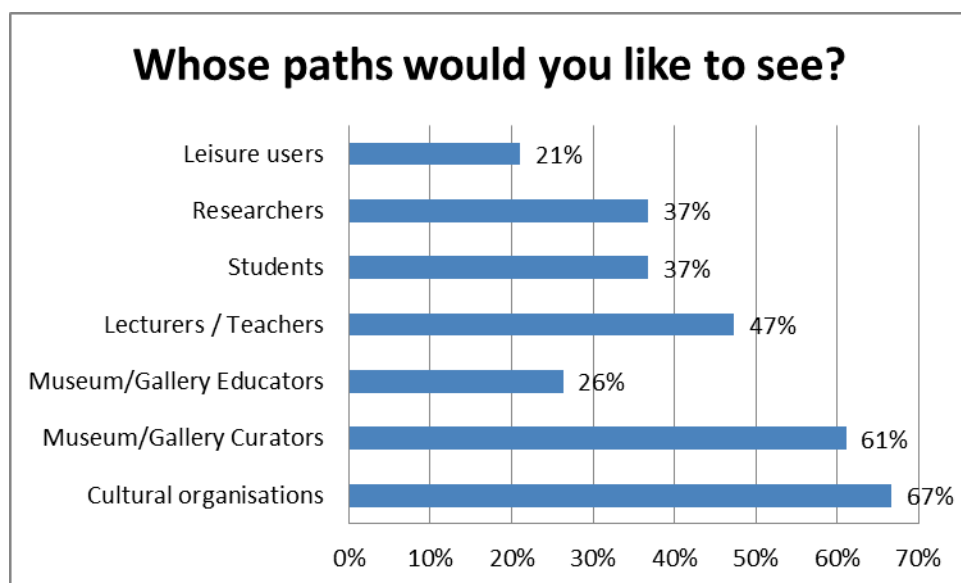
- More User Friendly
- add more pictures and videos
- maybe by putting some interesting videos
- Adding Advanced search feature and pre-ready topics
- more source
- Seems odd that it's possible to go to any node in the path by clicking on it in the overview. Surely the aim is to follow the path by going from one item to the connected ones to follow the narrative
- add more contents, and give more operation buttons
- More information about the pictures. More information about the people who made the paths
- Make searching for paths clearer, perhaps allow browsing through paths.
- More information about the items
- More instructions and information
- More information about what it does and what it is for
- More help
- Provide some help
- context
- more content
- content
- more information in the paths
- links to other information about the topic
- better ways of finding paths when you don't know what is in there

The suggestions focus mainly on providing more help and information and on the content:

<b>Comment category</b>	<b>Count (number of comments)</b>
Source content (images, videos)	6
Information (metadata) about paths, context	6
Help	4
Searching	2
Navigation, user friendliness	2

**Figure 75 Summary of suggested improvements PATHS, Mobile Trials**

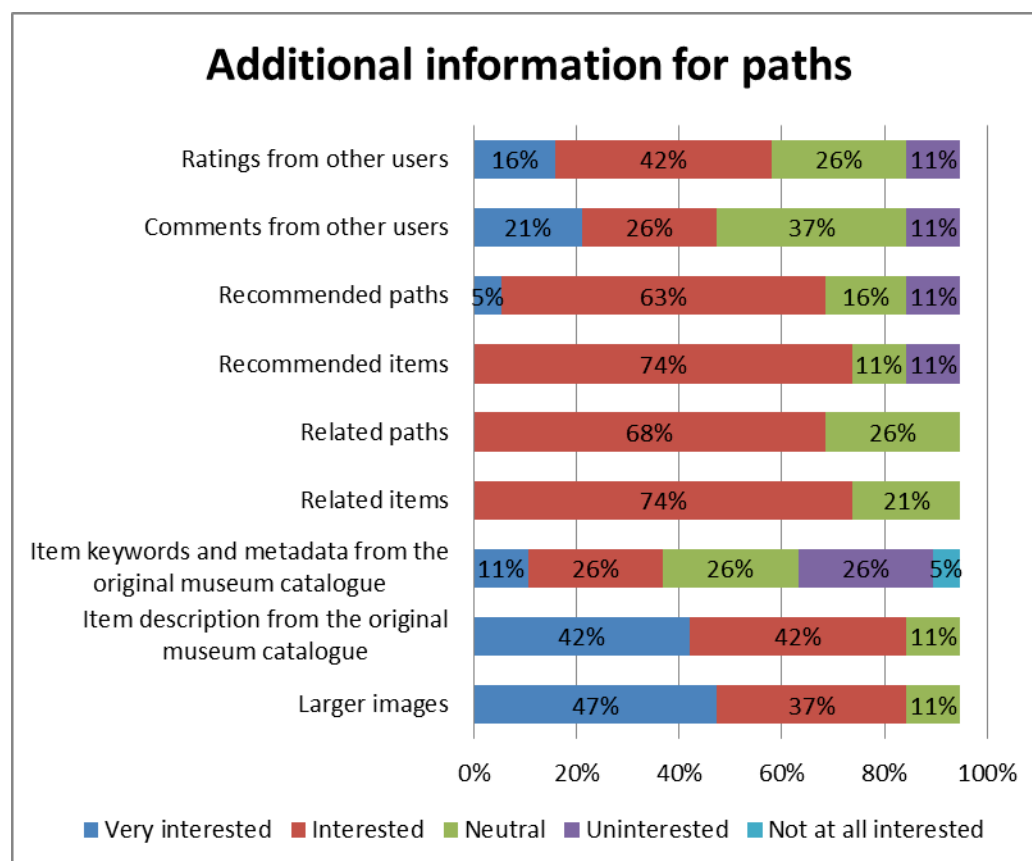
#### **5.4 Additional functionality, viewing and sharing paths in the Mobile application**



**Figure 76 Whose path would you like to see? Mobile Trials**

The majority of users indicated that they would like to see paths created by cultural organisations (67%) and curators (61%). Just under half indicated Lecturers/Teachers, but far fewer chose Museum/Gallery educators (26%). Both students and researchers received approval from over a third of the users (37% each) whilst only 21% wanted to see paths created by Leisure users. Paths users prefer content created by cultural heritage organisations and professionals to less knowledgeable creators.

The responses to *'How interested would you be in seeing the following types of additional information included in a path?'* were varied but endorse the need for additional information to improve PATHS.



**Figure 77 Additional information for inclusion in a path, Mobile Trials**

The two equally most popular items that the participants would like to see were larger images and the description from the original museum catalogue. For both, 84% of users indicated that they were Very interested or Interested with the remaining 11% remaining neutral. None said they were uninterested. After this, Related paths and Related items were popular with 68% and 78% of users indicating that they were Interested and the rest being Neutral. Recommended paths and Recommended items have a similar profile with 11% of users saying they were Uninterested for both of these.

'Ratings from other users' has a more mixed result with 58% showing strong to moderate interest, 26% being Neutral and 11% Uninterested. 'Comments from other users' was similar but with less positive interest (47%) and more Neutral responses (37%). Finally, 'Item keywords and metadata from the original museum catalogue' had the widest range of responses from 11% being Very Interested, 5% Not at all interested and then all levels between (Interested/Neutral/Uninterested) at 26% each.

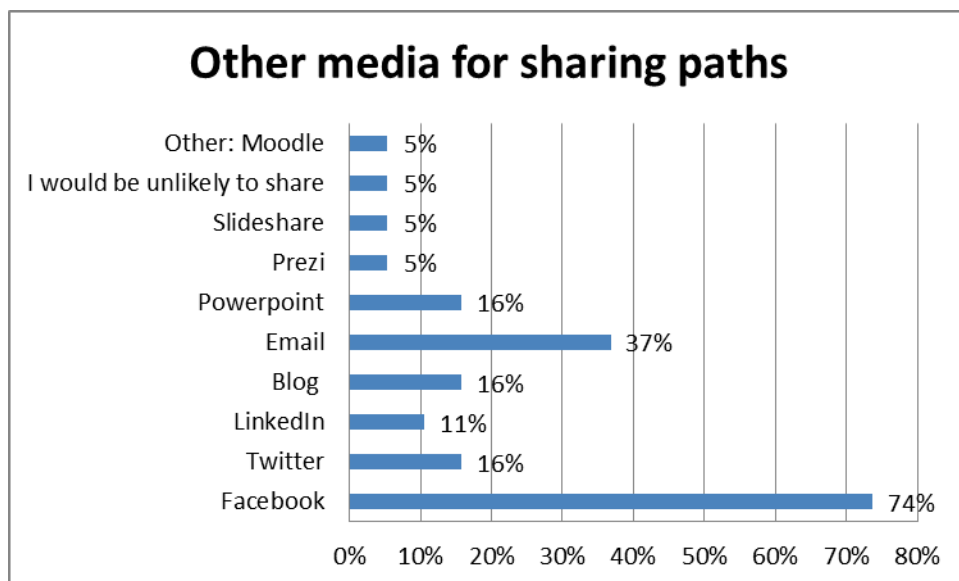


Figure 78 Other media for sharing paths, Mobile Trials

When asked ‘*If you could share a path outside the system, which media would you use?*’, the outstanding choice was Facebook (74%) followed by email at 37%. Twitter, PowerPoint and by Blog (all 16%) and LinkedIn (11%) were likely to be used by just a few of the users with Slideshare, Prezi and Moodle (suggested as alternative Other choice) even less so. 5% of users indicated that they were unlikely to share paths. Other suggested channels (Pinterest, Tumblr, Delicious, Reddit) were not chosen by anyone.

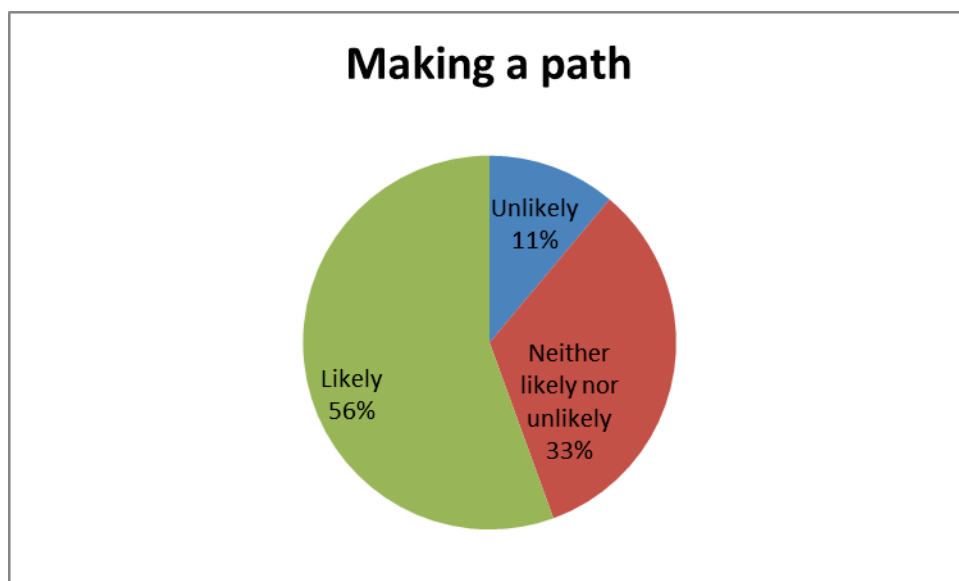


Figure 79 Other media for sharing paths, Mobile Trials

The mobile trail participants were asked ‘*How likely would you be to make your own path from a cultural heritage collection?*’. Just over half of the participants indicated that they were likely to make their own paths with a further third undecided. Only 11% said that they were Unlikely to do this. However, no-one said that they were Very likely to make their own path or, more positively, Very Unlikely.



Figure 80 Preference for sharing paths, Mobile Trials

Three options were provided for the question: ‘If you could make your own path, how would you most prefer to share it?’. The third option ‘Keep your path private’ had zero responses – everyone wanted to share their paths but the majority (61%) would not allow others to edit their shared paths (whilst 39% would).

### 5.5 Responses to usability Semantic Differentials, Mobile Trials

In the final section of the questionnaire participants were asked for their responses to a shortened series of semantic differential scales, rating polar opposite experiences on a 7-point scale of +3 to -3, with a neutral 0 (zero) position at the centre.

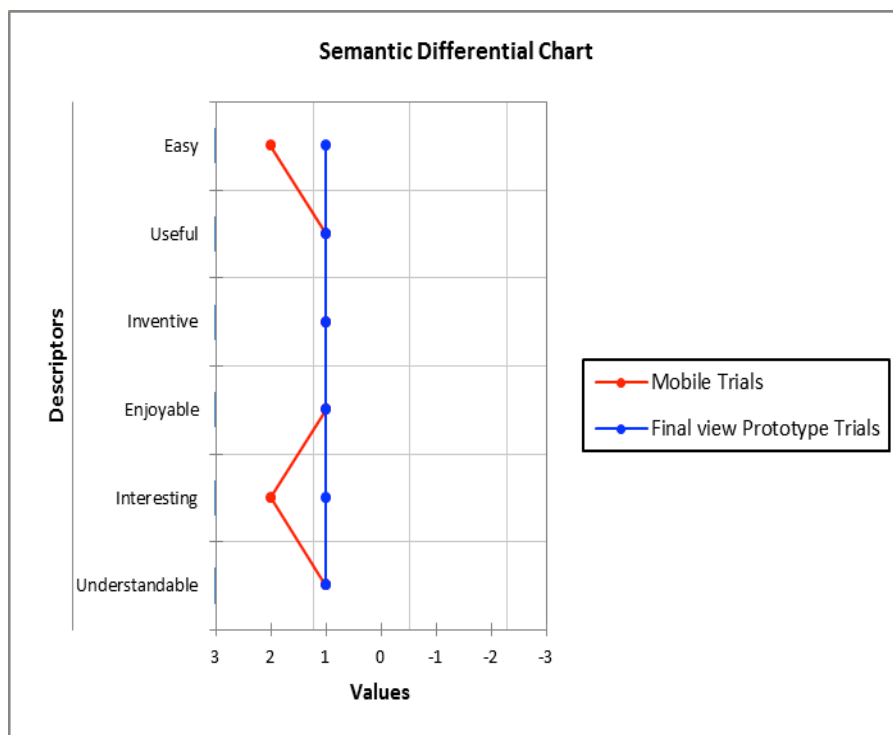


Figure 81 First impressions of PATHS, Mobile Trials

Results to the six semantic pairings by the Mobile Field Trial participants are shown via the red line. This is compared to the final view of participants of the Prototype Field Trials (blue line). This shows a positive response to all six usability aspects evaluated, ranging from +1 to +2, and at least as positive on Useful, Inventive, Enjoyable and Understandable scales and more positive on Easy and Interesting.

## 6. Results of the project-wide activities

Whilst activities undertaken via demonstration sessions and laboratory testing constitutes the main work of PATHS user evaluation, assessment of the different elements of the PATHS system are also being conducted by the technical development partners: i-Sieve, Avinet, The University of the Basque Country and The University of Sheffield. These evaluations are concerned with the system architecture, content processing and enrichment and user interface design. These activities are specifically focussed on systematic, objective evaluation of the building blocks of the system as standalone entities.

### 6.1 System Architecture

An internal review of development of the system architecture revealed three main challenges to the implementation and development of the PATHS system.

- Hardware stability
- Parallel work versus sequential dependency
- Diverging and numerous technologies

#### 6.1.1 Hardware stability

A dedicated physical server was provided to run the first version of the prototype from April 2012 onwards. In the spring of 2013, this server became unstable and occasionally hanged. Analysis of the hardware did not reveal any configuration issues and a decision was made to replace the existing server with a new one, this work was completed in mid-August.

#### 6.1.2 Parallel development of front-end, back-end and processing of data

Another challenge was posed by three different, but interdependent tasks, being executed within the same space of time by four different teams of technical developers. The perimeters of the system were defined by the prototypical development of the end-user interface where the Web API was implemented in parallel. Since the end-user interface was dependent on the back-end system, it was necessary to develop “dummy” services during the development stage. These “dummy” services then became the specification for the implementation of the corresponding back-end service.

The “dummy services” were built on different back-end technologies from those specified in the deliverable D3.1 and accessed via a proxy service on the same server. This reduced the overhead of making HTTP calls between two different server instances and the end-user interface could therefore call more methods and transfer more data between the “dummy” services and the end-user application per page view than what may realistically be expected in a real-life deployment scenario.

#### 6.1.3 Diverging and numerous technologies

The project built a platform based on a data model implemented in PostgreSQL/PostGIS with a parallel full-text search index on the side, Solr. This platform provided Web Services based on Rest principles that would in turn be consumed by a light-weight browser-based end-user client. However, since the different components of the system were developed by partners who had different starting points in terms of baseline technologies, a greater number of technologies were incorporated into the platform.

EHU and iSieve wrote the recommender system and sentiment analysis tools in Java. USFD wrote the user interface applications in Python and AVINET wrote the back-end in C#.NET. While the components were living by themselves, this did not pose any challenge – but once they were integrated into the same server platform a number of issues became evident.

- An application written in Java requires a Java capable servlet container and cannot run directly in Apache or IIS – Tomcat had to be included in the server platform.
- Python have their own web servers – but can be integrated with Apache via a semi-stable interface called WSGI. This only runs on 32 bit setups of Windows servers
- C# requires Internet Information Server (or Mono)
- Each of these three web servers requires a TCP/IP port to be reserved on the server. All public web applications and web services should be served via the standard http port 80 in order to be accessible from everywhere.
- As a consequence, one of the servers would have to be set up as a reverse proxy for the rest of the system – adding a certain overhead to each request.

The challenges added a strain on the technical development teams and on the teams responsible to carry out the end-user trials. A well-functioning prototype was an absolute prerequisite for execution of the evaluation activities and user trials. Some of the technical difficulties which arose from these main issues caused the Prototype to perform less well than had been noted during the demonstration and laboratory activities reported in D5.2.

## 6.2 Content analysis and enrichment

This section presents a quantitative evaluation of the work undertaken in Work Package 2.

The work package is responsible for NLP processing and metadata enrichment of a collection of Cultural Heritage (CH) items. All the details can be found in *Deliverables D2.1* and *D2.2*.

The following tasks were measured in D5.1:

- Content analysis (T2.2): NLP processing of the whole collection, including POS tagging, lemmatization and named entity recognition.
- Ontology extension (T2.3): in this task we address the problem of linking CH items to external vocabularies.
- Intra-collection links (T2.4): we create new relations between CH items, so that two CH items are linked if they are semantically similar.
- Background links (T2.5): we link CH items to external Knowledge Bases or sources such as Wikipedia.

In this deliverable we report additional qualitative analysis on the new software developed in WP2 (full details in *D2.2 Processing and representation of Content for the second prototype, 2012*):

- Ontology extension (T2.3): in this task we address the problem of linking CH items to external vocabularies. New taxonomies have been proposed and automatically linked to the items in the PATHS collections.
- Intra-collection links (T2.4): the links provided in D2.1 have been further enriched with the multidimensional similarity, where similarity in dimensions like similar author, similar location, etc. have been automatically computed.



### 6.2.1 Ontology extension

There is a general demand for taxonomies to organise large collections of documents into categories for browsing and exploration. In WP2 we examined four existing taxonomies that have been manually created, along with two methods for deriving taxonomies automatically from data items. We used these taxonomies to organise items from a large online cultural heritage collection automatically. We then performed two human evaluations of the taxonomies. The first measured the cohesion of the taxonomies to determine how well they group together similar items under the same concept node. The second analysed the concept relations in the taxonomies. The results show that the manual taxonomies have high quality well defined relations. However, the novel automatic method is found to generate very high cohesion. The results of the analysis are detailed in D2.2, Fernando et al. (2012) and a summary is also presented here.

The Library of Congress Subject Headings taxonomy has been manually created for the purpose of organising library collections and so might be the obvious choice to organise CH data online. However the results show that the relations within LCSH are defined less clearly than that of the Wikipedia derived taxonomies. WordNet domains performs at a similar level to the LCSH in terms of the quality of the relations. The LDA topic hierarchy gave poor results in terms of the identified topics. The topic pairs were often unrelated, and had no general-to-specific structure as would be desirable for this application. The WikiFreq hierarchy performed slightly better in this regard. Just over half the concept pairs were judged to be related. Just under a third were labelled as 'Don't know' which may reflect the obscurity of the concept nodes identified. It was hoped that organising the frequency counts of the links would organise the hierarchy into a general-to-specific direction. This was not achieved, although the hierarchy does have the benefit of providing the user with an overview of the collection by immediately seeing which kind of items are most prevalent.

In terms of cohesion, all the taxonomies achieved similar results except for the WikiFreq taxonomy, which achieved almost perfect cohesion. This shows how effective the Wikipedia links are in grouping together similar items.

In conclusion, it was decided that a mixture of WikiFreq (for mapping items to Wikipedia categories) and the Wikipedia taxonomy to yield the taxonomy would give the best results. These results agree with the preferences of the users in the field trials as around 80% liked the thesaurus tool most.

### 6.2.2 Intra-collection links – typed similarity


One of the most requested features by users of Europeana was to show similar and related items, where the interface would explicitly mention the reason for that similarity. Users wanted to know in what sense, and why, an item of a collection was similar to another. Inspired by this request, the UPV/EHU and USFD teams of PATHS (Eneko Agirre, Nikolaos Aletras, Aitor Gonzalez-Agirre, German Rigau, and Mark Stevenson) designed and organized the typed-similarity task, as part of the Semantic Textual Similarity (STS) task, the Shared Task of the

SEM 2013 conference<sup>1</sup> (Agirre et al. 2013b).

In the Typed-similarity task, the items were taken from Europeana, extracting the meta-data describing a cultural heritage item and a thumbnail of the item itself. Systems participating in this task computed the similarity between items, based on the meta-data of the items. The systems had to return a general similarity score, plus an additional score for each type of similarity considered. Following the user studies, we defined seven types of similarity, as follows: similar author or creator, similar people involved, similar time period, similar location, similar event or action, similar subject and similar description.

In order to evaluate the systems, we had previously crowdsourced 5 annotations for each of the selected 1500 pairs of items. Annotators had to select 0 for no relation, 5 for equivalent items, or a number in-between. Fig. 1 shows an example of the annotation task. The systems could use 750 pairs for training, and the rest were used to evaluate the systems. The task attracted 6 teams, submitting a total of 14 runs. The best results scored a Pearson correlation above 76%, comparable to human agreement. The PATHS team performed well, the system they entered ranked second in the official evaluation (Agirre et al. 2013a). The users in the Field Trials liked the recommendations, including the typed similarity relations.

**Item 1**



**Title**  
Sculptured slabs of Aditya and Buddha, photographed at the Bihar Museum.

**Creator**  
Photographer : Beglar, Joseph David


**Subject**  
Bihar Bihar Sharif India Archaeological Survey of India Collections Archaeological Survey of India Collections (Indian Museum Series) Indian sculpture Indian sculpture (Buddhist) South Asia -- History 954

**Description**  
This photograph showing sculpture fragments was taken by Joseph David Beglar in the 1870s. The sculptures were located in the Bihar museum and the photograph is part of the Archaeological Survey of India Collections. A note written by Bloch reads, "The sculptures photographed while exhibited in the Bihar Museum were collected from various places in Bihar, and are now in the Indian Museum."

**Date** [1870] **T**

**Source**

**Item 2**



**Title**  
Buddhist sculpture pieces from Jamal-Garhi. 1003995

**Creator**  
Photographer : Craddock, James

**Subject**  
North-West Frontier Province Pakistan Buddha images Gandharan art Indian sculpture Indian sculpture (Buddhist) museum objects South Asia -- History 954

**Description**  
Photograph of Buddhist sculpture pieces from Jamal-Garhi. This print shows boxed sculpture fragments. A note with Jamal-Garhi prints reads: The plates entered here also include photographs taken from sculptures coming from Takht-i-Bahl and Shahr-i-Buhul. No separate arrangement was possible. Nearly all the sculptures coming from these places are now in the Indian Museum, Calcutta.

**Date** [1880] **T**

**Source**

**General Similarity (required)**

	0	1	2	3	4	5	
Completely Unrelated	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Identical

**Author Similarity (required)**

	Not Applicable	0	1	2	3	4	5	
Completely Unrelated	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Identical

Figure 82 Example of item annotation

<sup>1</sup> SEM was held in Atlanta in June, spanning two days. It was held in conjunction with the the 2013 Conference of the North American Chapter of the Association for Computational Linguistics: Human Language Technologies (NAACL-HLT 2013). It attracted more than 150 attendants.

### 6.2.3 Recommender system experiments

Non-personalized and log-based recommendations are provided by the prototype, and additional experiments have been carried out making use of different sources of information and to provide personalized recommendations, and non-personalized recommendations. Further details about the implementation of these experiments can be found in Deliverable D4.3, a summary is also presented here.

The following recommender algorithms were implemented:

- Baseline-random.
- Simple-keywords, based on Solr search platform.
- Simple-similarity, based on the similarity links.
- Simple-categories, based on Wikipedia categories.
- PPR-similarity, based on Personalized PageRank (PPR) algorithm and similarity links.
- PPR-logs, based on PPR and logs extracted from Europeana portal.
- PPR-categories, based on PPR and Wikipedia categories.
- PPR-wiki, based on PPR and Wikipedia background links.
- PPR-combination, combining all PPR algorithms.

Each of these algorithms was evaluated for these three different scenarios:

- **no profile, item page**: when the user is viewing an item, but there is no profile information because they have not logged into their account. The recommendation system makes a recommendation for the current item.
- **profile, landing page**: when the user is at the general landing page and, as they have logged into their account, their profile information is available. The recommendation system makes a recommendation taking into account the three items of the profile.
- **profile, item page**: when the user is viewing an item and, as they have logged into their account, their profile information is available. The recommender system makes a recommendation taking into account the current item and the three items of the profile.

Transaction logs for the main Europeana portal were downloaded for a 6-month period (from 1 January 2012 to 30 June 2012). Standard pre-processing was applied, for example the removal of non-relevant information (e.g. style sheets) and session segmentation. A 30-minute timeout period of inactivity was the criteria for the session segmentation, based on previous research (Tanasa and Trousse, 2004; Catledge and Pitkow, 1995).

In total, the processed data consisted of 3,245,766 sessions. After filtering out those sessions without any request for items that map to the experimental subset, we had 102,524 sessions (3.2% of the initial log) with 208,584 item views.

For each session we extracted sequences of 5 viewed items, ignoring all other request types. We ignored sequences containing repeated items. This resulted in a set of 28,222 5-item-logs.

For evaluation purposes, a gold standard was created based on the set of 5-item-logs. We selected randomly 1000 5-item-log sequences from the extracted logs. The output of different recommender systems were then judged against this gold standard for the different scenarios as follows:

- **no profile, item page:** Given the fourth item of each 5-item-log as current item, the fifth item is the gold standard recommendation.
- **profile, landing page:** Given the first three items of each 5-item-log as profile items, the gold standard recommendation is the fifth one.
- **profile, item page:** Given the first three items of each 5-item-log as profile items, and the fourth item as current item, the gold standard recommendation is the fifth one.

The main evaluation metric used is Mean Reciprocal Rank (MRR). But the results table also shows the number of times at least one recommendation is given (nrec) for each entry in the evaluation set (i.e. out of 1000).

Results for the single algorithms are shown in the table below.

	<b>no profile, item page</b>	<b>profile, landing page</b>	<b>profile, item page</b>
<b>baseline-random</b>	nrec: 1000 MRR: 0.0000	nrec: 1000 MRR: 0.0000	nrec: 1000 MRR: 0.0000
<b>simple-keywords</b>	nrec: 1000 MRR: 0.0193	nrec: 1000 MRR: 0.0073	nrec: 1000 MRR: 0.0202
<b>simple-similarity</b>	nrec: 875 MRR: 0.0148	nrec: 958 MRR: 0.0076	nrec: 980 MRR: 0.0145
<b>simple-categories</b>	nrec: 669 MRR: 0	nrec: 921 MRR: 0	<i>not implemented</i>
<b>PPR-similarity</b>	nrec: 877 MRR: 0.0086	nrec: 958 MRR: 0.0039	nrec: 980 MRR: 0.0059
<b>PPR-logs</b>	nrec: 996 MRR: 0.0159	nrec: 1000 MRR: 0.0167	nrec: 1000 MRR: 0.0156
<b>PPR-categories</b>	nrec: 338 MRR: 0.0049	nrec: 669 MRR: 0.0008	nrec: 751 MRR: 0.0020
<b>PPR-wiki</b>	nrec: 1000 MRR: 0.0114	nrec: 1000 MRR: 0.0053	nrec: 1000 MRR: 0.0070
<b>PPR-combination</b>	nrec: 1000 MRR: 0.0127	nrec: 1000 MRR: 0.0080	nrec: 1000 MRR: 0.0092

Figure 83 Results of ranking by a single method

It was thought that the recommender systems could be complementary, and so we combined the results rankings summing the rank position of the results. The results of the combined rankings are shown in the following table.

	<b>no profile, item page</b>	<b>profile, landing page</b>	<b>profile, item page</b>
<b>simple-keywords + simple-similarity</b>	nrec: 1000 MRR: 0.0211	nrec: 1000 MRR: 0.0085	nrec: 1000 MRR: 0.0208
<b>simple-keywords + PPR-logs</b>	nrec: 1000 MRR: 0.0489	nrec: 1000 MRR: 0.0269	nrec: 1000 MRR: 0.0555
<b>simple-keywords + PPR-logs + simple-similarity</b>	nrec: 1000 MRR: 0.0493	nrec: 1000 MRR: 0.0286	nrec: 1000 MRR: 0.0565
<b>simple-keywords + PPR-logs + simple-similarity + PPR-wiki + PPR-intra + PPR-categories</b>	nrec: 1000 MRR: 0.0414	nrec: 1000 MRR: 0.0194	nrec: 1000 MRR: 0.0272
<b>simple-keywords + simple-similarity + PPR-combination</b>	nrec: 1000 MRR: 0.0318	nrec: 1000 MRR: 0.0148	nrec: 1000 MRR: 0.0316

Figure 84 Results of combined rankings

The results show that the best algorithm is different depending on the scenario. PPR-logs is the best for “profile, landing page” scenario. But, simple-keywords is the best for “item page” scenarios (both no-profile and profile scenarios). In fact, the ranking of the systems is the same for both the “no profile, item page” and “profile, item page” scenarios. That reveals that systems on “profile, item page” do as well as non-profile scenario, which is a more difficult problem. The combination of the different PPR graphs does not seem to work, as PPR-comb is always below PPR-log.

Regarding the combination of different recommendation ranks (i.e. Figure 84 Results of combined rankings), the best results are obtained when combining simple-keywords with PPR-logs and simple-similarity, beating the results of single algorithms for all scenarios.

### 6.3 Review against the Functional Specification

The functionality provided by the final prototype has been evaluated against the functionality specified in *D1.5 Functional Specification for second prototype (2012)*. The table below shows all user requirements by Priority together with the functional specification they relate to, their implementation status and, where applicable, explanatory notes. Three implementation statuses are used:

- Complete: The requirement is fully implemented.
- Partial: Parts of the requirement have not been implemented or work differently than specified in D1.5.

- Not implemented: The requirement has not been implemented at all, see the Notes for explanation.

Overall the majority of the top-priority user requirements and functionality have been implemented in the final prototype.

<b>Spec #</b>	<b>Req #</b>	<b>Title</b>	<b>Priority</b>	<b>Status</b>	<b>Notes</b>
5.1	F.5	Edit Profile	MUST	Complete	
5.1	F.6	Visibility of Profile	MUST	Complete	
5.1	F.9	Terms and Conditions	SHOULD	Not implemented	
5.1	F.10	Upload profile image	COULD	Not implemented	
5.2	F.11	Add to Workspace	MUST	Complete	
5.2	F.12	Re-arrange Workspace	MUST	Complete	
5.3	F.14	Search ordering	MUST	Not implemented	The metadata was not complete enough for reliable ordering (e.g. for ordering by creation date)
5.3	F.16	Search list → explore with tag/image	MUST	Partial	Alternative ways of viewing search results were provided, i.e. the semantic map
5.3	F.17	Spell check suggestions	SHOULD	Complete	
5.3	F.18	Enhanced search result display	SHOULD	Complete	
5.3	F.12	Search the user's workspace	COULD	Not implemented	
5.5	F.22	Extended path creation functions	MUST	Complete	
5.5	F.28	Visibility of Paths	MUST	Complete	
5.5	F.29	Improved editing UI	SHOULD	Complete	
5.5	F.30	Improved path overview	SHOULD	Complete	
5.5	F.31	Collaborative paths	COULD	Not implemented	
5.7	F.35	Web content as object	COULD	Not implemented	
5.8	F.37	Control tags from authors	COULD	Not implemented	
5.9	F.38	Rate paths	COULD	Not implemented	
5.9	F.39	Aggregate ratings	COULD	Not implemented	

Spec #	Req #	Title	Priority	Status	Notes
6.1	F.46	Collection overview visualisations	MUST	Complete	
6.1	F.47	UI integration, consistency and clarity	MUST	Complete	
6.1	F.48	Integrated help	MUST	Complete	
6.1	F.49	Usability improvements	MUST	Complete	
6.2	F.50	Access to WP2 similarity and links	MUST	Complete	
6.3	F.51	Relatedness of paths	SHOULD	Not implemented	
6.4	F.52	Record user's behaviour	MUST	Complete	
6.4	F.53	Classify users based on behaviour	SHOULD	Not implemented	
6.4	F.54	Cognitive styles recorded on profiles	SHOULD	Not implemented	
6.5	F.55	Flexible recommendations	MUST	Partial	Spec 6.5 and 6.6: Recommendation algorithms have been developed using Europeana log data. This is an active research area and the approaches developed were not mature enough to go into the prototype for user testing.
6.5	F.56	Personalised recommendations	MUST	Partial	
6.5	F.57	People who viewed this also looked for...	MUST	Partial	Implemented in P2 as <i>non-personalised recommendation</i> using data from the Europeana logs. However, these do not appear frequently due to data sparseness
6.6	F.58	Online tutorial	SHOULD	Complete	
7.1	F.59	General users functionality	MUST	Complete	
7.2	F.60	Registered users functionality	MUST	Complete	
7.3	F.61	Administrator	MUST	Complete	

<b>Spec #</b>	<b>Req #</b>	<b>Title</b>	<b>Priority</b>	<b>Status</b>	<b>Notes</b>
7.4	F.62	Registered users create/join/leave groups	COULD	Not implemented	
7.4	F.63	Users can see other members of their groups	COULD	Not implemented	
7.5	F.64	Visibility of contributions	MUST	Complete	

**Figure 85 Review against the Functional Specification**



## 7. Discussion

Digitisation of cultural heritage assets held by museums and institutions enables access to a much greater variety and quantity of material than can be achieved through physical displays. Tools such as PATHS bring additional added value when utilised by experienced staff and/or knowledgeable end users to bring together related items and to present new themes, enriched by additional information. Cultural collections should be able to exploit their collections better by presenting information to end users in the form of exciting new paths. As PATHS is an interactive tool, educators can take predefined paths and adapt them for their students, and all end users can contribute and add the existing PATHS as well as create their own paths from the materials available. In addition, when using material from a variety of sources, digital assets can be combined into a path in a way that is difficult to achieve with physical objects.

The following section presents comparisons of the Field Trial results with those from the first and second prototype evaluations.

### 7.1 Response to key functionality of PATHS

#### 7.1.1 Finding and following a path

Functions for finding a path included Search and Explore. A simple quick search function was available, by clicking the tab Search the main search screen appeared. The search screen included a list of keywords which the user could select from, a single free-text search field as well as a scrolling field of sample content thumbnails representative of the contents of each of the keywords. The keywords were derived from the data processed in *D2.1: Processing and Representation of Content for First Prototype* and *D2.2: Processing and Representation of Content for Second Prototype*.

Results from P1 and 2 (reported in D5.2) rated ease of use of finding a path highly, and overall, the second prototype was an improvement on the first. The flexibility of following a path also improved in the second prototype, going from around 50% to an average of around 80% for both groups combined.

The majority of participants of the Prototype Field Trials thought finding paths was 'Very easy' or 'Easy', and most thought it was 'Very useful' to 'Neutral' to find paths. The responses on the Inventiveness measurement were spread evenly across the seven respondents from one 'Very inventive' to two 'Conventional'.

Four people found following a path 'Very easy', two were neutral and one found it 'Very complicated'. It is not clear why there is this one extreme viewpoint as there is no corresponding explanation in the suggestions for improvement. The usefulness of following a path was mixed (but not negative) with responses equally split between 'Very useful' and 'Neutral'. The response to the inventiveness of following a path was positive with four people rating it as 'Inventive', one as 'Very inventive' and one 'Neutral'.

Participants were of the Mobile Field Trial rated finding a path as Easy (47%) with a further 26% as Very easy. The results were similar when asked about following a path. Most users

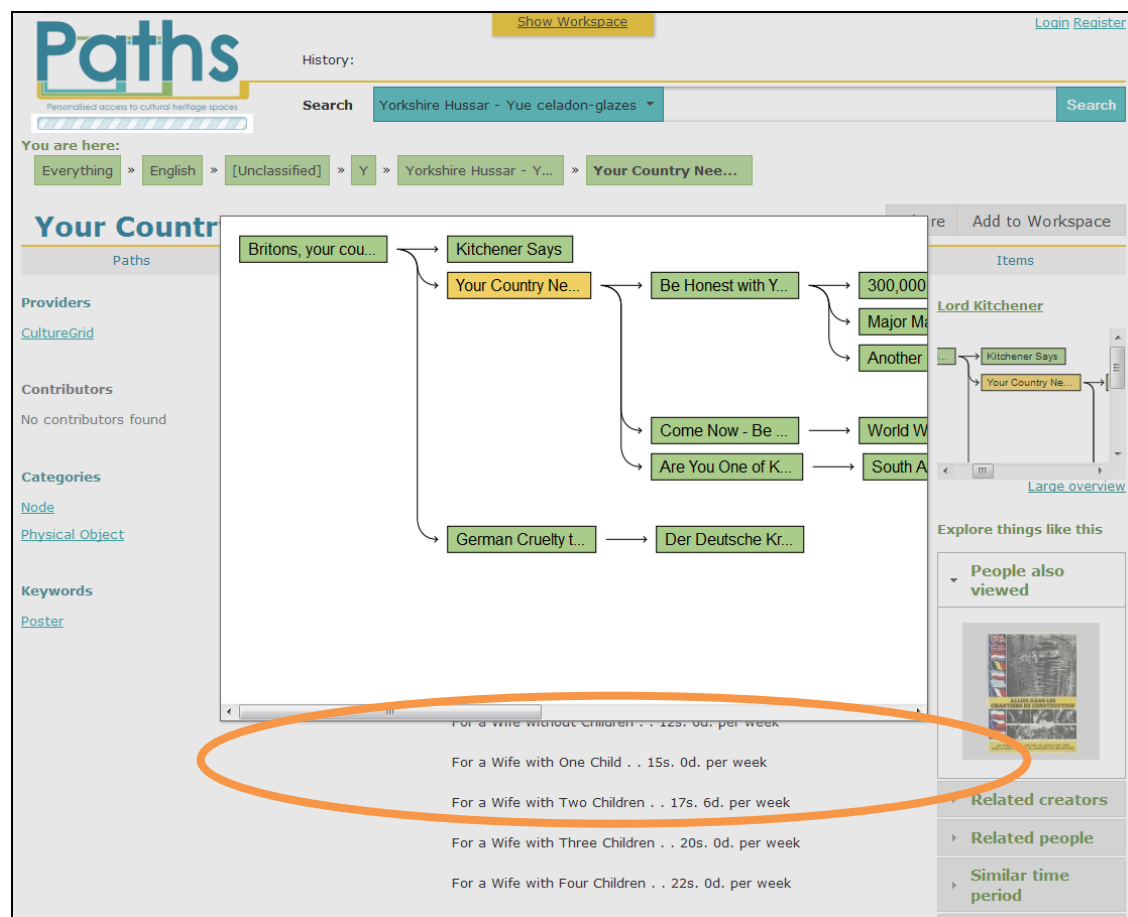
(77%) rated this as Very easy/ Easy. The majority of the PATHS users rated their experience as Flexible (58%) or Very flexible (26%) so 84% in total.

However, some participants initially had difficulty finding paths in the mobile application. If there are no results for a query, the screen remains blank, rather than displaying a message such as “No results found”. One user noted, “I found it hard to get started finding the paths. I searched for things but nothing came up and there were no instructions”. This issue could be solved by addressing a comment from other users, who suggested that being able to browse all of the paths would be better than only being able to search them, since the users were not familiar with the contents of the collection. The user who asked for “better ways of finding paths when you don’t know what is in there” would likely have benefited from the alternative exploration options in the main prototype, such as the thesaurus, map, and tag cloud features.

Some differences could be observed in finding and following a path, particularly in the mobile application. For example, one user made an interesting observation regarding navigation in the mobile app: “Seems odd that it’s possible to go to any node in the path by clicking on it in the overview. Surely the aim is to follow the path by going from one item to the connected ones to follow the narrative”. This functionality is also technically present in the full prototype: arrows between the nodes display the original order as determined by the path creator, but users have the flexibility to “follow” a path in any order they choose by clicking on any node at any time. The potential for following paths out of sequence is more pronounced in the mobile app version of the system, because a much higher proportion of the overall path is displayed in the mobile app than in the prototype (compare Figure 86 with Figure 87 below).

Figure 86 Full node in prototype (Following mode): note “Large overview” area outlined in orange

A pop-up of the large overview can be accessed by clicking on the “Large overview” link, but it may not display the entire path if it is extensive and has a complex branching structure (see Figure 87 below).



**Figure 87 Large overview in prototype: note only half of the path is visible**

This issue is related to one that was discussed in the field trial focus groups: users want a comprehensive overview of each path at a glance before they decide to follow it, and they also need a way to distinguish which nodes they have viewed when they return to the overview if they do not follow the path in order.

One of the main objectives of the PATHS system is to support the four user persona types (expert path creator, non-expert path creator, expert path facilitator, and non-expert path consumer) in the context of the five activities in the interaction model (consume, concept, collect, create, and communicate). To this end, it is important to provide both flexibility and stability at the same time. The participants in the prototype field trial reported following paths to discover ways of structuring their own paths, so they skipped nodes and went back and forth to establish the parameters of the paths rather than strictly reading each node in order.

It may be argued that berrypicking (Bates, 1989) is an appropriate way to begin to navigate a branching or complex branching path; however, there is a distinct textual narrative in the linear path “The Love Song of J. Alfred Prufrock” (see Figure 88 below).

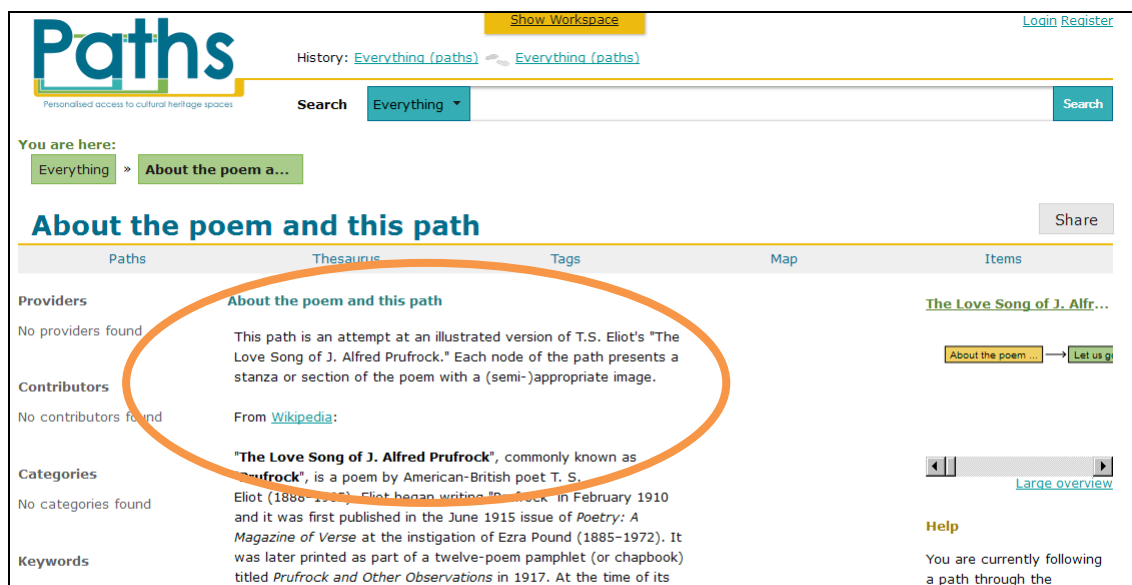


Figure 88 Full node in prototype: note explanation in orange

This path is explicitly intended to be followed in a linear fashion, and while that pattern is visible to an extent in the large overview from the prototype (see Figure 89 below), it is much more apparent in the overview from the mobile app (see Figure 90 below).

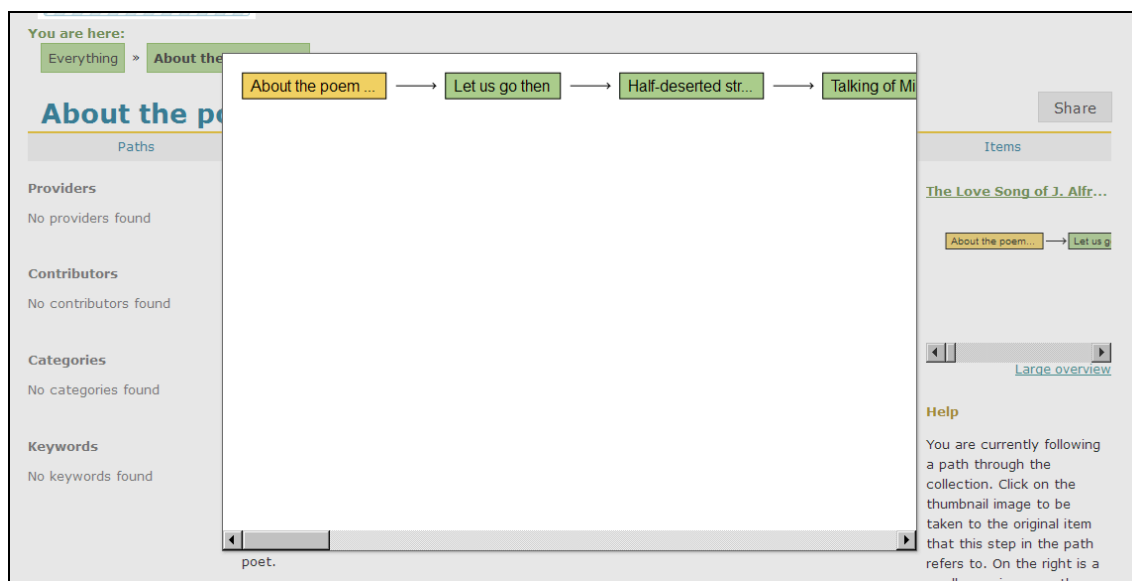


Figure 89 Large overview in prototype

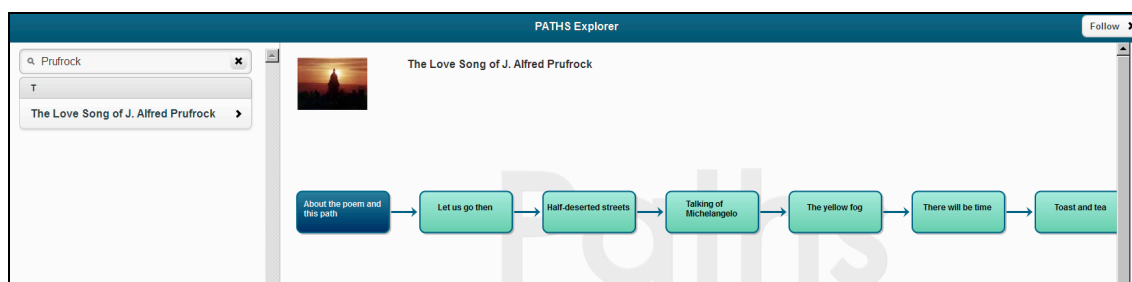


Figure 90 Overview in mobile app

The difference between the two systems may provide advantageous for different types of users in different contexts. If the user wants to read the information in the nodes of a path in a pre-defined way, then it may be less distracting to do so the prototype; conversely, if the user would like to have a quick visual overview of the shape and structure of the path, then it will be more comprehensive via the mobile app. Ultimately, the choice of how to navigate paths will be made by each individual user and may change many times during the course of a session. It is worth bearing in mind that the number of nodes visible in the overview of a path and the way they are displayed both have an effect on how users perceive and use the PATHS interface.

Participants of the Mobile Trials were frustrated by the lack of functionality, content, and context. As one user expressed it, "I'm not sure what I'm looking at. Where did the pictures come from? Who wrote the descriptions? Why are there so many without descriptions?". Another user was confused by the fact that all of the paths have different structures.

The most common request in participants' responses was that more help and instructions are required to make the mobile app "user friendly". Also, echoing every evaluation ever done on the PATHS system, users want more content, including videos. In addition, they want more information about every aspect: what the system does, what the system is for, where the pictures came from, who made the paths, and more information in the paths themselves. It is clear that while participants like the look and feel of the mobile app, they cannot comprehend its context without reference points to the prototype system.

### **7.1.2 Exploring with PATHS**

Exploration of cultural heritage collections forms a key area of research within PATHS. In the first prototype exploration was offered through two functions: in the first function, the screen which appeared when clicking the Explore tab showed a cycling slideshow of items and item-titles from the underlying collections, providing the user with random suggestions of content to explore. The second function comprised a Tag Cloud, which gave a view of all the items with a thumbnail image and a title. This allowed end-users to browse the collections visually. By clicking on either of the thumbnails, the corresponding item was displayed.

Exploration functionality was greatly extended in P2, with Thesaurus, Tag Cloud, Map and Item options comprising the different exploration modes. The Thesaurus page displays the thesaurus hierarchy using indentation to represent the parent - child relationship. Additionally to give the users an idea of what they can expect to find if they select a topic in the hierarchy, for each topic the number of sub-topics, items, and paths are displayed.

The main area of the Tag Cloud shows the sub-topics for the current topic with the size of each sub-topic representing the number of items within that sub-topic. Moving the mouse over any of the sub-topics displays the number of sub-sub-topics, items, and paths within the sub-topic. All other components and the potential interactions they offer are the same as on the Thesaurus page.

As is the case with the Thesaurus and Tags Cloud, the Map is initially zoomed and centred on the current topic. The Map page consists of the map itself and the zoom control that can be used to zoom in and out of the map. The Map is not a spatial map, but a semantic map that

represents the thesaurus hierarchy in a two-dimensional arrangement. While the thesaurus and tags pages represent information such as the number of items in a topic textually, in the map this information is represented by the size of the topic areas shown on the map. All other components are as on the Thesaurus page.

Overall, results from D5.2 showed that both evaluation groups liked the Thesaurus method best (82% and 79%) with the Tag cloud being a second choice and the Map third. Both the Map and Tag cloud were less popular with the Laboratory group than the Demonstration by around 18% and 15% respectively. Overall, ease of use improved in the second prototype and the Thesaurus was the preferred exploration method.

In the Prototype Field Trials the 'Search box' was by far the most popular first choice of tool (80%) and was chosen as one of the top three tools by all the participants. The Thesaurus was the second most popular first choice and also second most popular tool overall, closely followed by 'Browsing multiple pages of search results'. The other methods were chosen by three people as second or third choices with the exception of the Map, which did not feature at all. For exploring content, six users browsed the search results, and half this number used the other methods equally, i.e. 'Related and recommended items' and the 'Search results filters'.

The 'Search box' was rated as very easy and easy by 80% of the users with only one person rating this as 'complicated'. The Thesaurus and the Related and Recommended Items did not present any problems for users, although these were the least used tools. The Tag Cloud, however, presented more of a challenge – there were no 'Very easy' ratings although four people found it 'Easy' and a further two were Neutral. However, two people rated the Tag Cloud as 'Complicated' and another as 'Very complicated'. The Map also produced a wide range of ratings (from two 'Very easy' to one 'Very complicated'). Whilst the mixed ratings for the Tag Cloud might be expected (this is a relatively new approach), the ratings for the map are more surprising as these to range from 'Very Easy' to 'Very Complicated' in equal measure.

The 'Search Box' was rated the most useful (80%) with one person rating it as 'Useless' (at odds with the majority). The 'Thesaurus' and the 'Related and recommended items' were the next most useful tools. The 'Tag cloud' produced a mixed reaction, from one 'Very useful' to one 'Useless' whilst the 'Map' fared badly – the best ratings were 'Neutral' with three people rating the Map as 'Useless'.

The ratings for inventiveness are not quite what might be expected. Given that the 'Search box' is a ubiquitous tool and the 'Tag cloud' is much more unusual and that the participants appeared to have problems with the Map, it is the Map that gets two 'Very Inventive' ratings whilst the Tag Cloud gets none. When 'Very inventive' and 'Inventive' are considered together, the Thesaurus rates slightly higher than the Map and Tag cloud. Overall, the 'Search Box' and 'Related and recommended items' have the most 'Conventional' ratings with the latter being the only tool with 'Very conventional' (two people) which is in line with expectations.

### 7.1.3 Path Creation

In the **first prototype** the path creation screen included a form on the left where information about the path such as title, description, tags and duration could be entered. On the right/centre part of the screen, the nodes of the path were listed. Buttons to save drafts or publish the path for public viewing were available above the nodes. The title of each node was by default that of the item it was based on, but was editable using the user interface. Using the “edit” pencil button which was displayed to the far right of the title of each node, other node metadata could be edited.

When a path was created it was available as a separate information element through the user interface and could be viewed just like an item. The path-viewing screen included basic metadata on the path including: suggested paths; possibility to interact with social networks; add ratings; comments or tags; and choose whether or not to follow the path. If the user chose to follow the path, the screen showing the node appeared. The node screen consisted of information on the path on the left hand side of the screen, including a list of crossing paths (paths which include one or more identical items). The right/centre side of the screen was occupied by information about the node itself including all user specified metadata such as title, description etc.

The screen allowed for user interaction including social network bookmarks, rating and comments. A set of buttons connected by “breadcrumbs” were shown directly above the node information, providing functions to move to the next or previous node.

In the **second prototype** the path creation function was developed and extended considerably. The Workspace consists of the workspace item area and buttons to create a path, refresh the workspace, and clear the workspace. For each item the thumbnail, title, and user's notes are displayed along with two buttons to edit the notes and remove the item from the workspace. The workspace supports the following primary interactions: 1) Clicking on the item's title or thumbnail to be taken to the Item page for the item; 2) Clicking on the Create Path button to create a new path and be taken to the Path editing page and, 3) Clicking on the Edit Notes button for an item to edit the notes associated with the item.

The user accesses the Path editing page either by clicking on an edit link for one of their own paths or by clicking on the Create path button in the workspace. The path-editing component has changed significantly from the first prototype; the path editing interaction design was completely redesigned. The page consists of a toolbar and the main area for laying out a path. The toolbar consists of the preview button that launches a preview of the path in its current state and the edit path meta-data button that shows the path meta-data and lets the user edit it. To publish a path the user opens the path meta-data and selects the desired access rights.

In the main area for laying out a path the individual path nodes and the relationships between the nodes are shown. The user can re-arrange the path nodes by dragging and dropping them to their new location. As the user is dragging the node the area for laying out a path highlights where the node will be moved to if the user drops it. The same mechanism is used to add new nodes to the path by dragging in items from the workspace. Each node also has preview, edit, and delete buttons that the user can use to preview individual nodes, edit the text associated with a node and delete the node. If the user selects to preview or edit a node, then they can

easily switch between the two modes in using the buttons provided in the node editing user interface.

Results from evaluation of P1 and P2 found that Path creation was easier in the first prototype. However, given that the functionality and options greatly increased between the two prototypes this would be expected. Responses of 72% and 59% for the Demonstration and Laboratory evaluators respectively are positive regarding the Ease of use for PATHS. Responses regarding Usefulness were very positive (79% to 89%) which suggests that the PATHS concept is highly popular and has been quite well implemented given the Ease of Use ratings. Path creation in the first prototype was rated more Very Inventive/Inventive than for the second, the Laboratory group being 20% more positive than the Demonstration group. The Demonstration group response dropped by 4% for the second prototype and by 12% for the Laboratory group (some of whom had also evaluated P1). Overall, the responses are positive.

Results from the Prototype Field Trials showed that most participants created at least one path (some created two and one person managed four paths), and created a wide and varied selection of paths from the content available. It should be noted that technical problems meant that the field trial participants may have attempted to create more paths but were not able to publish them. One user commented: "I created loads and loads of paths, but because of system error only one got saved."

The top features in terms of usefulness were the 'Search box' (80% rated as 'very useful'), 'Browsing multiple pages of items' and 'Search filters (facets)' - all rated 'Very easy' or 'Easy' with one Neutral for the last two features. The features rated the next most useful was the Thesaurus. The other three features had mixed ratings with the Map rated the worst, receiving 'Neutral', 'Useless' and 'Completely useless' ratings. 'Selected items' and the 'Tag cloud' had a wide range of ratings.

Of the seven people who used Keywords and Metadata, five rated this feature as 'Very useful', one as 'Useful' and one as 'Completely useless'. Despite this one negative rating, it appears that the majority of participants rated this feature highly. Background information from Wikipedia was used by four people who rated this as 'Very useful' or 'Useful'. Related and recommended items had a slightly more mixed response. More people (seven) used this feature, which received the same number of positive ratings as the Background information feature with two 'Neutral' and one 'Useless' rating.

Images were the most popular feature used for selecting items for inclusion in paths. The title was the next most popular, followed by the text description, with the keywords and metadata being the least used. This concurs with the previous comments about the poor metadata – if the provided metadata were improved, it is likely this feature would be used more.

The most popular method for ordering items in a path was by Narrative, then by Theme, with one person opting for 'Interestingness'. The Other comment was 'Did not complete a path'. No one opted for Chronological or Geographical ordering by Importance or 'No particular order'.

Nearly everyone (80%) found collecting items in the Workspace 'Very easy' or 'Easy'. Moving items from the Workspace into the path was nearly as well rated, with one person finding this 'Complicated' and one 'Very complicated'. Adding text nodes was similarly rated, as is



Describing the path/adding metadata and Annotating items in the path (in these cases, there are 1-2 less 'Easy' and 1-2 more 'Neutral' ratings). The two most difficult operations for users were arranging items in a path: four people found this to be 'Complicated' or 'Very complicated', whilst Publishing/sharing a path had the least 'Very easy/Easy' ratings (30%), three 'Neutral' ratings (30%) and one each for 'Complicated' and 'Very complicated'. Note, that the same participant rated all the options as 'very complicated' (except Collecting items, which was rated 'Complicated'). Another person was unable to create a path (Did not use).

There appears to be a very mixed set of opinions regarding how easy it was to create a path. Half (50%) the participants found this to be 'Very Easy' or 'Easy', two were Neutral, and four people rated the process as 'Complicated' or 'Very complicated'. The response to the usefulness of creating a path was more positive – half found this to be 'Useful' with one more person rating it as 'Very useful'. Three people rated it as 'Neutral' with one person rating it as 'Useless'. Likewise, the ratings for the Inventiveness of path creation was also quite positive. Three people rated this as 'Very inventive', a further two as 'Inventive' with the other five ratings being 'Neutral'.

## 7.2 Overall response to PATHS

There were many areas of positive responses to the Prototype. These are summarised according to top level functionality of the system.

### Finding and following a path:

The majority of participants to both the Prototype and Mobile Trials did find paths easy to find and follow, and useful and inventive. Participants found following paths useful because:

- It gave them structural examples (e.g. to see how nodes were laid out, to compare the balance of image and text nodes, to see the "journey" between the nodes, and to see how paths were "introduced")
- It gave participants confidence and reassurance that their paths were "in the ballpark"
- It's easy to find a path if you know what you're looking for
- Following paths could be useful, especially with a group of students

### Exploring with PATHS:

- Search was a popular feature
- Some users browsed for items in the thesaurus
- The thesaurus feature is ideal for true browsing (with no specific goal)
- A few users filtered their search results by using the left-side facets; likewise, a few followed the right-side recommended items
- Several users collected items over a series of sessions
- Many users reflected on their collection and creation strategies outside their system sessions and changed their behaviour accordingly

### Path Creation:

- Users enjoyed "playing around" with different structures and node organisation concepts
- Most users created their paths in a single session, but some developed an outline structure first and filled in during subsequent sessions

- Some participants structured their paths only after collecting all of their items, and the content of the items they collected influenced the structure
- Structures were determined by narrative flow, item type, and representation of physical path (tour guide through historic buildings)
- Several users added text nodes, but very few of them changed the descriptions of image nodes
- Users had a fluid idea of when their paths were “finished”: most of them see paths as open-ended and always ready for further development, if more content were to be added to the system

### **General:**

Overall participants liked the ‘simple’, ‘clear structure’ and ‘uncluttered’ design, and responded that the interface was easy to use and easy to navigate between different functionality of the system. The paths themselves were also found to be ‘interesting’ and ‘liked’ and were thought to be ‘useful for classes’ as well as for ‘general enjoyment’. Links out to other resources were also liked, as was the level of interactivity, design and functionality PATHS offers.

Whilst the overall response to PATHS was positive there were a few areas which could be further developed, these can be summarised as:

### **Exploring with PATHS:**

Some participants found PATHS slow to respond and not always ‘intuitive’, difficulties with the Map were apparent as some participants wanted it to be ‘clickable’. The Map is clickable and interactive, but did operate slowly during some of the Field Trials and this may have impacted on participants’ experience with it. Some problems searching by category were noted, and confusion as to how searches were refined were reported.

### **Path Creation:**

Some participants found path creation difficult, for example ‘it’s so hard to use, must be made easier’ and ‘make it less fiddly. Adding nodes is not intuitive’. Additional Help at this point would be useful, as one participant put it ‘more instructions that could be turned on or off as needed. I needed a fair amount of help getting started, but was fine once I figured things out’.

### **General:**

Overall it was clear that additional Help would alleviate the majority of the difficulties participants encountered with the system. Some confusion was apparent in the use of some terminology, for example Tags, some participants thought it indicated user-generated content, while others understood that it was derived from the original metadata. Confusion was also evident regarding the functionality and purpose of the Map, as an innovative approach to visualisation this was a new, and very different, way to explore a collection. It was also noted that the hierarchy of the Thesaurus could be presented more clearly, by further indentation, or colour coding.

Items without images and broken links were a source of frustration to participants and participants did not understand the green “You are here” topic structure—they assumed it to be their own history and were confused by the box titles that did not match pages they looked at.

The results of the field trials have helped to highlight the main issues arising when participants actively engaged in undertaking various information based tasks in the PATHS system and provide a useful basis for discussion on the further development of systems which seek to develop new approaches to access to cultural heritage collections, and may inform future work in the wider research areas related to the project.

## 8. Conclusions

It is pleasing to note that the majority of participants involved in the evaluations of the PATHS prototypes (first, second and mobile) responded positively finding PATHS *usable, organised, creative, likeable and useful*, and supportive of exploration of cultural heritage collections. The system was also seen as offering novel functionality that could be useful in a number of different user scenarios.

The majority of participants indicated that PATHS supported *Finding items related to a topic* and *Exploring what content is available in a collection* and *Creating resources from cultural heritage collections*. *Serendipity/discovering new things* and *Developing ideas* were also well rated. The tasks that PATHS supported the least well were *Fact-finding* and *Communicating with other users*. The majority of users indicated that they would like to see paths created by *cultural organisations* and *curators*, with some interest also noted for *Lecturers/Teachers* and *Museum/Gallery educators*.

Whilst there have been many positive responses to PATHS there are areas where further investigation could be undertaken, which centre around system operation, presentation and content. The most common issues appear to be related to the metadata, which needs to be improved at the source (and is outside the scope of this project), and the functionality of the Map tool. Participants also felt that additional onscreen Help would have been useful.

The main issues arose when participants actively engaged in information based tasks using the PATHS system. They provide a useful basis for discussion on the further development of systems which seek to develop new approaches to access to cultural heritage collections, and may inform future work in the wider research areas related to the project.

Project-wide evaluation activities also provided important assessment of PATHS, results of which are reported here and in individual reports related to the *PATHS system and its architecture*, the *Paths user interface* and *Content processing and enrichment*. Technical testing of the different elements of the system specifically sought to identify whether the specified functionality was present and working (as measured against *D1.5 Functional Specification for second prototype*, 2012); that system performance was robust and reliable and, that the scalability and quality of content enrichment was good. These evaluation activities have enabled us to objectively measure PATHS to assess accuracy, reliability and scalability

Finally, results of the Field Trials, coupled with those reported in D5.1 and D5.2, have enabled us to confirm that the PATHS prototype does meet user requirements as identified in D1.1 User Requirements Analysis (2011). PATHS is viewed as an application that is best for *searching, exploring* and *creating resources* by individuals using cultural heritage collections. It allows users to create personalised stories within cultural collections and, if following a path from a cultural organisation, offers meaningful guidance about the interpretation of cultural works. Users are provided with innovative ways to access and utilise the contents of digital collections that enrich their experiences of these resources and facilitates innovative access to which better supports knowledge discovery and exploration.

## 9. References

Agirre E., Aletras N., Gonzalez-Agirre A., Rigau G., Stevenson M. (2013) UBC UOS-TYPED: Regression for typed-similarity. *The Second Joint Conference on Lexical and Computational Semantics (\*SEM 2013)*

Agirre E., Cer D., Diab M., Gonzalez-Agirre A., Guo W. (2013) \*SEM 2013 shared task: Semantic Textual Similarity. *The Second Joint Conference on Lexical and Computational Semantics (\*SEM 2013)* ISBN 978-1-937284-48-0

Baddeley, A. (1968). A 3 min reasoning test based on grammatical transformation. *Psychometric Science*, 10, 341-342.

Bates, M. (1989). The Design of Browsing and Berrypicking Techniques for the Online Search Interface. *Online Review* 13(5): 407-424.

Borlund, P. and Ingwersen, P. E.R. (1997). The Development of a Method for the Evaluation of Interactive Information Retrieval Systems. *Journal of Documentation*, 53(3), 225-250.

Borlund, P. (2009). User-Centred Evaluation of Information Retrieval Systems. *Information Retrieval*: 21-37.

Bryman, A. (2012). *Social Research Methods* (4th ed.). Oxford: Oxford University Press.

Card, S. K., Robertson, G. G., and Mackinlay, J. D. (1991). *The information visualizer: An information workspace*. *Proc. ACM CHI'91 Conf.* (New Orleans, LA, 28 April-2 May), 181-188.

Catledge, L., and Pitkow, J. (1995) Characterizing browsing strategies in the world-wide web, In *Proceedings of the Third International World-Wide Web Conference on Technology, tools and applications*, Vol. 27.

Christensen, P.A., Guilford, J.P., Merrifield, P.R. & Wilson, R.C. (1960). *Alternate uses*. Beverly Hills: Sheridan Psychological Services.

Chamorro-Premuzic, T. and Reichenbacher, L. (2007). Effects of Personality and Threat of Evaluation on Divergent and Convergent Thinking. DOI: 10.1016/j.jrp.2007.12.007. To appear in: *Journal of Research in Personality*.

Creswell, J.W. (2008) *Research design: Qualitative, quantitative, and mixed methods approaches*. Sage Publications.

D1.1 *User Requirements Analysis* (2011) <http://www.paths-project.eu/eng/Resources>

D1.3 Functional Specification of the first PATHS prototype (2011) <http://www.paths-project.eu/eng/Resources>

D1.5 Functional Specification for second prototype (2012) <http://www.paths-project.eu/eng/Resources/D1.5-Functional-specification-for-second-PATHS-prototype>

D2.1: Processing and Representation of Content for first Prototype (2011) <http://www.paths-project.eu/eng/Resources/D2.1-Processing-and-Representation-of-Content-for-First-Prototype>

D2.2: Processing and Representation of Content for second Prototype (2012) <http://www.paths-project.eu/eng/Resources>

D3.1 System architecture specification (2011) <http://www.paths-project.eu/eng/Resources>

D5.1 Evaluation of the first PATHS Prototype (2012) <http://www.paths-project.eu/eng/Resources/D5.1-Evaluation-of-the-1st-PATHS-Prototype>

D5.2 Evaluation of the second PATHS Prototype (2013).

Felder and Soloman's *Index of Learning Styles Questionnaire*  
<http://www.engr.ncsu.edu/learningstyles/ilsweb.html>

Fernando S., Hall M., Agirre E., Soroa A., Clough P. and Stevenson M. (2012) Comparing taxonomies for organising collections of documents. *In Proceedings of The 24th International Conference on Computational Linguistics (COLING 2012)*

Fink, A., Grabner, R.H., Benedek, M. & Neubauer, A. C. (2006). Divergent thinking training is related to frontal electroencephalogram alpha synchronization. *European Journal of Neuroscience*, 23, 2241-2246.

Järvelin, K. (2011). Evaluation. In: Ruthven & Kelly, D., Eds. *Interactive Information Seeking, Behaviour and Retrieval*. London, Facet Publishing: 113-138.

Järvelin, K. & Ingwersen, P. (2004). Information Seeking Research Needs Extension Towards Tasks and Technology. *Information Research* 10(1): 10-11.

Kelly, D. (2009). Methods for Evaluating Interactive Information Retrieval Systems with Users. *Foundations and Trends in Information Retrieval*, 3(1—2), p.1-224.

Miller, R. B. (1968). *Response time in man-computer conversational transactions*. *Proc. AFIPS Fall Joint Computer Conference* Vol. 33, 267-277.

Riding, R.J. (1991). *Cognitive Style Analysis: Administration*. Birmingham: Learning and Training Technology.

Sharp, H., Rogers, Y. and Preece, J. (2007). *Interaction Design: beyond human-computer interaction* (2nd ed.). Chichester: John Wiley & Sons Ltd.

Skov, M. and P. Ingwersen (2008). Exploring information seeking behaviour in a digital museum context. *Proceedings of IliX 2008*, ACM.

Tanasa, D., and Trousse, B. (2004) Advanced data preprocessing for intersites Web usage mining, *Intelligent Systems, IEEE*, 19(2), pp.59-65.

Wilson, L.M., et al. (2010). From Keyword Search to Exploration: Designing Future Search Interfaces for the Web. *Foundations and Trends in Web Science*, 2(1), 1-97.

Wiseman, R., Watt, C., Gilhooly, K. and Georgiou, G. (2011). Creativity and ease of ambiguous figural reversal. *British Journal of Psychology*, 102, 615–622.

**Appendix 1 PATHS Prototype Field Trial - User Profile**

User ID Number:

Gender

1. Female
2. Male

What is your native language?

Age group:

1. Under 18 years
2. 18-25 years
3. 26-35 years
4. 36-50 years
5. 51-65 years
6. Over 65 years
7. Prefer not to say

How experienced are you in using the internet?

1. Advanced user
2. Intermediate user
3. Basic user
4. No experience

How experienced are you in using web search engines?

1. Advanced user
2. Intermediate user
3. Basic user
4. No experience

How often do you search for cultural heritage information online?

1. Never
2. Rarely
3. Sometimes
4. Often

In which of these roles do you use cultural heritage information online? [select all that apply]

1. General museum visitor
2. Student
3. Lecturer / Teacher
4. Librarian/Information specialist
5. Researcher (academic)
6. Researcher (leisure)
7. Cultural heritage professional
8. Business professional
9. Other \_\_\_\_\_



User Study: PATHS Mobile App

Do you use any of the following websites for information about cultural heritage?

	Never	Rarely	Sometimes	Often
Museum web site	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Gallery web site	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Archive web site	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Library web site	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Europeana	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Wikipedia	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Please state:

How familiar are you with the PATHS system?

1. Unfamiliar – never seen or used
2. Seen a previous version, but never used
3. Seen and used a previous version occasionally
4. Seen and used a previous version often

**You have completed the profile questions.**

**Now, watch the PATHS demonstration or introductory videos before moving onto the next questions.**



User Study: PATHS Mobile App  
**Appendix 2 PATHS Prototype Field Trial - Diary**

ID Number:

What date does this diary entry relate to?

- \_\_\_\_\_

Is this the first time you have used PATHS during the field study?

1. Yes
2. No

Are you using the same computer and network as last time?

1. Yes
2. No

### **ABOUT YOUR COMPUTER SYSTEM**

What type of computer are you using to access PATHS today?

1. Desktop
2. Laptop
3. Other

Which operating system are you using?

1. Windows
2. Mac
3. Other

Which internet browser are you using?

1. Firefox
2. Chrome
3. Internet Explorer
4. Other

What type of network are you on?

1. Home
2. University/Work
3. Mobile (via a USB dongle)

How are you connected to the internet?

1. Wifi
2. Cable
3. 3G
4. Dont know

### **PATHS USER DIARY**

User Study: PATHS Mobile App

For what purpose are you using PATHS today?

1. Leisure
2. Study
3. Work
4. Other \_\_\_\_\_

Thinking about your use of PATHS today, to what extent do you agree with the following statements:

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
I had a specific goal or information need in mind from the start	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
My goals or information needs developed over the course of the session	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I wanted to achieve a specific outcome	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I was just looking around, with no specific goal in mind	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Was your main goal or information need:

1. New
2. Continuing from a previous session
3. Undefined

Describe your main goal or information need whilst using PATHS today.

Describe what steps you took to achieve this. [For example, WHAT you looked for, WHAT you did to find it, WHAT you selected and WHY, HOW you used it, etc...]

User Study: PATHS Mobile App

Did you engage in any specific activities when using PATHS today?[select all that apply]

1. Looking up specific items
2. Finding items related to a topic
3. Exploring the content
4. Following other peoples paths
5. Collecting items for a path
6. Starting a new path
7. Editing an existing path
8. Completing a path
9. Nothing specific
10. Other \_\_\_\_\_

Thinking about your experience of using PATHS today, to what extent do you agree with the following statements:

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
I achieved what I set out to do	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I am satisfied with what I achieved	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
It was difficult to achieve what I wanted	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Describe any difficulties you encountered whilst using PATHS today. [optional]

Please give any other comments about your experience of using PATHS today. [optional]

User ID Number:

**EXPLORING AND SEARCHING CONTENT**

During the last two weeks, which tools have you used to search for and explore the content available in PATHS?

[select all that apply]

1. Search box
2. Thesaurus
3. Tag cloud
4. Map
5. Related and recommended items (right-hand side)
6. Search results filters (left-hand side)
7. Browsing multiple pages of search results
8. Other \_\_\_\_\_

Did the search box seem:

Very easy	Easy	Neutral	Complicated	Very complicated	Did not use
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Very useful	Useful	Neutral	Useless	Completely useless	Did not use
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Very inventive	Inventive	Neutral	Conventional	Very conventional	Did not use
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Did the thesaurus seem:

Very easy	Easy	Neutral	Complicated	Very complicated	Did not use
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Very useful	Useful	Neutral	Useless	Completely useless	Did not use
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Very inventive	Inventive	Neutral	Conventional	Very conventional	Did not use
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Did the tag cloud seem:

Very easy	Easy	Neutral	Complicated	Very complicated	Did not use
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Very useful	Useful	Neutral	Useless	Completely useless	Did not use
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Very inventive	Inventive	Neutral	Conventional	Very conventional	Did not use
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Did the map seem:

User Study: PATHS Mobile App

Very easy	Easy	Neutral	Complicated	Very complicated	Did not use
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Very useful	Useful	Neutral	Useless	Completely useless	Did not use
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Very inventive	Inventive	Neutral	Conventional	Very conventional	Did not use
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Did the related and recommended items seem:

Very easy	Easy	Neutral	Complicated	Very complicated	Did not use
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Very useful	Useful	Neutral	Useless	Completely useless	Did not use
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Very inventive	Inventive	Neutral	Conventional	Very conventional	Did not use
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Which search and exploration tools did you most prefer?

[SELECT THREE ONLY - Rank 1st, 2nd, 3rd]

- Search box \_\_\_\_\_
- Thesaurus \_\_\_\_\_
- Tag cloud \_\_\_\_\_
- Map \_\_\_\_\_
- Search filters/facets (left-hand side) \_\_\_\_\_
- Related and recommended items (right-hand side) \_\_\_\_\_
- Browsing multiple pages of search results \_\_\_\_\_
- Other \_\_\_\_\_

Could we improve searching and exploring content in PATHS?

1. Yes
2. No

If Yes, please tell us how:

User Study: PATHS Mobile App  
**FINDING AND FOLLOWING PATHS**

Did you attempt to find and follow other people's paths during the last two weeks?

1. Yes
2. No

Please comment on why you did not attempt to find and follow paths

Did finding a path seem:

Very easy	Easy	Neutral	Complicated	Very complicated	Did not use
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Very useful	Useful	Neutral	Useless	Completely useless	Did not use
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Very inventive	Inventive	Neutral	Conventional	Very conventional	Did not use
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Did following a path seem:

Very easy	Easy	Neutral	Complicated	Very complicated	Did not use
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Very useful	Useful	Neutral	Useless	Completely useless	Did not use
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Very inventive	Inventive	Neutral	Conventional	Very conventional	Did not use
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Could we improve following a path?

1. Yes
2. No

If Yes, please tell us how:



User Study: PATHS Mobile App  
**CREATING PATHS**

How many paths did you create during the last two weeks?

What is the title of your path(s)?

How useful did you find the following features for finding items to include in your path?

	Very Useful	Useful	Neutral	Useless	Completely Useless	Did not use
1 Search box	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2 Thesaurus	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3 Tag cloud	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4 Map	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5 Search filters (facets)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6 Selected items	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7 Browsing multiple pages of items	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

How useful did you find the following features for finding items to include in your path?

	Very Useful	Useful	Neutral	Useless	Completely Useless	Did not use
8 Related and recommended items	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9 Background information (Wikipedia)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10 Keywords/metadata	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

What information did you use when choosing items for your path?

[select all that apply]

1. Image
2. Title
3. Text description
4. Keywords/metadata

What criteria did you use when choosing items for your path?

[select all that apply]

1. Typical examples
2. Unusual / unique
3. Aesthetically pleasing
4. Interesting description
5. The only items available for my topic
6. Other

User Study: PATHS Mobile App

How did you order the items in your path?

1. Theme(s)
2. Chronological
3. Narrative
4. Geographical
5. Importance
6. Interestingness
7. No particular order
8. Other

Did each of these elements of creating a path seem easy or complicated?

	Very easy	Easy	Neutral	Complicated	Very complicated	Did not use
Collecting items in the workspace	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Moving items from the workspace into the path	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Adding text nodes to the path	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Arranging items in the path	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Describing the path / adding metadata	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Annotating items in the path	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Publishing / sharing a path	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Overall, did the Create a Path function seem:

Very easy	Easy	Neutral	Complicated	Very complicated	Did not use
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Very useful	Useful	Neutral	Useless	Completely useless	Did not use
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Very inventive	Inventive	Neutral	Conventional	Very conventional	Did not use
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Could we improve the Create a Path function?

1. Yes
2. No

If Yes, please tell us how:

User Study: PATHS Mobile App  
**GENERAL FEEDBACK**

In your opinion, how well does PATHS support each of the following tasks?

	Very well	Quite well	Neutral	Not very well	Not at all
Fact-finding	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Finding items related to a topic	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Exploring what content is available in the collection	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Serendipity / discovering new things	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Developing ideas	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Creating resources from cultural heritage collections	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sharing content with others	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Communicating with other users	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Using content created by other users	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Which tasks would you be most likely to use PATHS for?

[select THREE CHOICES ONLY, numbered 1-3, where 1 is most likely]

- Fact-finding \_\_\_\_\_
- Finding items related to a topic \_\_\_\_\_
- Exploring what content is available in the collection \_\_\_\_\_
- Serendipity / discovering new things \_\_\_\_\_
- Developing ideas \_\_\_\_\_
- Creating resources from cultural heritage collections \_\_\_\_\_
- Sharing content with others \_\_\_\_\_
- Communicating with other users \_\_\_\_\_
- Using content created by other users \_\_\_\_\_

**Appendix 4 PATHS Prototype Field Trial – Focus Group/Interview Schedule**

1. **Consume:** Did you follow any paths? Was it useful? In what way was it useful? What did you gain from that?
  
2. **Concept:** Which parts of the system did you use to help you come up with your idea for your path? Did you use anything else outside the system? Was it just in your head? Or did you use PATHS to help you develop your research?
  
3. **Collection:** Which parts of the system did you use to help you find items for your path? Which were most useful? Why? Are there any parts that you used less? Was there a reason for that?
  
4. **Create:** How did you go about creating your path? Did you do it in a single session, or did you go back to it over multiple days?
  
5. **Communicate:** In what context do you think PATHS would be a useful communication tool? Who would you want to share with? Why? (Share something interesting, teach something, share a research process)
  
6. What were the most significant difficulties you encountered? To what extent did they affect your experience with PATHS?
  
7. Any other comments?

User Study: PATHS Mobile App  
**Appendix 5 PATHS Mobile Field Trial – Questionnaire**  
**ABOUT YOU**

Gender

1. Female
2. Male

Age group:

1. Under 18 years
2. 18-25 years
3. 26-35 years
4. 36-50 years
5. 51-65 years
6. Over 65 years
7. Prefer not to say

How experienced are you in using the internet?

1. Advanced user
2. Intermediate user
3. Basic user
4. No experience

How familiar are you with the PATHS system?

1. Unfamiliar – never seen or used
2. Seen a previous version, but never used
3. Seen and used a previous version occasionally
4. Seen and used a previous version often

Which mobile devices do you own?[select all that apply]

1. Android smartphone
2. Android tablet
3. iPhone
4. iPad
5. Windows smartphone
6. Windows tablet
7. None

How experienced are you in using tablet devices?

1. Advanced user
2. Intermediate user
3. Basic user
4. No experience

How often do you search for cultural heritage information online?

1. Never
2. Rarely
3. Sometimes
4. Often

In which of these roles do you use cultural heritage information online? [select all that apply]

1. General museum visitor
2. Student
3. Lecturer / Teacher
4. Librarian/Information specialist
5. Researcher (academic)
6. Researcher (leisure)
7. Cultural heritage professional
8. Business professional
9. Other \_\_\_\_\_

**FIRST IMPRESSIONS**

Overall, how would you rate your experience of using the PATHS mobile app against the following criteria?

Easy+3 <input type="checkbox"/>	+2 <input type="checkbox"/>	+1 <input type="checkbox"/>	0 <input type="checkbox"/>	-1 <input type="checkbox"/>	-2 <input type="checkbox"/>	Complicated-3 <input type="checkbox"/>
Useful+3 <input type="checkbox"/>	+2 <input type="checkbox"/>	+1 <input type="checkbox"/>	0 <input type="checkbox"/>	-1 <input type="checkbox"/>	-2 <input type="checkbox"/>	Useless-3 <input type="checkbox"/>
Inventive+3 <input type="checkbox"/>	+2 <input type="checkbox"/>	+1 <input type="checkbox"/>	0 <input type="checkbox"/>	-1 <input type="checkbox"/>	-2 <input type="checkbox"/>	Conventional-3 <input type="checkbox"/>
Enjoyable +3 <input type="checkbox"/>	+2 <input type="checkbox"/>	+1 <input type="checkbox"/>	0 <input type="checkbox"/>	-1 <input type="checkbox"/>	-2 <input type="checkbox"/>	Annoying-3 <input type="checkbox"/>
Interesting +3 <input type="checkbox"/>	+2 <input type="checkbox"/>	+1 <input type="checkbox"/>	0 <input type="checkbox"/>	-1 <input type="checkbox"/>	-2 <input type="checkbox"/>	Not interesting-3 <input type="checkbox"/>
Understandable +3 <input type="checkbox"/>	+2 <input type="checkbox"/>	+1 <input type="checkbox"/>	0 <input type="checkbox"/>	-1 <input type="checkbox"/>	-2 <input type="checkbox"/>	Not understandable-3 <input type="checkbox"/>

Did finding a path seem:

Very easy <input type="checkbox"/>	Easy <input type="checkbox"/>	Neutral <input type="checkbox"/>	Complicated <input type="checkbox"/>	Very complicated <input type="checkbox"/>
---------------------------------------	----------------------------------	-------------------------------------	---	--

Did following a path seem:

Very easy <input type="checkbox"/>	Easy <input type="checkbox"/>	Neutral <input type="checkbox"/>	Complicated <input type="checkbox"/>	Very complicated <input type="checkbox"/>
---------------------------------------	----------------------------------	-------------------------------------	---	--

What degree of flexibility did you feel there is in how you can follow a Path? (for example, moving between items in the Path, changing direction, or being able to stop, start and go back?)

1. Very flexible
2. Flexible
3. Neutral
4. Limited flexibility
5. No flexibility

**FEEDBACK**

What did you like most about the PATHS mobile app?

What did you like least about the PATHS mobile app?

What could we improve in the PATHS mobile app?

**FUTURE DEVELOPMENTS**

Whose paths would you like to see? [select all that apply]

- 1. Cultural organisations
- 2. Museum/Gallery Curators
- 3. Museum/Gallery Educators
- 4. Lecturers / Teachers
- 5. Students
- 6. Researchers
- 7. Leisure users
- 8. None of these

How interested would you be in seeing the following types of additional information included in a path?

	Not at all interested	Uninterested	Neutral	Interested	Very interested
Larger images	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Item description from the original museum catalogue	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Item keywords and metadata from the original museum catalogue	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Related items	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Related paths	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Recommended items	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Recommended paths	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Comments from other users	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ratings from other users	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

If you could share a path outside the system, which media would you use? [select all that apply]

- 1. Facebook
- 2. Twitter
- 3. LinkedIn
- 4. Pinterest
- 5. Tumblr
- 6. Delicious
- 7. Reddit
- 8. Blog
- 9. Email
- 10. Powerpoint
- 11. Prezi
- 12. Slideshare
- 13. I would be unlikely to share
- 14. Other \_\_\_\_\_

How likely would you be to make your own path from a cultural heritage collection?

1. Not at all
2. Unlikely
3. Neither Likely nor Unlikely
4. Likely
5. Very likely

If you could make your own path, how would you most prefer to share it?

1. Share your path for reuse and allow others to edit in the future
2. Share your path but not allow editing
3. Keep your path private
4. Another way \_\_\_\_\_