

1. Introduction

1.1 Terms of reference

The terms of reference of the study were to:

- Undertake an analysis of existing and current HCI design principles in terms of their applicability to JISC services and resources.
- Consider current practice and directions within the UK and other countries that have particular research strengths in this area.
- Recommend adaptations of HCI design principles to make them applicable to web-based, end-user-oriented JISC services and other JISC funded resources (e.g. projects creating learning & teaching materials) as a basis for good practice within higher and further education.
- Review the existing adoption and use of HCI design principles within JISC services and JISC funded resources. In addition, to report on the experience/results of implementation with an emphasis on identifying best practice that could be taken up more generally by JISC services and projects.
- Make recommendations on what additional work would be required to further develop HCI design principles for particular types of service, e.g. portals, content services, advice services, and types of resource, e.g. bibliographic, image, geospatial.
- Liaise with the Visualisation Foundation Study and discuss common areas of work and interchange of results/experience/ideas.
- Make recommendations on how pedagogical models within a web-based environment might be enhanced and facilitated by use of HCI design principles.

As the previous Usability Foundation Study [K4] had covered usability design methods, the project plan for this study focussed on human computer interface design principles, to be documented as guidelines for use within the broader context of user centred design. The approach to developing the guidelines was itself to be user-centred, incorporating activities such as identifying stakeholder groups, elaborating the requirements of stakeholders, and evaluating early versions of the results.

1.2 Stakeholders

The following categories of stakeholders were identified:

Primary audience:

- JISC resource developers: who work on the services and content.
- Managers of JISC resource developers: who specify requirements and allocate budget.

Secondary audience:

- Webmasters in higher and further education who work on the services and content.
- Academics who develop individual pages.

Indirect (beneficiaries of improved HCI):

- Users of JISC resources.
- Users of other academic web sites.

JISC is also a stakeholder, in its role of acting on the results of the study.

2. Current approaches to HCI

2.1 JISC services

We started by contacting 4 JISC funded services. We found that HCI and usability guidelines are seldom used in the development stages of these projects. Although the benefits are acknowledged, constraints on cost, time and resources meant that usability was usually ignored at this stage.

“On the smaller projects especially, there are constraints on time, cost and resources which make it hard to factor in Usability. The focus is on getting the service up rather than making it usable, which is dictated by the contract”

It is apparent that any guidelines need to be simple to use, and should involve activities that do not require a lot of time.

Few examples were given of using any HCI or usability guidelines (although the W3C Accessibility guidelines are widely used).

“When the <service> was created user surveys were used (questionnaires). The <organisation> has produced style guides and guidelines that the <service> has to adhere to”

Sometimes a well-established, similar service is used as a model when a service is developed.

“For <new service> the interface copied <existing service> so that users would have a familiar interface”

Some form of evaluation of the new service is sometimes carried out at a later stage. This is usually by questionnaires or user testing. However user testing is usually relatively informal with a small number of people who may not be representative of typical users.

“We had a list of organisational reps who were mostly librarians, and they were used to test the system in an informal way”

“Sometimes cognitive walkthroughs, expert evaluation, questionnaires (e.g. SUS [K1]) are used, and the occasional user testing session is held. Mock-ups are sometimes tested”

A preference was expressed for HCI guidelines to be provided as web pages or pdf files, so that they could be accessed easily.

“Web based would be best so that it can be easily accessed”

“A web page that could be downloaded as a pdf”

Types of service

We identified the main categories of JISC service as:

- Digital libraries
 - Bibliographic, e.g. Zetoc
 - Images, e.g. VADS
 - Maps, e.g. Digimap
- Portals
 - E.g. RDN
- Reference information
 - E.g. TechWatch, Plagiarism Advice Service
- Instructional materials
 - E.g. UKOLN

2.2 Guidelines for academic web sites

We carried out an extensive search for existing HCI and style guides on academic web sites, and emailed 43 academic institutions around the world (15 in the UK) that provide online learning, teaching and research facilities (see Annex A for full details), asking whether they used HCI guidelines or a style guide. We received replies from 16 organisations (5 in the UK).

In most cases there were no guidelines.

“We do not have any HCI guidelines. There are templates for our collections, and most new or revised collections simply fit into that template. There are special layouts for exhibits or other special collections, but the majority are the same”

“Our students develop a thorough understanding of instructional design theory and practice, and are exposed to a variety of guidelines as they find useful for their own purposes, but we don't have a specific set that we publish or recommend”

It was found that when guidelines do exist, they are generally basic guidelines or style guides for the design of interfaces and do not cover important issues such as user analysis, Information Architecture, etc...

“As far as I am aware we do not have a formal HCI guideline for teaching resource development. However we do have some general guidelines for publishing materials on the University's Web server. We do not have any way to judge how effectively these guidelines are used”

Even the university with the best-developed guidelines stated that:

“Typically, course developers do not make much use of these principles. Taking them a step further, rarely do instructional designers take the time to flowchart their work or to

storyboard as is done in many multimedia productions. ... Many courses bypass many of these guidelines because of limitations of Course Management Systems. Many of these CMS also ignore HCI.”

2.3 Types of guidelines

We identified and reviewed over 200 publications related to usability and HCI for learning, teaching and research. The result was a list of 121 HCI guidelines that are widely applicable to the development of any web-based service, derived from 32 publications that provided useful practical guidance (Annex B).

Additional guidelines were identified associated with specific aspects of JISC services:

- Online courses (Annex D).
- Digital libraries (Annex E): where the search interface is particularly important.
- Personalisation (Annex F): either customised or automatically personalised.
- Portals (Annex G). HCI guidelines for complex home pages and for personalisation are relevant.
- Maps and images: many of these issues will be covered by the Visualisation Foundation Study and some aspects have already been thoroughly documented in the BEST-GIS Guidelines for best practice in user interface for Geographic Information Systems [2]. Information was exchanged with the Visualisation Foundation Study, but there did not appear to be any significant areas of overlap.

We have noticed in both books and websites that some guidelines that would previously have been described as usability or HCI are now regarded as part of good design practice. This is a welcome trend, and the scope of the guidelines we have covered includes all the user-centred activities that contribute to producing a solution that better meets user needs.

2.4 Research-based web design and usability guidelines

On October 27 2003 the US National Institute of Health (NIH) released a new set of 187 Research-Based Web Design and Usability Guidelines for information-oriented sites, superseding the 60 on the usability.gov web site. The new version (currently only available in pdf format [C1]) is derived from 375 cited publications, and is a significant improvement over the web version both in its scope and because it now contains expert ratings for the relative importance of guidelines.

We cross-referenced our guidelines against the NIH guidelines (Annex B/C), and found that 49 were in common. The NIH guidelines have been rated for importance by 8 website designers and 8 usability specialists, and have been categorised based on a card-sorting exercise by 20 website designers. Although designed for information oriented web sites in general rather than academic sites, we decided that these guidelines are sufficiently authoritative to provide the main structure and reference point for our work.

They are also very well documented and illustrated with examples, and freely available as a pdf, and are expected to be published as a book.

To reduce the 187 guidelines to a more manageable set of key guidelines, we first eliminated 9 that were unlikely to be applicable to academic sites (see Annex C). We then included all remaining guidelines that were rated either extremely important (28) or very important (54). To these we subsequently added additional guidelines that were judged by ourselves and the academic webmasters see (section 3.2) to be particularly important for academic web sites: a further 32 lower priority guidelines from the NIH set and 7 of our original guidelines. This gives a total of 121 guidelines (Annex I).

2.5 Guidance for online courses

In view of the perceived need for simple guidance, we also selected the best-documented simple guidelines for creating online courses: Illinois Online Network Web Design for Online Courses [8]. When printed, this consists of one or two pages on each of the following topics:

- General Guidelines
- Guidelines for Academic Web Sites
- Practical Use of Technology
- Navigability
- Using Links
- Accessibility Issues
- Browser Considerations
- How to Use Tables and Frames

We subsequently used this as a basis for producing a second smaller set of 82 guidelines for people developing online courses (Annex J): these include 7 extra guidelines specifically related to online courses (Annex D), but excluded guidelines related to overall design of the website.

2.6 User centred design

Some of our original guidelines were concerned with the broader user centred design process and evaluation methods. We reviewed other existing sources of this information.

There are many comprehensive overviews of user centred design: for example the JISC Usability Study [K4], Quality Framework for UK government website design [K3] and the UsabilityNet web site [K6]. However, all of these are rather daunting for the ordinary developer. User centred design also needs to be interpreted in the context of Information Architecture (that has produced similar advice tailored to web site design). From our literature review we identified the SAP Quick Guide to Creating Information-Oriented Web Sites [21] as providing the most concise and easy to follow procedure.

Other useful resources include:

Planning & Managing a Web Site. The University of Nottingham Staff & Educational Development Unit. <http://www.nottingham.ac.uk/sedu/webforum/index.php>

Web interface design. Educational Technologies at Virginia Tech.
<http://www.edtech.vt.edu/edtech/id/interface/index.html>