Designing a usable online web authoring and publishing system

A study submitted in partial fulfilment of the requirements for the degree of Master of Science in Information Management

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by

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Abstract

Despite the huge potential that the World Wide Web offers for society, a surprisingly low proportion (less than one third) of UK businesses have their own website. Reasons for non-adoption of web sites include skills shortages, costs, and cultural barriers. This study seeks to break down the skills barrier to web design through the design and implementation of an online web authoring and publishing system which can be used by people with no prior web design experience.

Web design is an iterative process, and usable sites are difficult to construct, requiring not only technical skills, but also an appreciation of accessibility and usability issues. The interaction design process is adopted as a framework for guiding the development of the system. Development of the system was iterative and user-centric. In phase 0 existing online web authoring and publishing systems were investigated and a set of requirements for the new system were established.

Phase 1 involved the construction and evaluation of a prototype to test proposed groupings of functions and interaction styles. The results of the evaluations were used to produce redesign requirements. Phase 2 involved the construction of a more comprehensive prototype which implemented the phase 1 recommendations.

In phase two, participants with no prior web design experience successfully used the prototype to produce their own websites. Although the sites were basic, they conformed to web usability and accessibility criteria such as being fully visible at different screen resolutions, using high contrast foreground and background colours, implementing flexible font sizes which could be overridden by browser settings, and offering comprehensive site navigation links. Participants gave the system an overall satisfaction rating of 4.69 out of 5, and a mean difficulty rating of 1.08 (1 = easy, 2 = ok, 3 = difficult) for the tasks they completed. This suggests that the project was successful in achieving its overall aim.
Acknowledgements

This project was enjoyable and challenging, and could not have been completed without the help and support of many people.

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Introduction

The internet and the world wide web (www)\(^1\) have had a massive impact for those on the right side of the digital divide. For individuals with the skills and equipment to access the internet, be it in the home, workplace, or in public spaces such as libraries, information is now more accessible than ever. Furthermore, for those individuals and organisations (both commercial and not-for-profit) with the skills to publish to the web, this new medium has enabled them to spread their particular message in a way that was unthinkable just two decades ago.

The web is a cheap means of disseminating information. Personal sites enable the sharing of information such as photographs and diaries, with friends and relatives. For non-for-profit organisations and businesses, the web is a new means of promoting their activities, products, and services to global markets.

Despite the advantages which web sites offer, uptake is lower than might be expected. The 2002 e-commerce survey of UK businesses found that less than one third of businesses (29\%) had their own web site (see table 1 below).

Table 1: Percentage of businesses with websites, by size of business, 2002

<table>
<thead>
<tr>
<th>Employment size</th>
<th>0-9</th>
<th>10-49</th>
<th>50-249</th>
<th>250-999</th>
<th>1000+</th>
<th>All sizebands</th>
<th>10 or more</th>
</tr>
</thead>
<tbody>
<tr>
<td>With website, own or third party</td>
<td>25</td>
<td>55</td>
<td>77</td>
<td>88</td>
<td>95</td>
<td>29</td>
<td>59</td>
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Reasons for non-adoption of websites include;

\(^1\) Loosely speaking, the internet is the technical infrastructure (comprising software and hardware) upon which the www (a set of protocols for the transfer of graphical information) resides. It is commonplace for the terms internet and www to be used synonymously to represent the composite of these two distinct technologies, due to the fact that the great majority of information on the internet is implemented using www standards.
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- Skills and knowledge shortages (HTML, image editing, web hosting)
- Costs (time, fiscal)
- Cultural barriers – general resistance to new technology and change

Of those websites that have been produced, many (even those designed by professionals) are criticised in terms of their usability and accessibility. Sites with usability flaws frustrate users, often resulting in them surfing off elsewhere, and being less likely to make a return visit (Nielsen, 2000; Krug 2002). Accessible sites are usable irrespective of the browser and screen resolution they are viewed with, and are also sensitive to the needs of visually impaired users (i.e. they can be effectively translated by screen reader software).

This project seeks to lower one of the barriers to the adoption of web sites – the skills and knowledge barrier. This will be achieved by implementing a web authoring and publishing system specifically designed for non-technical people. The system will automate the most difficult aspects of web design, leaving only the simple tasks which people are already likely to have experience of such as word processing, and file management.

The goal of this project therefore is to design a system which will enable people with no prior web design experience to author and publish their own web site. The system must have a high level of usability, and should help users to produce usable and accessible sites. In order to achieve this, the process of web design must be examined. The activities and skills which prevent non-web designers from producing sites must be identified so that the system can assist users to overcome these hurdles. A development approach must be selected with a focus on achieving usable design, as this system aims to simplify a complex process. The study objectives are summarised below:

**Objectives**

1. Identify the tasks associated with web authoring, publishing and site management.
2. Identify how a system can assist with web authoring, publishing, and site management processes.
3. Through the application of relevant Human Computer Interaction (HCI) theory (such as user interface design issues), and from the findings of objectives 1 and 2, develop a usable system which will enable users to create and maintain their own usable and accessible websites.

Outline

This study begins with an outline of the web design process. A review of current guidance on user interface and interaction design is also presented, as this will inform the design of the proposed system. This is followed by a section detailing the methodology for the design and development of the system.

The development work is split into three phases. Phase 0 involves the investigation of existing online web authoring and publishing systems. This is achieved through a variety of research methods. First, two popular online web authoring and publishing systems are evaluated. Next an in depth case study of a Content Management System is conducted. Finally, a questionnaire is sent to web designers to find out about their experiences of online web authoring and publishing systems, and their opinions on features proposed for the new system. Analyses of the these data leads to the specification of requirements for the new system.

In phase 1, a prototype for the system is produced based on the requirement specification. The prototype is then subjected to user evaluation. Analysis of the user evaluation data is used to produce redesign requirements. Phase 2 involves the implementation of a near fully functional prototype. User evaluations are repeated for this system, and the results are compared with those for phase 1.

In the conclusion, the success of the project is assessed with reference to the phase 2 user evaluations and the goal of the project outlined above. Possibilities for follow up work on this project are also presented.
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The web design process

Web design is an iterative process. Web designers will produce a site, keep it up to date, and then every so often, revamp the aesthetics, delete redundant sections, and create new branches. The web site must respond to changes in the business environment, and changes in personal circumstances. The steps below are therefore not only followed linearly, but are cycled through repeatedly during the lifespan of the site. It is very important therefore that a web authoring and publishing tool should support this evolutionary design cycle by facilitating wholesale makeovers or information restructuring.

**Step 1) Identifying needs and goals**

During the internet boom in the mid to late nineties, business and public organisations suddenly felt compelled to develop a website to keep up with everyone else. However, websites can be used for many different things; product promotion, e-commerce, recruitment, and online delivery of services to name but a few. The focus or goals of the site drive the rest of the design process, and sites without goals will be vague and confusing for the surfer, and may do more harm than good for the organisation’s reputation. The first step in any web design project therefore is to consider what is hoped to be achieved with the site (DiNucci, Giudice and Stiles 1997). For business users, this may be;

- Raising brand awareness
- Generating more sales
- Distributing information cheaply (e.g. user manuals, sales catalogues, company news)
- Enabling e-commerce
- Offering online support (e.g. Frequently asked questions, support forums)

For home and non-for-profit users, this may be;

- To share photos and diary entries with friends and family
- To advertise activity sessions (e.g. sports / hobby clubs)
- To publicise upcoming events

Site goals underpin the whole project, and must be firmly established before moving on to step two. Further points to consider at the outset are ‘who is the target
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audience – what are their skills, capabilities’, ‘what web browser are they likely to be using’. These questions are important as they will influence the style of presentation, and the technologies used to present information or provide functionalities. Unless the site is being developed for an intranet where corporate standards dictate that all browsers will be of a certain type, most sites will have to be designed for extensive cross browser compatibility. While this can be achieved by avoiding the latest technologies and sticking to deprecated code to ensure backward compatibility to an agreed browser threshold, Zeldman (2003) urges web designers to adhere to standards which ‘make it possible to design for all browsers and devices as easily and quickly as for just one’.

**Step 2) Content gathering**

Once site goals, target audience(s) and desired browser coverage has been established, content must be gathered for the site. Content which already exists in hardcopy (paper) must be digitised, and content in non-standard electronic formats may have to be extracted and converted into rich text format. Once content has been gathered, attention must be turned to logically structuring the information.

**Step 3) Information architecture**

Rosenfeld and Morville (2002) offer four definitions for information architecture. Their second definition best captures the use of the term within this study, “[Information architecture is] The structural design of an information space to facilitate task completion and intuitive access to content” (p 4). How information is structured on a website affects the way people navigate the site, determines the level of exposure items will receive, and influences how long surfers will stick with the site. If users cannot access the content they are seeking within a few mouse clicks, low switching costs dictate that they will move on to another site.

The process of structuring information begins with the clustering of related items. For example, the business user may assign all information items relating to products and services to one cluster, and all items relating to the company background (staff, history etc.) in another. Mind mapping and brainstorming may assist with this process.
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Once information items have been clustered they must be chunked into portions which can effectively be displayed on one web page without the need to scroll down. Research shows that users do not like to scroll down long pages, and therefore information ‘beneath the fold’ is much less likely to be read. In usability studies conducted by Nielsen (2000), just 10% of users would scroll beyond the information visible in the window when the page came up. Articles must also be prioritised so that when they are listed as links, the most important are listed first. For example, a cluster on products and services may include:

- Descriptions (text and pictures) and prices of three products
- After sales service information
- Technical support for products A, B, and C

If product descriptions are lengthy it will be necessary to break them down into individual articles. If one of the goals of the site is to increase sales, then product descriptions and after sales advice would probably be prioritised over technical support information as details of previous faults would deter customers. The information cluster would therefore be converted to:

1. Product A description (text and pictures) and price
2. Product B description (text and pictures) and price
3. Product C description (text and pictures) and price
4. After sales service information
5. Technical support for products A, B, and C

Prioritised information clusters should then be amalgamated into a branching diagram, whereby each cluster forms a branch in the diagram. Branching diagrams (or site maps as they are often referred to) provide a useful overview of a site for both web developers and site users (Matthews and Poulsen, 1999; DiNucci, Giudice and Stiles, 1997), and are a concise representation of the information architecture; showing site content and functionality, and how information items are related (see figure 1 below);

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2 The fold is the point at the bottom of the screen. Information below the fold cannot be seen without scrolling down. This is a reference to newspaper folds, whereby information beneath the fold is not visible to someone browsing the newspaper shelves.
Figure 1) A simple branching diagram for a clothes shop web site

```
Home page
   /   \
 /     \
|       |
Our products | Our location | Corporate information
   |    |           |
|     |
Men’s wear   Ladies’ wear
```

**Step 4) Defining specifications for interactive elements**

Where an interactive element is required (e.g. message board, shopping cart), the desired functionality should be defined in a technical specification document. User interactions and system responses can be modelled using use cases, and other equivalent tools.

**Step 5) Page template design**

Web pages comprise of distinct elements. These are:

- Header
- Content
- Navigation panels – persistent navigation and local navigation (options at current level)
- Footer
- Advertising

The HCI principle of consistency is just as valid for websites as it is for offline software user interfaces. Nielsen (2000) shows that sites are easier to use if these elements are consistently positioned from page to page. Consistently placed navigation controls with a standardised appearance can easily be distinguished from everything else and located quickly. Web designers often therefore produce a page template which is applied to all pages for consistent positioning, and standardised
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styling of page elements, “By designing fixed template pages… you ensure consistent quality in your Web pages” (Kentie, 2002, p 21). Figure 2) below shows the application of page templates on Amazon.co.uk. The template ensures that the page header (with the company logo, top level navigation links, and utility links - search, your account, view basket etc.), navigation (local links on left ‘browse’ pane), main content, and footer are consistently placed and styled.

Figure 2) Page templates provide consistent styling and layout on Amazon.co.uk

Step 5 therefore involves the design of page templates. Such designs can be low fidelity (paper based) or high fidelity (html).

Page templates are used to create a branding for the site, through the use of graphical elements such as the corporate logo, and splashes of colour reflecting the corporate colour scheme. Page template design therefore entails the production of icons, images, animations, and selection of background colours, all of which are embedded into the template elements. The page template also sets the default font type and style for the site.

As features built into the page template appear on every page, graphics should be used conservatively. Incorporating large graphics into the page template would increase download times across the site which frustrates users. Templates should also avoid the use of features which require specific browser plug-ins (e.g. macromedia flash) as all of the pages would display incorrectly when viewed on a browser without that plug-in.
According to Krug (2000), there are five elements of persistent navigation design, which are incorporated into the page template. These are:

- Site logo – could be corporate logo – also doubles as home button.
- A way home
- A way to search
- Utilities
- Sections

(Krug, 2000, p 62)

Sections are primary sections (tier two in the information architecture). These are often displayed at the top of the page beneath the site logo (as in Figure 2 above). Tabs are a popular choice for these links, as they effectively communicate the notion of distinct site sections. Sites also often show secondary sections (subheadings for the main sections) in drop down menus which are activated by rolling over the main headings.

Utilities are important items of content which must be easily accessible, but don’t fit into the main information architecture. They can be envisaged as external to, but at the same level of importance as tier two headers. Utilities comprise functional elements (e.g. shopping cart, text only), advanced navigation tools (search box, site map), and publisher information (about us, contact us).

All pages must be accurately labelled – this means that the page name must be prominently displayed both in the persistent navigation, and in the main content section. The page name should be distinguishable from the page through the use of a larger font, with styling which sets it aside from the rest of the page. The page name should match the label you clicked upon. Breadcrumbs are useful for indicating where you have been, but however they do not show where else you can go (other than back up the information hierarchy).

When templates are complete, they must be produced in HTML, and (hyper)linked together using the branching diagram as a reference map. At the end of this stage, an
empty web shell has been produced. This is a series of navigable templates, awaiting
the injection of page content.

**Step 6) Application design**

Where applicable, the web designer, or web application programmer, should now
implement the interactive elements using the technical specification documents. It is
important to involve real end users throughout this development process, in order to
ensure that the evolving design is intuitive and appropriate for end user needs. The
‘front end’ of the application (the web page which the user sees) should be
implemented using the templates and styles defined in the previous step.

**Step 7) Transplanting content**

It’s finally time to marry the empty shell with the content and applications developed
in the previous steps. Page by page, the web designer copies and pastes text from the
digital archive into the shell. Applications are inserted into the relevant areas. At the
end of this stage, the site is complete, and ready for testing. Typically, the site will
be produced on a staging server – a server replicating the live server, enabling full
testing of the site without making the site public.

**Step 8) Publishing the site**

Once the site is fully tested, it is published to the live server. This involves
transferring the files from the staging server to the live server. FTP (File Transfer
Protocol) is a common means of achieving this.

**Step 9) Marketing the site**

After the site has gone live, it must be marketed. There are many ways to market
sites including online and offline measures. Online techniques include; getting the
site spidered by major search engines (e.g. Google), and listed in directories (e.g.
Yahoo); joining a banner ads exchange scheme; and sending promotional emails.
Offline techniques include advertising in traditional media (newspapers, magazines,
television, radio etc.) and attending trade fairs.

Gaining a high search engine ranking greatly improves the likelihood that people will
find the site. The main means of gaining a good ranking is to encourage other sites
to link to yours. This is due to the nature of the ranking algorithm applied by the main search engines, which favours sites which are well linked to. The logic behind this is that a link to a site is a vote of popularity. If many people link to a site, it must be worth looking at. Therefore well connected sites are given higher rankings, which means that users of the search engine are more likely to find quality sites. The implication for the web designer therefore is to encourage other web masters to link back to their site. A popular way of achieving this is to create a links section on the site, and then contact the webmasters of those sites linked to, and ask for the favour to be returned. The more heavily enmeshed the site becomes in the web (through reciprocal linking), the higher the search ranking will become.

Although meta-data is no longer used by search engines for ranking purposes, this information is used in the search results listings to describe the pages returned. Figure 3) shows the contrast between the listings for ‘FishingWorld.com’ (where meta data was omitted) and ‘The-Fishing-Network.com’ (where meta data was included). The page description for FishingWorld.com is gibberish, whereas the description for The-Fishing-Network.com is articulate and enticing. The practice of defining the meaning and purpose of a page is also useful as it gives the web designer the chance to review whether or not the page is really adding value to the site. Meta-tagging all pages is recommended because this ensures that all pages are well represented in search engine databases. As search engines are the portal to the internet for so many web users, users are much more likely to find relevant pages in the site (which may be buried deep in the information architecture) if they are effectively meta tagged.

**Step 10) Maintenance and management**

Once the site is designed, published and marketed, it must be kept up to date. Pages may be updated, added, deleted, and moved. A periodic overhaul of the site’s appearance is also necessary to keep up with current design trends. Sites quickly look dated on the web, and if the site has been implemented correctly, it should be relatively straightforward to apply global changes to the styling and layout of content.
Most web masters require information about how their site is performing. Usage can be monitored in terms of page hits (the number of times a page has been loaded during a specified period), unique page hits (number of times a page has been loaded by a unique visitor), user click tracking (recording the path users take through your site), and page referrals (which site a visitor was browsing, prior to viewing your site).

As indicated at the outset, web design is an iterative process, and changes in the environment (new legislation, new technologies, new website goals) may require going back to an earlier stage, or starting again from scratch.
Usability

Since this project strives for a usable design, it helps to define exactly what is meant by usability. Krug (2000, p 5) defines usability as

“… making sure that something works well: that a person of average (or even below average) ability and experience can use the thing – whether it’s a Web site, a fighter jet, or a revolving door - for its intended purpose without getting hopelessly frustrated”.

Reading further into this definition, it follows that for a person of average or below average ability and experience to ‘use the thing’, the product must be easy to learn. Preece (2002) adds that a usable product should not only avoid user frustration, but deliver user satisfaction, and be fun to use.

Indeed usability is a broad term, encompassing a number attributes. Various sets of usability components have been proposed. Nielsen (1993), the pioneer of usability engineering, suggests that usability comprises of learnability, efficiency, memorability, errors, and satisfaction. Preece agrees with the first three components, and repackages ‘errors’ as ‘safety’. Usefully, she takes subjective components out of the definition of usability, and bundles these into a separate ‘user experience’ strand. Preece also adds ‘effectiveness’ and ‘utility’ to her definition of usability. It is this definition of usability which is adopted for this study, and each term is expanded upon below.

Elements of usability
- Effectiveness
- Efficiency
- Safety
- Utility
- Learnability
- Memorability

Preece (2002)
Effectiveness refers to the extent to which the product enables the user to achieve the task at hand. This is what Krug was getting at in the definition provided above. Efficiency relates to the amount of energy or time which must be spent using the product to achieve a goal. For example, an efficient email program might allow a user to delete all of their unwanted email in one click, whereas an inefficient program would require the user to open each mail individually to delete it. The importance of knowing your user base and understanding the environment and circumstances of system operation is clearly evident when it comes to designing for efficiency. For example, if users will be using the system daily to perform highly repetitive tasks, then the interface should include keyboard shortcuts for frequently accessed functions. If on the other hand the system or individual function will be used infrequently, then a keyboard shortcut is unlikely to be remembered and is not as appropriate as a clearly labelled graphical control. Whereas keyboard shortcuts will introduce large efficiency gains for systems such as a supermarket checkout, they would be superfluous on management information systems, whereby functions for producing reports are only used once per month.

The concept of safety is linked to usability in the sense that the user should be protected from the inadvertent loss of work or data. This can be achieved by reducing or eliminating possibilities for the accidental operation of harmful functions. In practical terms this means keeping ‘save’ distant from ‘quit’ and ‘exit’ in a menu, and implementing confirmation dialog boxes, so that users are given the opportunity to cancel an undesired action. Additional safety features include an ‘undo’ function to roll back undesired changes. Unsafe systems reduce user confidence, making them less likely to explore the system’s capabilities.

Preece defines utility as, “[ The provision of ] an appropriate set of functions that enable users to carry out all their tasks in the way they want to do them” (2002, p 16). In other words, utility is about whether or not the system provides enough functionality to support the task at hand.

A system with high learnability is easy to learn. At the most basic level, there are two levels of learnability; how easy it is to get started, and how easy it is to learn an
expanded set of functions. Memorability refers to the extent to which users can recall how to use a system over an extended period of time. Memorable systems are more usable because the user has to invest less time re-learning the system at each revisit.

**User interface design**

Based on this definition of usability, it is possible to see how guidelines for interface design from the domain of Human-Computer Interaction promote effective user interaction. Nielsen (1994) provides a set of ten heuristics – principles by which experts can evaluate the usability of an interface. These are provided below, and discussed with reference to the definition of usability provided above.

1. Visibility of system status – keep users informed of what is going on.
2. Match between system and the real world – use words, phrases, concepts familiar to the user – not technical jargon.
3. User control and freedom – enable users to escape from places they didn’t expect to end up in.
4. Consistency and standards – avoid making users wonder whether different words, situations, or actions mean the same thing.
5. Help users recognise, diagnose, and recover from errors.
6. Error prevention – where possible, prevent errors from occurring in the first place.
8. Flexibility and efficiency of use – provide accelerators that are invisible to novice users, but allow more experienced users to carry out tasks more quickly.
9. Aesthetic and minimalist design – avoid using information that is irrelevant or rarely needed.
10. Help and documentation – provide information that can be easily searched and provides help in a set of concrete steps that can easily be followed.

Visibility of system status is provided through feedback. System feedback is important for building user confidence. When a user selects a function, the system
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should send back a message indicating the outcome of the interaction. For example, if the user presses ‘save’, the system should indicate ‘save accomplished’ or ‘save failed’ in the event of an error. If such information is not provided, the user may wonder whether or not the button was pressed properly, or if the system is faulty. This is likely to lead to repeated button presses, and a reluctance to proceed. Good system feedback therefore positively impacts upon efficiency and safety.

By ‘match between system and the real world’, Nielsen emphasises the need for systems to avoid technical jargon, and instead use phrases and terms which the user is familiar with. The use of technical terminology which users are unfamiliar with would clearly reduce learnability.

Systems offering good ‘user control and freedom’ enable users to recover from errors and backtrack when they realise that they have entered a part of the system which they do not wish to be in. For example, a word processor exhibiting good user control and freedom would enable a user to cancel printing at the print preview stage if the user so desired (if for example they spotted a spelling error). A bad design would commit the user to printing once they had reached the print preview screen. Good user control and freedom ensures that systems are efficient, and also boosts user confidence and safety, because users can work safe in the knowledge that in the event of a wrong turn, they will always be able to return to the previous screen without losing data or work.

Consistency and standards covers a broad range of design principles. In general, consistency is desirable because it reduces the number of things to be learned. By using control elements, and similar iconography to that found in other common user interfaces (i.e. being consistent with other user interfaces), users can apply their knowledge and experience of other interactions to the new interface. This strategy is evident in the Microsoft suite of products, whereby functions for achieving similar aims utilise exactly the same icons (e.g. the align right icon is used throughout the Microsoft product range). This has a direct positive impact upon learnability and memorability.
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As the Graphical User Interface has reached maturity, interaction commonalities or conventions can be seen across the vast majority of software. For example, in the Windows environment, the first two components of the menu bar are usually ‘File’, ‘Edit’, and pressing the right mouse button results in the display of a pop-up menu. Any deviation from these conventions forces the user to learn and remember a new interaction style. It is good practice therefore for an interface to adopt these interaction standards, instead of introducing new interaction styles which must be learned.

Within an application, the consistent positioning of interface elements from one screen to another is also important for usability. For example, navigation controls, and buttons to access functions of global importance (e.g. link to a search form) should be located in the same spot on the interface from screen to screen. This means that once the user has found the control once, they will know where to find the control again on other forms. Producing controls which exhibit external consistency is another means of improving usability. A control with external consistency mimics real world processes, using metaphorical icons and actions. The classic example is the dragging of unwanted items into the recycle bin. Again, this improves learnability because users can apply their knowledge of the real world to the interface.

Consistency of terminology within an application is important since discrepancies cause confusion and uncertainty. In practice, this means that labels on buttons which link to pages, or hypertext links, should match or closely resemble the title of the page which is loaded upon use of the control.

Errors are almost inevitable in a system, and although any error will clearly impede usability, the way in which the system reports errors can ameliorate the problem. Under Nielsen’s principle ‘Help users recognise, diagnose, and recover from errors’, he advises the use of plain language to describe errors, and adds that where possible, explanations of how to recover from the situation should be given. The sixth principle ‘Error prevention’ reminds designers that error prevention is better than error cure. This can be achieved to some extent through the use of constraints.
Constraints are a means of preventing the inappropriate operation of controls. For example, in a word processor, when a user selects to close a file which they have not saved, a dialog box appears asking whether or not they wish to save changes before closing the document. The dialog box has focus, and all other controls cannot be accessed until the user selects either yes or no. If the user were able to access the other controls (e.g. new file) while the program was in this state, the operation of opening a new file may cause the system to crash, or the existing file to be closed immediately without the changes being applied. Constraints therefore play an important role in terms of safety.

The principle ‘recognition rather than recall’ draws on psychological research which shows that recognition is a much less complex and demanding cognitive activity than recall. This is because in recognition, visual information acts as a cue for information retrieval. The implication for interface design is that users should be able to recognise controls for interaction rather than have to recall them. In other words, controls should be highly visible. If controls are concealed, users must stop, think, and recall where they are located. Making controls highly visible means that users can see at a glance which functions are available to them, thus increasing productivity, and reducing frustration. The implementation of highly visible controls improves most aspects of usability. In order to achieve the tasks (effectiveness) quickly (efficiency) the user must be able to find the controls. If functions are easy to find, learnability will be improved as users are able to focus on the task, rather than hunting for functions. Highly visible functions also help make the system more memorable as users do not need to recall long paths through menu structures.

Usable interfaces should provide flexibility for efficiency according to Nielsen. This is achieved by the implementation of dual interfaces. The novice interface features a high level of descriptive content and graphical controls which are usually manipulated with a mouse. The point and click interface has high learnability, as the user can see all of the functions available to her along with explanatory notes. However once the user has gained familiarity with the system, the hand holding style of the novice interface, which often includes confirmation dialog boxes after every button press, restricts productivity. This is where the expert interface comes into play. The expert interface is invisible, and overlays the novice interface, allowing
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the user to take shortcuts to functions. This is usually achieved via keyboard shortcuts. Instead of opening menus and drilling down to a desired function with the mouse, a function can be accessed directly via a keyboard combination (usually pressing two or more keys simultaneously). The expert interface therefore allows experienced users to operate the system much more efficiently. As the expert interface relies on recall, it is only useful to frequent users of the system.

A user interface must also be aesthetically pleasing. Simplicity or minimalism is also recognised as good practice in interface design. Interfaces which are clutter free, with logically grouped elements, and descriptive and easy to understand labelling have high learnability. Krug (2000) emphasises the need for simplicity in design, championing the likes of the Google interface. Krug’s key message is ‘Don’t make me think’. He explains that a good user interface should not need to be worked out, it should just be obvious and intuitive. Every detail of the user interface should work towards this goal, and anything that raises questions in the mind of the user should be reworked. Krug uses the example of a button to illustrate this philosophy. He states that all buttons should be rendered three dimensional to indicate that they really are buttons, as a two dimensional button raises the question ‘Is this really a button’? Questions in users’ minds add to the time required to interact with the system, and therefore reduce efficiency.

Finally, Nielsen stresses the importance of help information and documentation. Again, the need for jargon free plain English is as applicable here as any other part of the system. Nielsen adds that help information should be searchable and written in steps which are easy to follow.

A principle which is omitted from this list is ‘Personalisation’. Many user interfaces today offer personalisation. At the simplest level, this might entail enabling the user to change the colours of the user interface. This in itself is an important advance, because while one can give general guidelines such as ‘there should be a high level of contrast between foreground and background colours’, it is not possible to prescribe a good colour scheme for an interface. Indeed, despite all of the efforts of a design team to implement designs which necessitate recognition rather than recall, and provide user control and freedom and so on, users will often react negatively to
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an interface because they don’t like the colour scheme. Personalisation can therefore make important contributions to the user experience. Personalisation can go beyond this however. For instance users may be permitted to define their own keyboard shortcuts. This is beneficial, because users can create a combination which is meaningful to them. These will be more memorable than an arbitrary combination imposed by the system developer.

Some web services offer more control still to the user. For example, the University of Sheffield’s MUSE system (see figure 4) – an information portal for students, providing access to a range of information sources (email, news, discussion forums etc.) - enables users to choose which elements to include on the interface, and where they should be positioned, through a customisation interface (see figure 5). This means that users can place the items of most use to them above the fold, and relegate other less important items down the page.

To a certain extent, the design of the MUSE interface could be described as a collaboration between the end user and the system developer, with the system developer defining broadly what can be achieved, and the end user able to control the fine detail. While such a level of personalisation may result in increased efficiency for the end user through optimal configuration of page content, there is also the potential for user modifications to degrade the service. In the case of MUSE, users may not be aware that the ‘Take Note’ element (top left, figure 4) provides important communications which are no longer transmitted by global email. Students turning off this feature would almost certainly miss out on vital information such as details of impending examinations. It is therefore the responsibility of the system developer to ensure that such controls are ring fenced so that they cannot be modified by the user. Indeed, the customisation feature of MUSE does not allow the user to delete or move the ‘Take Note’ feature from its prominent position at the top left of the page.

Nielsen (1993) is weary of customisation, stating that “the customisation feature itself will need a user interface and will thus add to the complexity of the system and to the users’ learning load” (p 12). He also claims that too much control will result in a plethora of different user interfaces, which erodes the potential for colleagues to
help one another. This is not an argument against personalisation per se, but a warning that offering the right level of personalisation is what matters.

Although heuristics like Nielsen’s provide useful general guidance for interface design, they have been criticised for being too vague. Furthermore, different platforms have different implications for interface design, and heuristics cannot be universally applied. This point is particularly pertinent to this project since the application is being developed for the Internet. Web applications differ from desktop applications in a number of ways. Perhaps the most important difference between web applications and desktop applications for interface design is that web applications must send and receive data over relatively slow networks. In a web application the interface must be transmitted from the web server to the client browser. This means that there is a need to streamline the interface so that it downloads quickly. Such considerations are not relevant in desktop application design, since information can be accessed at high speeds direct from the hard disk. These differences have been recognised, and in response Nielsen (2000) has produced a set of web specific heuristics, described collectively as HOME RUN;

- High quality content
- Often updated
- Minimal download time
- Ease of use
- Relevant to users’ needs
- Unique to the online medium
- Netcentric corporate culture

These are particularly tailored to the evaluation of web sites, however the principles of minimal download time and ease of use are highly applicable to this project.
Interaction design

Now that we have a good understanding of usability, and a set of usability design principles, it is necessary to identify an appropriate development methodology to guide the development of the online web authoring and publishing system. Traditional systems development methodologies based on the waterfall approach (linear development through a series of stages) such as SSADM are inappropriate as they exclude the user from the development process and can result in systems which are obsolete by the time they are released. Therefore, a methodology which is iterative and user-centric in nature is required. By actively involving end users throughout the design process, it is hoped that the system will ultimately be more usable. Achieving a usable design is vital for this project, due to the very low switching costs associated with web applications. If a user doesn’t like the application, they can easily surf onto a competitor’s site.

The framework for development adopted for this project is called ‘Interaction design’, and is detailed in a text of the same name by Preece et al. (2002). Preece et al. define interaction design as: “Designing interactive products to support people in their everyday and working lives” (2002, p v). Good interaction design should assist the user as they perform the task, and expand the user’s capabilities.

Gaining a good understanding of the user base and the environment in which the system will be operated is a crucial first step in interaction design. Different users have different abilities and expectations, and the operating environment determines physical requirements for the product (e.g. an aircraft control panel must be able to withstand high levels of vibration). Preece et al. suggest that interaction designers need to take account of people’s strengths and weaknesses with respect to the tasks they need to achieve. This can be achieved by observing how things are currently done. In addition to identifying tasks which could be automated, and other means of exploiting computing power, emphasis is also placed on providing ‘quality user experiences’. In other words, the goal is not simply to produce an efficient system, but to produce a system which satisfies, stimulates, and pleases the user. Most
importantly, interaction design is participatory. The users views are just as important as all of the other stakeholders.

Preece explains that interaction design is an iterative process, comprising four main elements;

- Identifying needs and establishing requirements
- Developing alternative designs that meet those requirements
- Building interactive versions of the designs so that they can be communicated and assessed
- Evaluating what is being built throughout the process

(2002, p 12). These processes are interrelated, with one informing another and vice versa.

Preece strongly advocates goal setting for interaction designers. Preece distinguishes between usability and user experience goals. As we have seen, usability comprises; Effectiveness; Efficiency; Safety; Utility; Learnability; and Memorability. Measures should be devised for each of these elements so that the system can be comprehensively usability tested.

User experience goals relate to things that go beyond improving efficiency and productivity, although they may also indirectly contribute to these. Preece offers the following as examples of user experience goals:

- Satisfying
- Enjoyable
- Fun
- Entertaining
- Helpful
- Motivating
- Aesthetically pleasing
- Supportive of creativity
- Rewarding
- Emotionally fulfilling

(2002, p 19)
Although all of the usability and user experience goals defined above are beneficial, the key goals vary from project to project, dependent upon the context in which the system is used, the tasks which must be achieved, and the profile of the average intended user.

**Identifying needs and establishing requirements**

The first stage of interaction design is to identify needs and establish requirements: “… understanding what the product under development should do and ensuring that it supports stakeholders’ needs are critically important activities in any product development” (p 203 Preece). In other words, questions such as ‘why is a new product required?’ and ‘what should / could the product do?’ need to be answered. A key part of identifying needs and establishing requirements is getting to know the target users. Preece suggests the use of user studies to establish needs. User studies involve looking at how people currently perform tasks, and identifying opportunities for assisting them as they tackle tasks.

The means of gathering requirements varies depending upon the nature of the product under development. Where a product is innovative, and no existing comparable system is available, it is necessary to see how users currently work, and to explore in depth the individual tasks and activities. This can be achieved through naturalistic observation. Observations can be recorded in note form, as this is unobtrusive. Observation notes, plus interview transcripts can be used as the basis for task analysis, and the production of use cases.

Where comparable systems already exist, and the aim is to develop an improved system, needs and requirements can be identified by conducting user evaluations of existing systems. The results of user studies or user evaluations can be used to identify the potential value of a new product to a user, and also enables the identification of features which the new system may require.

Preece advocates the setting of specific usability and user experience goals at the beginning of the project. This provides a yardstick for performance monitoring
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throughout the project. The output from this initial stage of the project is a set of user requirements which are then translated into design proposals.

Requirements may be functional or non functional. Functional requirements are specific things which the system must enable the user to do, such as ‘Have a facility for deleting email’. Non functional requirements are things which the system must be, and include usability goals, such as ‘The system must be easy to learn’ and ‘The system must be fun to use’.

**Developing alternative designs that meet those requirements**

The next step in interaction design is to suggest ideas for meeting the requirements. Design is broken down into two components, conceptual and physical. Conceptual design is concerned with what the product should do, and how it should behave. Physical design is concerned with the fine details: the graphics, the colour scheme, which items to include on specific menus and so on.

**Building interactive versions of the designs so that they can be communicated and assessed**

The designs are implemented in the form of prototypes, to give users the opportunity to visualise the design, and begin to interact with the system. Prototypes can come in many different forms, and can be used for different purposes. Lo-fidelity prototypes are simple mock ups made from cheap resources. They are never intended to be integrated into the final design, and appear quite different to the final product. They are used because they are cheap and easy to produce. A typical low fidelity prototype is an interface sketched on paper. Hi-fidelity prototypes use the same materials or technologies as will be used for the final product. Indeed in some systems development methodologies, a working prototype is evolved and re-engineered until it is finally released as the finished product. This is in contrast to the throw away prototype model, whereby although a prototype may be coded in the same language as the final product, the prototype will be ultimately be discarded. The final build will be produced from scratch because the program has become inefficient and unwieldy during design iterations.
Evaluating what is being built throughout the process

Once a prototype is complete, it is evaluated by end users. Continued evaluation by end users is crucial to interaction design, as this ensures that the product is heading in the right direction. Evaluation gives users the opportunity see how their requirements have been translated into a design. By interacting with something tangible, users are often better able to elaborate on their requirements. The usability of the design is measured against criteria derived from the usability goals. For example, ease of learning can be measured by recording the number of errors users make as well as the time it takes them to complete a task.

Usability testing is central to interaction design. As outlined above, usability testing may be conducted at the start of the project where a comparable system is already available. Usability testing is always performed during prototype evaluations. Usability testing involves the measurement of key criteria, which are related to the elements of usability defined above. These criteria are: time taken to complete a task, number of mistakes made, and overall task outcome (success or fail). Additionally, usability testing involves assessing the user experience.

Assessing a design for its usability therefore entails finding out whether or not the user can achieve their goal(s), and how easy or painful their experience was. Usability testing is used to reveal aspects of the design which impede progress, agitate, or confuse the user, so that these can be ironed out during the next design iteration.

Participants in usability tests should be drawn from the target user base. For example, if the system is to be implemented in public libraries, participants should be selected from regular library users. The test environment need not necessarily be a fully blown usability lab, but could be a room which is temporarily equipped with the necessary equipment. The important thing is that there will be no interruptions.

Tasks are designed so that they capture what it is that you want the user to be able to achieve with the system. Each participant should perform the same tasks, so that the objective comparisons can be made between the participants. Building some
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flexibility into the tasks however is likely to increase user interest and responsiveness (Krug 2000, p 153).

One problem with user testing is that users are on their best behaviour during trials. When being observed they feel that they are being tested rather than the system. This means that they will try hard to get it right, and will persist with a problem. In reality, they may rapidly exit a system which is difficult to use. This means that task outcome is not the only important usability measure, and must be complemented with data on time taken, and participant gestures and apparent feelings towards a task (Shneiderman, 1998).

After each round of testing, problems must be identified and prioritised. High priority problems are those which cause users to fail a task. Low priority problems may not be universally experienced by participants, and may niggle users rather than cause task failure.
Methodology

In this section, details of the methods used to develop the online web authoring and publishing system are provided. As outlined in previous sections, usability is vital for the success of an interactive product. The system development methodology assumed for this project is therefore the user-centric, iterative process for interaction design proposed by Preece (2002). This comprises;

- Identifying needs and establishing requirements
- Developing alternative designs that meet those requirements
- Building interactive versions of the designs so that they can be communicated and assessed
- Evaluating what is being built throughout the process

These activities are interrelated, with the output of one element feeding into the others. The process cycles until resources dictate an end. Preece (2002) highlights the cumulative benefits of the design-evaluation cycle, “As designers understand users’ needs better, their designs reflect this understanding. Similarly, as users see and experience design ideas, they are able to give better feedback that enables the designers to improve their designs further.” (p 339). This project is divided into three phases based upon the elements of interaction design given above.

The user centric approach adopted for this project means that research methods are predominantly qualitative. Usability testing is key to user centred design (Dix et al, 1998), and therefore forms a central part of this research. Usability testing involves the observation of carefully selected research participants while they conduct pre-determined tasks. Data collected is therefore in the form of observation notes. Post test evaluation is also performed via questionnaires and interviews. Because usability testing involves comprehensive analysis of the behaviours and actions of a small group of individuals, the data gathered is essentially qualitative, and not suitable for any significant statistical analysis. Some quantitative data is collected in the first phase, which allows a certain amount of triangulation. This data is gathered via questionnaires distributed by email.
The methods used at each stage are now presented.

**Phase 0: Identifying needs and establishing requirements**

The web design process as defined in the literature was presented earlier. In order to gain more detailed insight into the needs and requirements for a web authoring and publishing tool, it was necessary to observe web design in practice. Fortunately, a good range of online web authoring and publishing systems already exist. As Krug (2000) points out, with existing systems, it's as though someone has made a prototype for you. Analysis of the existing systems to identify their strengths and weaknesses formed a sound platform for the development of the new system.

First, user evaluations of two online web authoring and publishing systems were conducted. Evaluations were limited to just two systems because of time constraints. This approach was complemented by a survey distributed to people with web design experience. This survey captured information about user experiences of a wide range of web tools. Finally, a professional web design team was observed as they worked on a content management system. One member of the team walked through a typical task, and all three were interviewed about their experiences with the system. From this rich picture of existing web authoring and publishing systems, the set of requirements for the new system were derived. This included functional requirements, and non-functional requirements including usability and user experience goals.

**User evaluations**

The user evaluations consist of usability testing, and techniques to elicit the user experience. User evaluations were conducted to assess how well the systems fulfilled users’ needs and whether or not the users liked them.

Before evaluations take place, it is important to define the target user for the proposed system, and understand what value the system will have for them. Users of the system will be computer literate, and will be regular users of the internet. This means that they will have a good understanding of what a website is, and what they are comprised of i.e. text, images, hyperlinks, pages. Users will also be familiar with word processors, and therefore concepts such as creating new documents, saving
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documents, formatting text and so on. However, users will have little or no web design experience. The value of the system for the users, is that it will enable them to produce and manage attractive, effective, usable web sites, without any technical knowledge.

First, two systems needed to be selected for the evaluation. The systems were required to offer similar functionalities to the proposed system, and also be aimed at the same user base. Therefore the systems selected were online web authoring tools catering for people with little or no web design experience.

Yahoo! Geocities (http://geocities.yahoo.com/) was the first system selected for evaluation. This tool boasts ‘Easy-to-use web design tools – no HTML required!’.

Although current member levels are difficult to ascertain, when Yahoo! acquired Geocities in 1999, there were over 3.5 million sites authored and hosted on Geocities (Yahoo! Media Relations, 1999). The second service selected for evaluation was Lycos Tripod (http://www.tripod.lycos.com/). Tripod has been a market leader since 1994, and offers a Site Builder service for users who aren’t familiar with HTML. Site Builder claims to offer ‘Easy, quick building’.

Usability testing with end users was selected over heuristic evaluation by experts for several reasons. Firstly, members from the target population were more readily available than expert system reviewers. Furthermore, heuristic evaluation has been criticised for being too subjective. Researchers have argued that some reviewers place more emphasis on some heuristics than others. Additionally, the heuristics themselves had been described as too vague, creating the possibility for alternative interpretations. It is therefore felt that direct observation of participants (who are representative of the target user base) undertaking tasks, is the best means of evaluating these systems.

Four participants were recruited for the evaluations. Ideally, evaluations involve five or more participants, however time constraints dictated that these evaluations were restricted to four participants. To reduce bias, only participants who had not used the systems under evaluation were selected. Participants were also selected based upon their levels of general computing experience and web design experience. All
participants were computer literate. Two participants had no previous web design experience, whereas the other two had produced sites before. This range of participants was selected as firstly it was not known whether users with no experience would indeed be able to complete the tasks devised. Secondly, by using participants with a range of abilities, it was possible to gain wider insight into the activities involved in web design, and to see whether or not certain features were more or less suited to the target user base. It was important however that the participants with no design experience were at least regular users of the internet with an interest in developing their own pages. This user profile matches the target user.

One weakness with the group of participants is that they were all educated to degree level. It would have been desirable to recruit participants from a range of educational backgrounds, however this compromise had to be made as other participants were not forthcoming.

As this was a comparative evaluation, each participant was required to complete equivalent tasks on each system. The tasks were designed so that they could both be completed within one and a half hours in total. As each test lasted approximately 45 minutes, participants were given a break in between evaluations. The tasks included requirements which would test the participants’ ability to achieve a number of key activities associated with web design such as inserting images, formatting text, creating a number of pages, and providing navigation between the pages. The tasks were not rigidly structured, because this provided the opportunity to observe the natural web design workflow, for comparison with that which was defined earlier in the web design chapter. The first tasks were designed to be relatively easy as this improves the participants’ confidence (Preece, 2002).

Using the same participants for both system eliminates bias introduced by individual differences in ability. Counterbalancing was introduced to avoid the order effect, whereby participants perform better in the second task because of experience and knowledge gained from the first. Task and system order were therefore rotated during the evaluation sessions as shown in table 2 below;
Table 2) User evaluation schedule

<table>
<thead>
<tr>
<th>Evaluation session</th>
<th>Participant</th>
<th>Task</th>
<th>System</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>A</td>
<td>A</td>
<td>Geocities</td>
</tr>
<tr>
<td>2</td>
<td>A</td>
<td>B</td>
<td>Tripod</td>
</tr>
<tr>
<td>3</td>
<td>B</td>
<td>B</td>
<td>Geocities</td>
</tr>
<tr>
<td>4</td>
<td>B</td>
<td>A</td>
<td>Tripod</td>
</tr>
<tr>
<td>5</td>
<td>C</td>
<td>A</td>
<td>Tripod</td>
</tr>
<tr>
<td>6</td>
<td>C</td>
<td>B</td>
<td>Geocities</td>
</tr>
<tr>
<td>7</td>
<td>D</td>
<td>B</td>
<td>Tripod</td>
</tr>
<tr>
<td>8</td>
<td>D</td>
<td>A</td>
<td>Geocities</td>
</tr>
</tbody>
</table>

The sessions were conducted over two days, with the first participant starting at 1pm, and the second at 3pm.

All evaluations took place in a specially prepared room. The room contained a PC which was connected to the internet with a 56K dial up modem. A dial up connection was used because, as we have seen earlier, an important part of web usability is download time. By testing with a 56K modem, we can be sure that an interface is usable (or not) for the majority of internet users. Arrangements were made so that there would be no interruptions during the evaluation session. A camcorder was also set up on a tripod to capture everything which happened on screen. The camcorder also picked up anything which the participant said during the session.

Standard scripts were used to brief and debrief participants. By adhering to scripts, all participants received the same instructions, thus reducing the potential for bias. The briefing script gave an overview of the purpose of the exercise, placing emphasis on the fact that it was the systems being tested and not the participant. Participants were made aware of the recording equipment and the fact that observation notes would be taken throughout the session. They were then assured that all data collected would be kept confidentially, and that any details provided in the report would be completely anonymised. Participants were then asked to sign informed consent forms.
The first system to be evaluated was then presented. Participants were given up to five minutes to explore the interface, and familiarise themselves with the system. During this period, user actions were noted. Participants were also encouraged to speak aloud their thoughts during the session, particularly if they were confused about something.

Once the participant was ready to begin the tasks, they were handed the task sheet. Participants were asked to read through the tasks, and then complete them at their own pace. They were also asked to indicate when they were satisfied that they had completed a task.

As participants worked on tasks their actions and feelings were recorded in observation notes, as well as by camcorder. The camcorder was used so that important episodes could be reviewed later in detail. They were observed from the side, so that their facial expressions and gestures could easily be seen. In some usability experiments, users are more heavily monitored through key logging software, and multiple camcorder recordings taken at different angles. In this case, limited equipment and time constraints (particularly the time available to analyse data) meant that key logging and multiple camcorder recordings were not adopted. Particular care was taken to record details of events where the participant was confused or frustrated, for example when an interaction had undesirable or unexpected consequences. In these cases participants were asked what they had expected to happen prior to the interaction. Scenarios where participants appeared lost were also recorded, and participants were asked what they were looking for.

At the end of each task, the participants were asked to rate the difficulty of subtasks on a three point scale (easy, ok, or difficult). They were then asked to complete a user experience survey. Finally, participants were interviewed about their experience.

After both systems had been evaluated, participants were asked which system they preferred and why. Copies of the tasks, scripts and post task interviews used for the Phase 0 user evaluations are provided in Appendices A, B and E.
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Much effort has gone into ensuring the reliability and validity of methods used here. To improve reliability, care was taken to ensure that conditions were consistent between evaluation sessions. Measures taken included preparing the room so that there would be no interruptions, running tests at the same time each day, and the use of scripts to brief and debrief participants. Validity was improved by the collection of a range of data, both quantitative and qualitative. This enabled triangulation which meant that a more comprehensive interpretation of events could be produced. Having only one observer meant that there was a danger that certain behaviours would be picked up on more than others, however having a video recording of the session meant that sessions could be replayed, and new observations identified. There was also the potential for biasing interview results by changes in the tone of voice, facial expressions, and so on. Unfortunately, these factors simply had to be borne in mind, and every effort was made to question participants consistently. Some bias was removed through the application of preset questions, as opposed to a completely unstructured approach.

Perhaps the main criticism of the usability testing methods adopted for this project relates to ecological validity. As lab experiments are strongly controlled, the performance and behaviour of participants may not be representative of their actions in the real world. Participants may feel pressured or anxious, which then affects their performance. Steps taken to counteract this scenario included; using a homely room as opposed to a sterile lab; fully explaining to participants at the outset that it is the system being tested and not the participant; and avoiding overly obtrusive recording devices.

**Analysis of user evaluation data**

The user evaluations provided a wealth of data. Key events such as moments of confusion, and unexpected system responses to interactions were transcribed. Similar occurrences were grouped together, so that key problems could be identified. Data from task ratings was tabulated and mean values for each calculated. Interviews were transcribed, and key themes were drawn out and grouped.
Observing web design professionals

A team of web design professionals was visited in order to gain insight into their way of working, and to explore the functionality provided by the Content Management System (CMS) which they use. CMSs are complex tools deployed to enable large organisations to manage their web sites more effectively. As well as enabling simultaneous web authoring, and ensuring that all pages produced comply to a corporate style, CMSs empower people with little or no web design experience to contribute to the web site. It was this aspect of the CMS which was of particular relevance to this project. By seeing the CMS in action, it was possible to see how a system can assist novices with the web design process.

First, a member of the team demonstrated how web content was authored and published using the system. Afterwards, the team was interviewed as one, so that discussions about the system could occur. This was necessitated by time constraints but enabled an interesting dialogue to develop.

Web design questionnaire

The first part of the questionnaire (see Appendix C) collected respondent variables relating to levels of computing and web design experience. These details could be used to identify trends in responses based on different levels of experience. The remainder of the questionnaire examined the activities which web design entails and the utility of specific features available in web authoring tools. Finally, a set of features derived from the results of the user evaluations was presented, and respondents were asked to indicate how useful they thought these would be in a web design tool for people with little or no web design experience.

Because the questionnaire is targeted at a subset of the population with web design experience, an effective means of reaching this group was required. The questionnaire was emailed to all students currently enrolled on Masters degree programmes at Sheffield University’s Information Studies department. A covering letter also asked respondents to forward the questionnaire to friends and family with web design experience. This snowball approach to research is an effective means of reaching a particular demographic, as people belonging to that group often have
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contacts with similar interests. This approach was cost effective and appropriate as people with web design experience are comfortable working with electronic documents and using email.

Questionnaires have some advantages over other research techniques such as interviews. Questionnaires are more neutral: each recipient gets exactly the same questions and therefore responds under the same circumstances. With interviews, interviewers may unwittingly guide the responses of their interviewees, by adding emphasis to certain questions, and inviting interviewees to expand upon some areas more than others (Gorman and Clayton, 1997). As interviews are conducted in person, interviewees may not be entirely honest with their responses, and they may want to please the interviewer. As questionnaires are more impersonal, respondents may answer questions more honestly.

This is not to say that questionnaires do not have the potential for response bias. Careful consideration was paid to the design of the questionnaire to eliminate the possibility of response bias. Questions of a ‘tick all that apply’ nature are complemented with an ‘Other - please specify’ option so that other unforeseen items can be reported (e.g. 2.3 Please indicate which of the following activities you undertook when doing web design). To keep response biases to a minimum, double barrelled, leading, and loaded questions were omitted from the questionnaire.

Another weakness with questionnaires is that the researcher is not able to clarify the meaning of an item if there is any confusion. The chances of this occurring can be reduced however by piloting the questionnaire. The first draft of the questionnaire was therefore piloted with five participants. Feedback from these pilots showed that some of the questions were slightly ambiguous, and these were then rephrased.

Conducting the questionnaire by email provided many practical advantages. Open ended responses were simply cut and pasted from one document to another, thus removing the need for transcribing. The questionnaires were also effectively limitless. If someone wanted to provide a lot of detail, they could do so without running out of space as can be the case with paper documents. Furthermore, all responses were legible.
Each question was numbered for ease of reference during analysis. The questionnaire was designed so that it would take less than 10 minutes to complete. Keeping the size of the questionnaire down improves the response rate, as people will not start a questionnaire which appears too lengthy. Automatic entry into a prize draw was also promised for all fully completed questionnaires which were received within 14 days of dispatch. This provided an incentive to reply, and to reply promptly.

31 surveys were returned, and only one was incomplete. It is not possible to define a response rate, because the proportion of students with web design experience among those canvassed is unknown. The sample of 30 web designers is not sufficiently large to make bold generalisations about web design, but it does provide valuable insight into this field.

**Phase 1**

The output of Phase 0 is a set of system requirements based on the data gathered. In phase 1, a number of possible interfaces are sketched, designed to meet those requirements. The best solution is implemented as a high fidelity prototype, using forms constructed in Microsoft Access (linked using macros) which imitate the functionalities of a fully featured prototype. A brief overview of how the design adheres to usability guidelines and meets the requirements is presented, before the interface is subjected to user evaluations.

These user evaluations are based around a strictly defined series of tasks designed to ensure that core aspects of web design can be achieved with the proposed system. The evaluations will be conducted under the same conditions as the phase 0 evaluations (as outlined above), and again involve four participants. All participants will be required to conduct exactly the same tasks. Participants will all be drawn from the target user population: they will be computer literate and regular users of the internet but with no prior web design experience. Again, the participants are briefed and debriefed using standard scripts for consistency. The participants are recorded using a camcorder, and errors, times taken to achieve tasks, and episodes of
confusion or user frustration are noted. Materials for the Phase 1 evaluations are presented in Appendices A, D, and E.

The user evaluation data is analysed and a set of requirements for the next design iteration are produced. These form the input to Phase 2.

**Phase 2**

Based on the new requirements established from Phase 1, a fully featured prototype is developed for phase 2. This prototype is built using technologies suitable for the final product, and all core functionalities are implemented. An overview of the technical implementation details are presented along with details of how the new design meets the new requirements. The system is then evaluated with four new participants. The same tasks are conducted under the same conditions as in Phase 1, so that the Phase 2 design can be objectively compared to the Phase 1 design. The phase 2 evaluation materials are therefore the same as those used in phase 1 (i.e. they are available in Appendices A, D and E).

The evaluation data is analysed, and requirements for the next design iteration (which is beyond the scope of this project) are specified.
Development

Each phase of development is now presented. In each phase, the results of the research are presented and discussed, and specifications are produced for the next design iteration.

**Phase 0**

Table 3) User evaluation results: Task ratings and pass rates

<table>
<thead>
<tr>
<th>ID</th>
<th>Task</th>
<th>Geocities</th>
<th></th>
<th>Tripod</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Mean</td>
<td>Standard</td>
<td>Mean</td>
<td>Standard</td>
<td>Pass</td>
<td>Mean</td>
</tr>
<tr>
<td></td>
<td></td>
<td>difficulty</td>
<td>deviation</td>
<td>difficulty</td>
<td>deviation</td>
<td>rate (%)</td>
<td>difficulty</td>
</tr>
<tr>
<td>1</td>
<td>Creating 3 pages</td>
<td>2.25</td>
<td>0.83</td>
<td>50</td>
<td>1</td>
<td>0.00</td>
<td>100</td>
</tr>
<tr>
<td>2</td>
<td>Applying page templates</td>
<td>2</td>
<td>0.71</td>
<td>100</td>
<td>1</td>
<td>0.00</td>
<td>100</td>
</tr>
<tr>
<td>3</td>
<td>Adding text</td>
<td>1.5</td>
<td>0.50</td>
<td>100</td>
<td>1</td>
<td>0.00</td>
<td>100</td>
</tr>
<tr>
<td>4</td>
<td>Formatting text</td>
<td>1</td>
<td>0.00</td>
<td>50</td>
<td>1.25</td>
<td>0.43</td>
<td>100</td>
</tr>
<tr>
<td>5</td>
<td>Inserting images</td>
<td>1.75</td>
<td>0.43</td>
<td>100</td>
<td>1.75</td>
<td>0.83</td>
<td>75</td>
</tr>
<tr>
<td>6</td>
<td>Resizing and positioning images</td>
<td>1</td>
<td>0.00</td>
<td>50</td>
<td>1.75</td>
<td>0.43</td>
<td>100</td>
</tr>
<tr>
<td>7</td>
<td>Adding external hyperlinks</td>
<td>1.75</td>
<td>0.83</td>
<td>100</td>
<td>1</td>
<td>0.00</td>
<td>100</td>
</tr>
<tr>
<td>8</td>
<td>Linking between pages</td>
<td>2</td>
<td>1.00</td>
<td>50</td>
<td>1</td>
<td>0.00</td>
<td>100</td>
</tr>
</tbody>
</table>
Designing a usable online web authoring and publishing system

<table>
<thead>
<tr>
<th>ID</th>
<th>Publishing the site</th>
<th>1</th>
<th>0.00</th>
<th>100</th>
<th>2.5</th>
<th>0.50</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>Viewing the site</td>
<td>1.75</td>
<td>0.43</td>
<td>100</td>
<td>1.5</td>
<td>0.50</td>
<td>100</td>
</tr>
<tr>
<td><strong>Means</strong></td>
<td></td>
<td><strong>1.60</strong></td>
<td><strong>80%</strong></td>
<td><strong>1.38</strong></td>
<td></td>
<td><strong>87.5%</strong></td>
<td></td>
</tr>
</tbody>
</table>

* Participants were awarded passes if tasks were achieved without the need for assistance

**Difficulty ratings (1 = easy, 2 = ok, 3 = difficult)

**Table 4** User experience summary

<table>
<thead>
<tr>
<th>ID</th>
<th>User experience statement</th>
<th>Geocities mean rating* (and no. responses if &lt; 4 **)</th>
<th>Geocities standard deviation</th>
<th>Tripod mean rating* (and no. responses if &lt; 4 **)</th>
<th>Tripod standard deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>I enjoyed using this system</td>
<td>2.5</td>
<td>0.50</td>
<td>3.75</td>
<td>1.09</td>
</tr>
<tr>
<td>2</td>
<td>I found the page wizard easy to use</td>
<td>3.33 (3)</td>
<td>0.47</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>I found the page editor easy to use</td>
<td>3.5 (2)</td>
<td>0.50</td>
<td>4 (3)</td>
<td>0.82</td>
</tr>
<tr>
<td>4</td>
<td>I am satisfied with the system</td>
<td>3.25</td>
<td>0.83</td>
<td>3.5</td>
<td>0.87</td>
</tr>
<tr>
<td>5</td>
<td>The system helped me to build pages quickly</td>
<td>3.75</td>
<td>0.83</td>
<td>3.5</td>
<td>1.12</td>
</tr>
<tr>
<td>6</td>
<td>The system was flexible</td>
<td>3.25</td>
<td>0.83</td>
<td>2.75</td>
<td>0.83</td>
</tr>
<tr>
<td>7</td>
<td>The system was easy to learn</td>
<td>3.5</td>
<td>0.87</td>
<td>4</td>
<td>0.71</td>
</tr>
<tr>
<td>8</td>
<td>I didn’t get lost using the system</td>
<td>1.75</td>
<td>1.30</td>
<td>3.5</td>
<td>0</td>
</tr>
<tr>
<td>9</td>
<td>I am satisfied with the pages I have produced</td>
<td>3.75</td>
<td>1.09</td>
<td>4</td>
<td>0.71</td>
</tr>
<tr>
<td>10</td>
<td>The screens were attractive</td>
<td>3</td>
<td>0.71</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>11</td>
<td>The page templates were effective</td>
<td>3.5</td>
<td>0.87</td>
<td>4</td>
<td>0.71</td>
</tr>
</tbody>
</table>
The publishing process was simple

I could easily find the functions I needed

|   | Designing a usable online web authoring and publishing system |
|---|---|---|---|---|
| 12 | The publishing process was simple | 3.5 | 0.50 | 3.5 | 1.5 |
| 13 | I could easily find the functions I needed | 2.25 | 0.43 | 2 | 0.71 |
| **Means** | | **3.14** | **3.58** | |

* (1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree)

** Not all of the participants used all of the features

**User evaluation results discussion**

Although the data presented above is of limited statistical value due to the fact that just four participants took part in the evaluations, this data can be used to make broad statements about the usability of each system and the user experiences, when cross referenced with observation notes, and comments made in the post task interviews.

The figures given at the bottom of the two tables represent the overall picture. They show that while there was very little between the two systems, Tripod was slightly better in terms of ease of use (lower mean task difficulty rating), effectiveness (higher mean task pass rate), and user experience (higher mean experience statement rating). The participants’ preference for Tripod was reiterated in the post task interview, where all four indicated that Tripod was their preferred system.

An examination of individual strengths and weaknesses in more detail assists with the definition of requirements for the new system. System weaknesses are identified and discussed with reference to extracts from observation notes and post task interviews. System aspects which participants appreciated are also summarised.

**Problems with Geocities**

**Creating three pages**

Only two of the participants managed to produce the full three pages as required. Participant C (PC) only completed two pages, as one was lost due to an ambiguous save procedure. After PC had completed the first page, he selected ‘New page from template’ from the file menu (page builder). This resulted in the display of a theme selection box for the new page. PC selected ‘Blank’, and a dialog box asking ‘Do you want to save the changes you made to the page?’ appeared. PC presumed that this dialog referred to the new page, and after pressing ‘save’, entered a name for the
new page (‘products.html’). In fact the dialog referred to the first page he had created. After PC edited the new page, he pressed save, and the dialog presented products.html as the default choice, which PC accepted. This resulted in his first page being overwritten and lost. In the post task interview, PC stated that after losing his work on the first page, he would probably have given up on the system in real life.

Participant A (PA) failed to produce all of the pages because she could not find an appropriate page template for the links page.

**Applying page templates**

This process was problematic because the button for modifying the page background (on the page builder interface) was isolated from the others - positioned at the bottom left hand corner of the page (see figure 6). Furthermore, the icon used was not naturally associated with modifying the background image, and the image did not change on mouseover like the other buttons. The position of the function within the menu structure was also not intuitive. This excerpt from observations of participant C highlight these difficulties:

> During task 1, PC decided to change the page template for one of his pages. PC explored the menus at the top of the page but could not find a function for changing the page background. This function was located under Insert > basics > background. PC searched the help file without success. Finally, after re-examining the menu options, PC eventually noticed the square icon at the bottom of the page which enabled him to edit the background.

**Formatting text and positioning/resizing images**

Only the two experienced participants were able to format text and manipulate images using Geocities, as the wizard which the novices relied on did not support this functionality.

**Adding external hyperlinks**

While three of the participants successfully added external hyperlinks, PA found this difficult. On the links form displayed on the page wizard, PA asked “Where would
you type the links? There’s no space to type them into”. The confusion arose because the link boxes contained predefined information (see figure 7). PA also didn’t understand why there were two boxes per link – one for the link text, and one for the associated URL. In the end, PA added the URL to both boxes and clicked ‘Next’.

**Linking between pages**

The failure of half of the participants to add navigation links to their site is Geocities’ most serious flaw, given the vital importance of good navigation for web usability. The novice participants (A and D) failed because the wizard did not provide a simple option for including a link to an existing page, and instead relied on the user entering the URL of the page to link to. During the wizard for the products page, Participant D (PD) commented, “I don’t know what the web address would be for the home page, so how can I link to it… How would I find it?”. PD added text for the link labels, but did not complete the corresponding URLs. Similarly, as PA attempted to add navigation links, she remarked, “I’ve got no idea what to enter into the boxes”.

**System navigation problem**

Another key problem with Geocities was associated with the screen presented upon completion of the wizard. After the wizard window was closed, a ‘view the page / make changes’ page was loaded into the parent window (see figure 8). The problem with this page was that the option for creating a new page with the page wizard was situated at the bottom of the page, beneath the fold. Neither PA nor PD found this option, and both required assistance. This problem is reflected in the very low mark (1.75) given for the statement ‘I didn’t get lost using the system’. This excerpt from observations of PA highlights the problems this caused:

Upon completion of the page wizard, PA selected the ‘View the page’ link, which loaded her page into the same window. She was pleased with the page that she had created, however she did not know what to do next. She clicked ‘Back’ on the browser, and scanned the ‘View the page’ page, without scrolling down. PA was aware that she now needed to create the photo page, and tried the links at the top of the page – ‘Account info’, Yahoo! (Home),
Help – each time quickly returning to the ‘View the page’ page using the browser’s back button.

PA said, “I’m stumped… I don’t know where its disappeared to, and I was doing so well”. I asked what she was looking for, and she said she was trying to find the Geocities home page, so that she could start the photo page wizard. PA then clicked some buttons on the Yahoo! Browser toolbar, at which point I intervened and entered the URL for the Geocities home page. From here, PA was able to re-launch the page wizard.

Lack of feedback
When uploading pictures, a dialog did indicate that uploading was in progress, however there was no indication of the amount of progress made (see figure 9). When PA uploaded an image, there was a pause of about 30 seconds, and despite the notice stating ‘Sending image, please be patient’, the user clearly became agitated.

Long download time for page builder interface
There was a delay of 3 minutes while the page builder interface downloaded. PB was clearly frustrated by this pause stating, “It wouldn’t be so bad if we had broadband”. PC commented that the good system feedback relating to the length of remaining download time made the wait more acceptable.

Boring interface
Participants neither agreed, nor disagreed with the statement ‘The screens were attractive’, but in the post task interview, Participant C said “The page builder interface is very dull… there’s far too much grey!”.

Geocities strengths
Participants were generally impressed with the page templates offered by Geocities (‘The page templates were effective’ was rated 3.5). In the post task interview, Participant A said “The templates make my site look professional”, and Participant B said “I think the templates are great for beginners as they jazz the site up, and are difficult to produce by hand.”
Although participants rated the statement ‘I found the page wizard easy to use’ neutrally, the novice participants were positive about the page wizard in the post task interview. PD said, “I think the wizard was good. It took me through a stage at a time, and it was easy to follow”. PA also said, “I think the wizard is very good for a beginner”. Participants probably rated the wizard neutrally because of the final screen which concealed the options for continuing.

**Problems with Tripod**

On the whole, participants succeeded with Tripod, however a few aspects of the interface caused problems.

**Inserting new images**

Although all participants managed to replace existing images with new ones, PA struggled to insert a new image. On the page editor page (see figure 10), PA opened the ‘Edit’ menu in the browser window and explained that this is where she inserts pictures from, in Word. She realised that this was not correct, and subsequently tried the ‘File Manager’ link at the top of the page saying, “Would you use this?”. After getting lost, PA was shown the ‘Add picture’ button at the bottom left hand corner of the screen (figure 10). This resulted in the page being refreshed, and the display of ‘Add it here’ buttons (see figure 11). PA looked confused, scrolled up and down the page and remarked “All I’ve got is add it here”. PA didn’t notice the explanatory text at the bottom of the page, but eventually pressed one of the buttons, resulting in the display of the picture chooser dialogue and successful insertion of the desired image. This observation suggests that toolbars and help dialogue should not be placed at the bottom of the interface.

**Lack of flexibility**

The system scored lower than neutral (2.75) for the statement ‘The system was flexible’. In the post task interviews, PB and PC both stated that the system was easy to use, but not very flexible. As PB edited some home page text, she remarked, “I like the way you can easily add content to the page using these boxes [points to predefined text blocks], but it’s a shame you cannot just drag the boxes around.” The same applies to images. Resizing actually requires going into the Edit dialog,
and finding the picture dimension options, whereas the participants expected to be able to drag items to resize them.

**Publishing the site**

Publishing the site was a major problem for all participants. Although the publish function was present on the main toolbar (bottom of figure 10), none of the participants tried to publish the site before declaring that they had finished the tasks.

**Finding functions**

Participants struggled to find appropriate functions throughout the Tripod evaluations. For example, when trying to remove a text block, PD selected ‘edit text’. PD then cleared the default text in the text editor (see figure 12). When PD pressed ‘done’, an error message was displayed, stating that empty text boxes cannot be created. PD assumed that she must therefore enter some text, and transferred a sentence from the above paragraph to this text box. Similarly, when PC decided he wanted to remove a picture, he chose ‘edit picture’ and commented “It doesn’t appear to have an option to not have a picture here. I suppose its just a function of the template”. PC then changed the image to one of his own choice.

These problems appear to stem from the fact that buttons are not seen when they are placed on the bottom toolbar. In both cases, a ‘Delete this item’ button was present on the bottom toolbar (figure 12). Guidance information displayed there was also unnoticed. As PD chose to change the default picture on her home page, she commented “the information bit telling you what to do should be at the top of the page, not at the bottom, ’cos I’ve only just noticed it’s there!”.

The fact that participants struggled to find functions was reflected in the low score of 2 (disagree) for the statement ‘I could easily find the functions I needed’.

**Slow response time**

Two of the participants commented that the system was not quick enough. Their frustration stemmed from the fact that upon clicking an ‘edit button’, the page editor took on average 30 seconds to load. After pressing save the system took 35 seconds to return to the main page view. This meant that to change just one word involved a
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round trip lasting over a minute. This is well over the 10 second usability threshold stipulated by Nielsen (2000).

Deleting unwanted pages

Upon completion of the photo page, PC said that he needed to remove the ‘About me’ page, which he had erroneously included at the beginning. He tried the ‘Edit navigation’ link, but found that this only enabled him to customise links for existing pages. PC concluded that he could not delete the unwanted page.

Tripod strengths

Participants were impressed with the automatic site navigation built by the system. As they added a page, Tripod updated the links to include the new page.

Participants also liked the range of templates – this was indicated by three of the four during the post task interview. Participants also agreed with the statement; ‘The page templates were effective’.

The novice participants appreciated the wizard driven nature of the system, and Participant A remarked, “The wizard is very helpful… I wouldn’t know where to start with a blank page”.

Controlsite Content Management System

The Content Management System (CMS) is an application which resides on the public web server. Site editors log into the system and edit their content using their web browser. This removes the need for uploading content, as it is produced directly on the web server. The CMS aims to make web authoring and publishing accessible to everyone by automating complex and time consuming tasks such as HTML coding, and navigation link maintenance.

A CMS offers many powerful features for the management of a large multi-author site, however, given the focus of this project, only the interface for creating and publishing content was explored. A member of the team demonstrated how the system was used to create and publish a simple page containing text and an image. The processes of editing and deleting existing pages were also demonstrated. After
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the demonstration, the team were asked as a group about the effectiveness of the system for web novices. This insight into another web authoring and publishing tool assisted with the specification of requirements for the new system.

The key functionalities are now presented, followed by some of the criticisms of the system made during the group interview.

Key functionalities

WYSIWYG editor

The system offers a simple form based interface for the entry of page content (see figure 13). Users enter text into the ‘body text’ area, and using the icons above can; cut, copy, and paste content; undo and redo changes; apply font styles and embolden, underline or italicise text; insert and edit tables; indent text; change text alignment; and insert bulleted lists. Users can also specify images for the page using the ‘media’ button. Assigning images to an article results in the picture(s) being displayed in a default arrangement, alternating between left and right aligned as you move down the page. The value of the WYSIWYG editor therefore is that users can produce formatted web content through a simple point, click, and type interface. Most importantly, users do not have to enter any HTML.

Page templates

The system has predefined page templates. When users create new pages, the site template automatically encapsulates the user content. By separating content from presentation elements, the system ensures that even pages produced by novices are indistinguishable from pages produced by experts. The page template (see figure 14) includes the standard site header at the top which includes the corporate logo that also acts as a link back to the home page. The template also includes global site links and functions just beneath the header, and local navigation down the left hand side. The use of standard templates ensures that the site’s appearance is consistent. Maintenance of a standard look and feel, as well as consistent placing of key page elements such as site navigation, and links to ‘related articles’ helps to make the website usable for the audience. Such consistencies reduce the amount of time it takes a user to learn how to use the site, and reduce the risk of a user feeling lost.
When pages of a site differ significantly in appearance, the user will often think that they have moved to a different site and become disoriented.

At the top of the main body section (figure 14), the CMS shows breadcrumbs with the label, ‘You are in:’. Although the conventional ‘>’ is not used to separate levels, it is quite clear that this represents the path into the current article, and helps to orientate the user. Again, the CMS strays from convention by not underlining each breadcrumb link, which introduces the possibility that the user will not realise that these are in fact hyperlinks to the parent sections.

For the main article content, entered by the site editor, the CMS applies a standard format to the text, emboldening the article header and intro text, and increasing their font size to make them stand out from the rest of the article. The same sans serif font (which is easier to read on screen) is applied to all of the text, and only the simple formatting permitted by the rich text editor is implemented in the body (italics, bold, indentation etc.). Finally, the page title (displayed at the very top of the browser window) is set by the CMS to match the article title. This is also important for navigation, as page titles are stored by web browsers for use with forward and back buttons, browsing history, and as bookmark entries if the user decides to bookmark the page.

**Automated navigation links**

Articles are positioned in the site structure using the point and click file tree interface (figure 13 – file tree interface, left pane). As articles are created, moved, or deleted, the system updates the site navigation. The site navigation comprises (figure 14); panels of utility and top level links beneath the main header; breadcrumbs at the top of the page body; and local navigation on the left panel. Manual maintenance of site navigation links is time consuming and error prone. The advantage that this automated approach provides was emphasised by participant A; “The system does save us a lot of time. For example, if you change the name of a page, all links to that page in the site navigation are changed”. This system therefore enables the web editor to spend more time writing content, and reduces the risk of broken links.

**Simple interface for assigning page meta data**
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The meta data button on the article editing interface (figure 13) loads the meta data editing form (figure 15). Keywords describing the article’s content are attached to the page, by selecting relevant terms from a meta data vocabulary.

Summary

The system is highly effective for novice web designers because it enables the rapid production of pages without the need for technical knowledge. The system ensures that the site produced is usable by enforcing design consistency, good navigation links, and HTML that is cross browser compatible.

Web design questionnaire results

The 30 questionnaire respondents comprised of 17 females and 13 males. All had some degree of web design experience, ranging from those who have produced just one small personal site for fun (1), through to web design professionals competent in a number of web technologies (5). The figure below shows that the modal group is comprised of people with a low level of web design experience, with the remaining groups sharing approximately equal proportions.

The table 5) below shows the activities which the respondents have undertaken while doing web design.
Table 5) Web design activities undertaken by questionnaire respondents

<table>
<thead>
<tr>
<th>Activity</th>
<th>Percentage of respondents who had undertaken activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conducted interviews with key stakeholders</td>
<td>36.7</td>
</tr>
<tr>
<td>Gathered content for the website (existing paper / electronic</td>
<td>96.7</td>
</tr>
<tr>
<td>documents, images, etc.)</td>
<td></td>
</tr>
<tr>
<td>Digitised paper based content</td>
<td>43.3</td>
</tr>
<tr>
<td>Grouped and arranged the information into a hierarchy</td>
<td>83.3</td>
</tr>
<tr>
<td>Designed page templates</td>
<td>56.7</td>
</tr>
<tr>
<td>Built the site using the page templates</td>
<td>63.3</td>
</tr>
<tr>
<td>Uploaded the site to a web host</td>
<td>63.3</td>
</tr>
</tbody>
</table>

Additional activities reported by respondents were database design (2), drawing illustrations (1), and writing content (1).

Web authoring tools

Over three quarters of respondents said they had used Microsoft FrontPage, half had used Dreamweaver, and one third had worked on a Content Management System. 10% indicated that they preferred to use a plain text editor, and a further 10% used other web editing packages.

Feature utility ratings

The questionnaire asked respondents to rate certain features of web design tools for their usefulness in web design. As can be seen in table 6), on average they found that page templates and automated links were ‘of some use’, and that a page wizard was less useful. There was clear support however for a WYSIWYG HTML editor.
Table 6) Utility ratings for web tool features

<table>
<thead>
<tr>
<th>Feature</th>
<th>Number of respondents who had used (and rated) the feature</th>
<th>Mean rating (1 = not useful, 3 = of some use, 5 = very useful)</th>
<th>Standard deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Page templates</td>
<td>30</td>
<td>3.00</td>
<td>1.21</td>
</tr>
<tr>
<td>WYSIWYG editor</td>
<td>29</td>
<td>4.14</td>
<td>1.11</td>
</tr>
<tr>
<td>Automated links</td>
<td>24</td>
<td>3.29</td>
<td>1.34</td>
</tr>
<tr>
<td>Page wizard</td>
<td>24</td>
<td>2.63</td>
<td>1.11</td>
</tr>
</tbody>
</table>

Respondents suggested the following additional useful features: Broken link checker (2), Page preview (2), Help information (1), Website hierarchy overview (1), Syntax highlighting in code editors (1).

Web design activity ratings: difficulty and time consumption

The questionnaire contained a section seeking web designers’ opinions towards the difficulty and length of time associated with certain aspects of web design. It was thought that elements which were found to be highly time consuming or technically difficult could be addressed in the prototype design.

Table 7) Web design activity ratings: difficulty and time consumption

<table>
<thead>
<tr>
<th>Activity</th>
<th>Mean difficulty rating*</th>
<th>Standard deviation (difficulty)</th>
<th>Mean time rating*</th>
<th>Standard deviation (time)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coding HTML</td>
<td>2.72</td>
<td>1.08</td>
<td>3.24</td>
<td>1.16</td>
</tr>
<tr>
<td>Designing page templates</td>
<td>3.23</td>
<td>1.02</td>
<td>3.70</td>
<td>0.97</td>
</tr>
<tr>
<td>Positioning elements on a page</td>
<td>2.60</td>
<td>0.76</td>
<td>3.13</td>
<td>0.85</td>
</tr>
<tr>
<td>Inserting and maintaining site navigation</td>
<td>1.97</td>
<td>0.80</td>
<td>2.77</td>
<td>1.28</td>
</tr>
</tbody>
</table>
Designing a usable online web authoring and publishing system

As can be seen in table 7) above, most respondents rated the activities as of low to medium difficulty, with designing page templates rated hardest. All of the activities bar uploading the site were rated medium or higher in terms of time consumption.

Other technically challenging or time consuming activities reported by respondents were: Ensuring that the site is compatible with all browsers (4); Graphic design (colour schemes and images) (3); Coding with scripting languages (2); Site marketing including search engine submissions (1); Testing links (1); proof reading (1); Producing dynamic, data driven pages (1); Updating content (1); Restructuring the site once it is up and running (1); Finding a reliable web host (1); Designing the site structure (1).

Novice web authoring tool features

Finally, the questionnaire asked respondents to indicate which features they thought were appropriate for a novice web authoring and publishing tool. Table 8) below shows that all of the proposed features received high levels of support from the respondents.

Table 8) Web design respondents’ opinions on proposed OWAPS features

<table>
<thead>
<tr>
<th>Feature</th>
<th>% respondents supporting feature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Simple page management section for;</td>
<td></td>
</tr>
<tr>
<td>• Adding new pages</td>
<td>96.7</td>
</tr>
<tr>
<td>• Renaming pages</td>
<td>80.0</td>
</tr>
<tr>
<td>• Deleting pages</td>
<td>86.7</td>
</tr>
</tbody>
</table>
Designing a usable online web authoring and publishing system

- Defining the site structure 86.7

Word processor style interface for:

- editing and formatting text 93.3
- inserting bulleted lists 80.0
- inserting tables 90.0
- inserting images 90.0
- inserting hyperlinks 86.7

Simple image management section for:

- Uploading images 93.3
- Renaming images 73.3
- Deleting images 83.3
- Viewing images 93.3

Predefined page templates 93.3
Wizard for producing pages 80.0
Automated navigation links 76.7
Simple page meta tag editor (contents, description) 83.3

In addition to the features presented above, respondents called for: Context sensitive help with explanations in plain English (4); An interface that is consistent with the Microsoft ‘office’ interface to make it easy to learn. (3); Information on mounting the site onto a web host (2); The need for the system to produce cross browser compatible code (2); Options to add multimedia elements to a site easily e.g. video, audio(1); Simple tool for producing forms and other interactive features e.g. Discussion forums, Website searches; and, Catalogue/database searches (1); Build your own page template wizard (1); Back / undo button (1); Simple table editing features (1).

System requirements

The requirements for the new OWAPS were derived from the usability and web design literature, the results of the user evaluations and questionnaires, and feedback from the CMS demonstration and interview session. These requirements were prioritised using the MoSoCoW convention (Must haves, Should haves, Could haves, Wont haves) and were classified according to how important they were in directly
Designing a usable online web authoring and publishing system

supporting the authoring and publishing process. Must haves were assigned high priorities, should haves were assigned medium priorities, and could haves were given low priorities. Wont haves were excluded from the requirements specification.

A brief explanation of some of the key requirements is now presented, and the requirements are summarised in table 9) below. We know from the literature that the web design process begins with a need for a site. The web designer then gathers information for the site, and where necessary digitises paper based materials (e.g. scanning in documents, and converting them to text using OCR software). Next, the web designer constructs an information hierarchy. Due to time and resource constraints, this system will not provide comprehensive assistance with the logical organisation of information. Other systems have however been developed for this purpose such as DENIM (Newman and Landay, 2000), and could eventually be integrated with this one. However, as designing the information architecture is a challenging task, this system should provide simple information templates for users. These templates should enable the user to create a blank site with pages and the relationships between them already defined.

Users need a simple interface for managing their site. This interface should clearly present the site’s pages, and enable the user to edit, add, or delete pages with ease. One of the key complaints of Tripod and Geocities was that participants did not know where their pages had gone once they’d produced them. Participant C was unable to delete an unwanted page on Tripod because he could not locate the page files. Usability principles suggest that for ease of learning and ease of use, systems should incorporate interface elements and enable interaction styles which users are familiar with. This interface should therefore utilise standard HTML interface elements such as drop down boxes, checkboxes, radio buttons and text boxes. The means for manipulating pages should also mimic other popular web interfaces such as those of web based email systems. This will make the system more intuitive.

After designing the information hierarchy, web designers often develop page templates. Page templates comprise branding elements; icons, images, and fonts which provide the look and feel, as well as navigational elements. The usability literature emphasises the vital importance of good page template design. Poorly
designed templates make it difficult for users to navigate the site and make the site unattractive. Furthermore, page templates built with poorly formed HTML, and those that incorporate low contrast colours for foreground and background elements will prevent access for visually impaired users.

On the other hand, consistently applied templates, which are well designed and adhere to usability and accessibility guidelines will greatly improve the user experience of the web site. Designing good page templates is clearly a difficult task, even for the experienced web designer. Given that the target user for this system is someone with little or no experience of web design, this system must therefore offer pre-defined page templates.

The quality of site navigation has a big impact upon web usability. During the user evaluations, the novice users found the concept of linking between pages (i.e. providing site navigation) very difficult to grasp, and neither managed this. Questionnaire respondents and the web professionals that were interviewed indicated that whilst site navigation was relatively easy to produce, the maintenance and updating of links was time consuming. One respondent commented that web designers were often constricted by the early information architecture which was developed. Redefining it later on was not only hugely time consuming, but also error prone and likely to lead to dead links.

Taking these factors into account, it is vital that the system automatically generates site navigation (which can be incorporated into the page templates) based on the information hierarchy defined by the user. This means that site navigation will be displayed in a consistent and usable fashion, with the added bonus that links will automatically be adjusted site wide, should the user redefine the information hierarchy. Similarly, by separating content management from the page template (or site look and feel), users will be able to change the look of the site by simply changing the page template.

Once the information architecture and page templates have been configured, the web designer effectively has an empty shell to fill with the content which has been gathered. The system must therefore support the process of editing pages. The user
must be able to create and format typical web content such as text, images, and hyperlinks.

It is necessary for the user to be able to format the text in all of the usual ways i.e. inserting new paragraphs; creating bulleted lists; indenting text; aligning text (left, centre, right); changing font face, size, colour, and style (italic, bold, underlined). Such formatting is achieved through HTML tags such as `<bold>`, and `<ul>`, however this system must enable users to produce these effects without having to code in HTML. The system must therefore incorporate a WYSIWYG interface for content manipulation. As some of the questionnaire respondents suggested, a page preview function is also helpful for the user, so that they can see how the page looks at any stage during its construction.

Despite some authors’ assertions that meta data is no longer a valued HTML component, investigations conducted earlier highlighted the negative impact upon presentation of search results on Google caused by the omission of meta data (Figure 3). The system must therefore allow the simple entry of meta data (keywords and description), so that once spidered, the pages will be well presented in search results. This is vital given current high levels of search oriented web browsing. Placing emphasis on Google’s use of meta data over that of other search engines is warranted due to Google’s majority market share on web search, estimated at 80% in November 2003 (BBC News, 2003).

In order to enable users to include their own images on their site, there needs to be some means of transferring and storing images onto the user’s account. Users must also be able to remove images from their account, as web space will be limited. An image manager interface must therefore provide upload and delete facilities.

Finally, the system needs to support management functions such as updating personal information (email address and password etc.). The system should also offer basic usage statistics such as page hit counters so that users can see how popular their site is.
Designing a usable online web authoring and publishing system

In short, this system aims to remove technical barriers to web authoring and publishing. The main hurdle is clearly the need to write HTML, therefore this tool is to provide an interface which enables the user to produce a site without directly entering any HTML.

Besides the functional requirements, this system must also satisfy a number of non-functional requirements given this project’s emphasis on usability. These include the need for an attractive interface, context sensitive help written in plain English, and a simple uncluttered interface. Most importantly the system must be fun and easy to use.

<table>
<thead>
<tr>
<th>Requirement ID</th>
<th>Description</th>
<th>Rationale</th>
<th>Priority</th>
<th>Functional / non functional</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>There must be a simple interface for managing pages</td>
<td>Users must be able to manage their pages effectively.</td>
<td>High</td>
<td>Both</td>
</tr>
<tr>
<td>1.1</td>
<td>Add a new page function</td>
<td></td>
<td>High</td>
<td>Functional</td>
</tr>
<tr>
<td>1.2</td>
<td>Edit page function</td>
<td></td>
<td>High</td>
<td>Functional</td>
</tr>
<tr>
<td>1.3</td>
<td>Delete page function</td>
<td></td>
<td>High</td>
<td>Functional</td>
</tr>
<tr>
<td>2</td>
<td>WYSIWYG HTML editor</td>
<td>The system must enable users to produce pages without having to code HTML</td>
<td>High</td>
<td>Functional</td>
</tr>
<tr>
<td>2.1</td>
<td>WYSIWYG HTML editor</td>
<td>WYSIWYG HTML editor must support text formatting (bold, underline, font style, size, colour etc.)</td>
<td>High</td>
<td>Functional</td>
</tr>
<tr>
<td>2.2</td>
<td>WYSIWYG HTML editor</td>
<td>WYSIWYG HTML editor must enable user to insert, position, and resize images.</td>
<td>High</td>
<td>Functional</td>
</tr>
</tbody>
</table>
### Designing a usable online web authoring and publishing system

<table>
<thead>
<tr>
<th></th>
<th>Requirement</th>
<th>Importance</th>
<th>Compliance</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.3</td>
<td>WYSIWYG HTML editor must enable user to insert and format tables</td>
<td>Functional</td>
<td></td>
</tr>
<tr>
<td>2.4</td>
<td>WYSIWYG HTML editor must enable user to insert hyperlinks</td>
<td>Functional</td>
<td></td>
</tr>
<tr>
<td>2.5</td>
<td>WYSIWYG HTML editor must enable user to insert bulleted lists</td>
<td>Functional</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>System must enable users to view and delete images from their account</td>
<td>High</td>
<td>Functional</td>
</tr>
<tr>
<td>4</td>
<td>The system must offer predefined page templates</td>
<td>High</td>
<td>Functional</td>
</tr>
<tr>
<td>4.1</td>
<td>The page templates must be designed according to web usability guidelines</td>
<td>High</td>
<td>Non functional</td>
</tr>
<tr>
<td>5</td>
<td>The system must generate navigation links automatically</td>
<td>High</td>
<td>Functional</td>
</tr>
<tr>
<td>5.1</td>
<td>The system must enable users to specify and modify the information architecture.</td>
<td>High</td>
<td>Functional</td>
</tr>
<tr>
<td>6</td>
<td>The system must offer context sensitive help information</td>
<td>High</td>
<td>Non functional</td>
</tr>
<tr>
<td>6.1</td>
<td>Help information must be written in plain English</td>
<td>High</td>
<td>Non functional</td>
</tr>
<tr>
<td>7</td>
<td>The system must adhere to Nielsen’s usability principles.</td>
<td>High</td>
<td>Non functional</td>
</tr>
<tr>
<td>8</td>
<td>Enable users to unpublish / Users may want to</td>
<td>High</td>
<td>Functional</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td><strong>Designing a usable online web authoring and publishing system</strong></td>
<td>publish pages</td>
<td>take pages offline while they update them.</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Enable users to preview pages</td>
<td>Users like to see the impact of changes upon their pages as they update them.</td>
<td>High</td>
</tr>
<tr>
<td>10</td>
<td>The system and sites produced by the system should be cross browser compatible</td>
<td>All web based systems designed for public access should be accessible from all major browsers.</td>
<td>High</td>
</tr>
<tr>
<td>11</td>
<td>The interface should resemble other interfaces</td>
<td>Using similar icons and control elements to other systems reduces the time required to learn the system.</td>
<td>High</td>
</tr>
<tr>
<td>12</td>
<td>The system should offer a wizard to help users get started</td>
<td>Novice users are intimidated by complex interfaces. A wizard to get them started builds confidence.</td>
<td>High</td>
</tr>
<tr>
<td>13</td>
<td>Simple page meta tag editor for keywords and description.</td>
<td>Specification of meta data ensures that pages are well represented in search engine</td>
<td>High</td>
</tr>
<tr>
<td>Number</td>
<td>Description</td>
<td>Functional Rating</td>
<td>Non-functional Rating</td>
</tr>
<tr>
<td>--------</td>
<td>-----------------------------------------------------------------------------</td>
<td>-------------------</td>
<td>-----------------------</td>
</tr>
<tr>
<td>14</td>
<td>Options to add multimedia elements to a site easily e.g. video, audio</td>
<td>Low</td>
<td>Functional</td>
</tr>
<tr>
<td>15</td>
<td>Simple tool for producing forms and other interactive features e.g. Discussion forums, Website searches; and, Catalogue/database searches</td>
<td>Low</td>
<td>Functional</td>
</tr>
<tr>
<td>16</td>
<td>Page hit counters</td>
<td>Low</td>
<td>Functional</td>
</tr>
<tr>
<td>17</td>
<td>Interface must be attractive</td>
<td>High</td>
<td>Non functional</td>
</tr>
<tr>
<td>18</td>
<td>System must be fun to use</td>
<td>High</td>
<td>Non functional</td>
</tr>
<tr>
<td>19</td>
<td>System must be easy to use</td>
<td>High</td>
<td>Non functional</td>
</tr>
<tr>
<td>20</td>
<td>System must be efficient</td>
<td>High</td>
<td>Non functional</td>
</tr>
</tbody>
</table>
Phase 1

Technical overview of the phase 1 prototype

The phase 1 prototype was designed to see if provisional groupings of control elements were helpful for the end user. The prototype was not fully functional, although it did enable the user to navigate the system and use the WYSIWYG editor. Most interactions however were simulated. For example, when a user pressed controls to delete a page, the update was simulated by a form being presented showing one less page than before. In reality, the system did not hold (or delete) any pages. The prototype was also visually unappealing since the emphasis was on finding out whether or not control arrangements were appropriate. The system was given the name ‘Easyweb’, as it was felt that this reflected the system goals.

Although the phase 1 prototype could have been implemented on paper, it was just as simple to produce the prototype using Microsoft Access forms, as controls can simply be dragged and dropped into position. The ability to link forms with macros meant that the evaluation process was more efficient and authentic as paper prototypes require manual intervention to simulate user navigation. Additionally, the use of a computer prototype meant that the user experience more closely resembled the final interaction experience given the nature of the final product. Since Access forms utilise standard GUI elements which now pervade the web (e.g. radio buttons, command buttons, drop down menu boxes), the prototype bore a high level of resemblance to a web interface.

The main problem with using the Access implementation was that the page transitions were instant. When a user clicked to see the next page, the page loaded immediately, whereas with the web, there is always a perceivable delay between page transitions due to the fact that data is being transmitted between the client and web server.
Phase 1 prototype design discussion

A walkthrough of the prototype is now presented and key usability features are highlighted. Figure 16) shows the login screen. Simple instructions explain the options, and basic interface elements (command buttons and text boxes) are used to enable the user to proceed. Since the system is web based users need to create an account. Figure 17) shows the registration form which includes straightforward help information. Figure 18) shows the confirmation dialog presented when users successfully register. New users are given the option to ‘Create a blank site’ or ‘Launch the Easyweb wizard’ (figure 19). The first step of the wizard (figure 20) requires the user to select the type of site they wish to build. This is necessary so that the appropriate information architecture template can be displayed on step two. On step two, users select the pages they wish to be included on their site (figure 21). On step three, users select a ‘theme’ (figure 22). The theme is in effect the page template design. The term ‘theme’ was adopted however as this was more consistent with other software packages. Upon completion of the wizard, the system displays a dialog to explain that the wizard is complete, and what will happen next (figure 23). The wizard features ‘previous’ and ‘next’ buttons throughout to enable the user to go back and make changes if so desired.

Next users are presented with the main control panel, named ‘Easyweb site manager’ (figure 24). This is the home page for users who have already built their site or completed the wizard. The ‘Easyweb site manager’ interface has two sections. The top header section contains the label ‘Easyweb site manager’, as well as links to the home page, and help information. The right hand side of the header section shows who is logged in, the URL of the user’s site, and a button to sign out. The lower part of the screen is variable dependent upon the tab selected (pages, themes, images, site name, or my details). The ‘pages’ tab is selected by default. Users who have just completed the wizard see the pages they specified. This page enables users to ‘Edit’, ‘View’, ‘Delete’, and ‘Add new’ pages. Pages to which actions can be applied are selected by ticking the corresponding rows. The ‘select all’ and ‘clear all’ buttons enable all of the pages to be selected or deselected in one click. This style of interaction is familiar to most web users as it is standard in most web based email services. This interface promotes efficiency because it enables batch deletion of
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pages. Straightforward instructions show exactly what can be achieved and how. The help information is concise as lengthy blocks of text puts users off.

The ‘Edit page’ form (figure 25) contains controls for the user to specify; the page title; the parent page (and therefore the information architecture); whether or not the page is published; the page description; page keywords; and finally, the page content. The page content area incorporates the WYSIWYG HTML editor. This is a key element of the system as it enables users to produce web content without having to write any HTML code. The editor interface is very similar to that of a Word processor, and the buttons for formatting the text and inserting tables, and images and so on incorporate universally accepted icons. This means that knowledge of other systems can readily be applied to this new system, thus increasing ease of learning. The panel of buttons at the top of the screen allow the user to; ‘Save changes’ (saves the new content and refreshes the page editor); ‘Save and exit’ (saves the new content and returns the user to the site manager); ‘Cancel’ (returns the user to the site manager without saving the changes).

The themes page (figure 26) enables the user to select a different theme for their site using the radio button control. A single command button labelled to reflect its functionality is pressed to ‘Apply new theme’.

The images interface (figure 27) shows the images users currently have on their account, and enables them to be viewed full size, renamed, or deleted. Again, this interface contains context sensitive help information in the form of easy to follow instructions.

The ‘site name’ page (figure 28) enables users to change the site address, which forms part of the URL which users sites are published to, and the display name, which is displayed at the top of every user’s web page.

Finally, the ‘my details’ page (figure 29)) enables users to update their account details.
This phase 1 prototype was made more usable by the application of usability principles wherever possible. Terminology used on the pages and on button labels is jargon free. Users are given control and freedom to back out of places they do not want to be (e.g. ‘Cancel’ button on page editor – figure 25, exit wizard button – figures 20 - 22). To avoid user confusion, navigation buttons and tabs lead to pages with titles which are consistent with button or tab labels, and functional buttons have simple but descriptive labels.

The interface promotes recognition rather than recall as all of the functions are accessed via buttons which are visible on the interface. The design is minimalist as help information is concise, and where possible, control elements have been designed to enable the manipulation of a number of elements. For example, another way to enable the deletion of pages would be to include a delete button at the end of every row (Figure 24). This would clearly clutter up the interface. The use of tabs to separate controls into logical groupings also ensures that interfaces are not overcrowded. Inline with Nielsen’s usability heuristics, help information is provided as easy to follow steps.

**Phase 1 user evaluation results**

User evaluations of the prototype were conducted with four participants. The participants were each given the same tasks to complete (see Appendix D). The tasks cover all aspects of functional requirements elicited in the previous phase of the project. For each task, the number of errors, time taken (to the nearest minute) and whether or not task was successfully completed was recorded. Users also rated the difficulty of each task, completed a user experience survey, and were interviewed about the system. The recording of this combination of data is important because one element alone may provide misleading results,

“Measuring speed of performance, rate of errors, and user satisfaction separately is important because sometimes users may be satisfied by an elaborate graphical interface even if it slows them down substantially. Finding the right balance among performance, error rates, and user satisfaction depends on whether you are building a repetitive data-entry system, an air-traffic control system, or a game”

Table 10) Phase 1 task results

<table>
<thead>
<tr>
<th>Task ID</th>
<th>Task</th>
<th>Mean difficulty rating* (standard deviation)</th>
<th>Mean number of errors (standard deviation)</th>
<th>Mean time taken (standard deviation)</th>
<th>% of participants that passed task</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Getting started</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 A</td>
<td>Register to use Easyweb</td>
<td>1 (0.00)</td>
<td>0.5 (0.50)</td>
<td>3 (1.00)</td>
<td>100</td>
</tr>
<tr>
<td>1 B</td>
<td>Sign out from Easyweb</td>
<td>1 (0.00)</td>
<td>0 (0.00)</td>
<td>1 (0.00)</td>
<td>100</td>
</tr>
<tr>
<td>1 C</td>
<td>Log back in to Easyweb</td>
<td>1 (0.00)</td>
<td>0.25 (0.43)</td>
<td>1 (0.00)</td>
<td>100</td>
</tr>
<tr>
<td>2</td>
<td>Using the wizard</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 A</td>
<td>Create a personal site consisting of a home page, and a ‘My hobbies’ page</td>
<td>2 (0.71)</td>
<td>0.25 (0.43)</td>
<td>2.5 (1.66)</td>
<td>100</td>
</tr>
<tr>
<td>3</td>
<td>Adding content to your site</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 A</td>
<td>Add the sample text to your home page and apply the same font style and spacing as indicated in the sample.</td>
<td>2 (0.71)</td>
<td>2.75 (2.59)</td>
<td>5.25 (1.92)</td>
<td>50</td>
</tr>
<tr>
<td>3 B</td>
<td>Save the changes, and exit from the page editor.</td>
<td>1.5 (0.87)</td>
<td>0.25 (0.43)</td>
<td>1.5 (0.87)</td>
<td>75</td>
</tr>
<tr>
<td>3 C</td>
<td>Add the sample text to the ‘My hobbies page’</td>
<td>1.75 (0.83)</td>
<td>0.75 (0.43)</td>
<td>2.75 (1.48)</td>
<td>50</td>
</tr>
<tr>
<td>3 D</td>
<td>Insert the sample picture beneath the</td>
<td>2.25 (0.83)</td>
<td>1.5 (0.87)</td>
<td>3.25 (1.48)</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td>Text you just entered.</td>
<td></td>
<td>1</td>
<td>0</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>3 E</td>
<td>Change the font of the text to Times, and make the text bold.</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>100</td>
</tr>
<tr>
<td>3 F</td>
<td>Add the sample bulleted list to the page beneath the photo</td>
<td>1.75</td>
<td>0.5</td>
<td>1.25</td>
<td>100</td>
</tr>
<tr>
<td>3 G</td>
<td>Save the changes you made to the page, and exit the page editor.</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>100</td>
</tr>
<tr>
<td>3 H</td>
<td>View your website</td>
<td>1.5</td>
<td>0</td>
<td>1</td>
<td>100</td>
</tr>
<tr>
<td>4</td>
<td>Managing your website</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 A</td>
<td>Delete the ‘My hobbies’ page</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>100</td>
</tr>
<tr>
<td>4 B</td>
<td>Add a new page and save it</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>100</td>
</tr>
<tr>
<td>4 C</td>
<td>Find out which page has been viewed the most</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>100</td>
</tr>
<tr>
<td>4 D</td>
<td>Unpublish a page</td>
<td>2.75</td>
<td>3.75</td>
<td>2.5</td>
<td>25</td>
</tr>
<tr>
<td>4 E</td>
<td>Change the display name of your website</td>
<td>1.25</td>
<td>0.75</td>
<td>1</td>
<td>75</td>
</tr>
<tr>
<td>4 F</td>
<td>Delete an unwanted image</td>
<td>1.5</td>
<td>0.5</td>
<td>1.25</td>
<td>75</td>
</tr>
<tr>
<td>4 G</td>
<td>Change the theme</td>
<td>1.25</td>
<td>0</td>
<td>1</td>
<td>100</td>
</tr>
</tbody>
</table>
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<table>
<thead>
<tr>
<th>of your website</th>
<th>(0.43)</th>
<th>(0.00)</th>
<th>(0.00)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Managing your account details</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 A Change your email address</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean difficulty</td>
<td>1.25</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Mean no. errors</td>
<td>0.59</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean time taken (total)</td>
<td>34.25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean participant pass rate</td>
<td>100</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* (1 = easy, 2 = ok, 3 = difficult)

**Table 11) Phase 1 user satisfaction survey results**

<table>
<thead>
<tr>
<th>Statement</th>
<th>Mean rating*</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>I enjoyed using this system</td>
<td>4</td>
<td>0.00</td>
</tr>
<tr>
<td>The wizard is easy to use</td>
<td>3.5</td>
<td>0.50</td>
</tr>
<tr>
<td>The page editor is easy to use</td>
<td>3.75</td>
<td>0.43</td>
</tr>
<tr>
<td>I am satisfied with the system</td>
<td>3.5</td>
<td>0.87</td>
</tr>
<tr>
<td>The system helped me to build pages quickly</td>
<td>3.5</td>
<td>0.50</td>
</tr>
<tr>
<td>The system is flexible</td>
<td>2.75</td>
<td>0.43</td>
</tr>
<tr>
<td>The system is easy to learn</td>
<td>4.25</td>
<td>0.43</td>
</tr>
<tr>
<td>I didn’t get lost using the system</td>
<td>3</td>
<td>0.71</td>
</tr>
<tr>
<td>The screen design was clear</td>
<td>3.5</td>
<td>0.87</td>
</tr>
<tr>
<td>The publishing process was simple</td>
<td>2.5</td>
<td>0.87</td>
</tr>
<tr>
<td>I could easily find the functions I needed</td>
<td>3.75</td>
<td>0.43</td>
</tr>
<tr>
<td>The language used was easy to understand</td>
<td>4.25</td>
<td>0.83</td>
</tr>
</tbody>
</table>
| There was enough help information onscreen to guide me through | 4 | 0.00 | Mean user experience rating 3.56

* (1 = Strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = Strongly agree)
Phase 1 user evaluation results discussion

Scanning the tables above reveals a number of key problems with the phase 1 prototype. These are now discussed with reference to observation notes.

Adding content to a page

Only half of the participants successfully added content to the ‘home page’ and ‘my hobbies’ page (tasks 3 A and 3 C). This problem stemmed from design flaws in the page editor (figure 25). While participants recognised the purpose of the page title control, and ignored the ‘parent page’ and ‘publish page’ controls, two participants entered their page content into the page description box. They completely ignored the main page content control and exited from the editor.

This extract from participant As observation notes shows the confusion caused by the meta data controls:

PA studies the keywords box and says “What does that mean? Page description – does that just repeat the page title, I’m not sure what it’s for. Is page description and keywords standard for a website? Sorry I’m a very naïve user… or is it a way of finding the page later?” PA begins to enter the main page content into the page description field. I intervene and explain the purpose of the fields.

The lack of help information on this page almost certainly contributed to this problem, as did the lack of prominence given to the main content editing section. The new design should therefore promote the main content editor to a position above the meta data entry boxes, and include context sensitive help.

Save changes and exit from the editor

Participant B failed to find the ‘Save and exit’ function on the page editor (figure 25). She scanned the icons at the head of the text editor, and hesitated. When asked what she was looking for she said, “I need to save the page. I’m looking at these icons which I normally just run across, but the labels aren’t coming”. After a minute, and evident user frustration, the user was shown the ‘save and exit’ button at the top
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of the page and remarked “I wasn’t even looking at the top of the page!” This problem is probably related to the distance between the main content editor and the buttons at the top of the page. By repositioning the main content editor higher up the page, users are less likely to fail to see the ‘save and exit’ function.

**Unpublish a page**

Just one of the four participants successfully unpublished a page. The problem was quite clear: participants simply could not locate the function for publishing or unpublishing a page. Participant A’s attempt is representative of all three failed attempts:

On the site manager interface (figure 24) PA Clicks themes, images, my details, site name, then back to pages tab. Comments, “I presume its something to do with ‘page published’. I would go in there and change it to no. It doesn’t tell me how to unpublish a page, unless unpublish means delete.” PA gives up and moves onto the next task.

The page publish control was not placed in an intuitive position for participants – it was in fact located on the page editor (figure 25). In the next design, it should be relocated.

**Deleting an image and changing site display name**

Three out of four participants successfully completed tasks 4 E and 4 F. The errors were simple mistakes whereby one user clicked to alter the site address (instead of site display name – figure 28) and the other user failed to select the image (by checking the box – figure 27) before pressing delete. No design amendments are deemed necessary for these problems.

**User satisfaction**

The user satisfaction survey results and interview statements corroborate the observations and task rating data. Participants disagreed that the publishing process was simple, which stems from the fact that they could not locate the publish/unpublish function. The neutral response to “I didn’t get lost using the system” seems to be related to instances where participants couldn’t find functions
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(e.g. publish/unpublish), and weren’t sure which control to use (e.g. use of the page description box for entry of page content). The slightly negative response to “The system is flexible” is difficult to explain as participants did not make substantial recommendations for new features when asked to do so in the post task interview.

In the post task interviews a number of points were repeated by participants. Although as indicated at the outset, this prototype was not designed to be aesthetically pleasing, with emphasis more on confirming the placement of controls and interaction style, three of the four participants stated that the next design should be much more colourful and ‘fun looking’. A remark made by Participant B highlights the importance of achieving an aesthetically pleasing design, “It must be visually appealing. I wouldn’t want anything to do with it if it looked boring”.

Positive feedback for the design included high user satisfaction at being able to produce web content without any coding. Participants also liked the concise help information displayed on most of the pages, and called for more where there was none (e.g. page editor – figure 25). Three of the participants also praised the wizard, indicating that it was a good way to get started. Satisfaction scores were high for the statements, “I enjoyed using this system”, “The system is easy to learn”, “The language used was easy to understand” and “There was enough help information onscreen to guide me through”. Apart from the redesign points outlined above (and summarised below), the evaluation proved that the controls were logically grouped and that the system met users needs. This was taken as a green light to proceed with the development of the phase two prototype. The phase two prototype will offer fuller functionality, and will also incorporate a more user friendly look and feel.

**Redesign requirements**

The page editor must be altered:
- the main content editor must be given more prominence
- help information should be provided
- The unpublish function should be moved to a more prominent position

The interface must be made more visually appealing.
### Phase 2

The aims of phase two are; to implement changes to the prototype design based on the findings of the phase one user evaluations; to implement the prototype using technologies which are suitable for the final product; to conduct user evaluations of the phase two prototype; and to define requirements for the next design iteration.

First an overview of the technical aspects of the phase two prototype is presented. This is followed by a discussion of the interface design, covering how the design conforms to usability principles, and how the interface has been altered to accommodate phase one redesign requirements. Finally, user evaluation results are presented, and redesign requirements are listed.

#### Technical overview of the phase 2 prototype

The phase 2 prototype is a hi-fidelity prototype. It can be accessed at [http://easywebcms.brinkster.net/development/](http://easywebcms.brinkster.net/development/), and trialled using the username ‘protoeval’ and password ‘password’. Core functionalities have been developed such as page management functions, fully integrated WYSIWYG HTML editor, and personal details manager. The interface has also been designed to be more visually appealing to improve the user experience.

It was decided that an off the shelf WYSIWYG HTML editor would be incorporated into this project, since coding one from scratch would take up the full duration of the period allocated for this project. The editor implemented is freely distributed on the web ([http://www.webwizguide.com/](http://www.webwizguide.com/)), and was chosen because; a) it was designed to be cross browser compatible; b) it had a simple user interface; c) it was built using the same technologies as those adopted for the rest of the phase 2 prototype and d) it provided all of the required HTML formatting functionalities.

The phase 2 prototype was produced using; HTML, Active Server Pages, Javascript, and a Microsoft Access Database. The user interface is built from HTML, and

---

3 The Microsoft Access database would need to be replaced with a more powerful database in the final mass market solution, as the Access database has bottlenecks including a relatively low number of
Active Server Pages (ASP) and Javascript were used to provide the required functionality. ASP is a server side language used to pass data between the interface and the database and vice versa. ASP was also used to process data, and control the flow of execution – for example redirecting a user to the appropriate page, based on information submitted. The use of a server side scripting language provides great benefits for web application design, because the code only has to be compatible with the server. All inputs into the ASP layer are from HTML forms, and all outputs are standard HTML. This means that anyone with a standard web browser can use a web application produced in ASP. Performing the processing on the client side would entail duplicate coding to deal with the plethora of different platforms.

Some client side processing is desirable, as it reduces the strain on the web server, and increases the application response time. In this application, client side scripting was used to validate form entries. Javascript was chosen for this task since it is the most widely accepted client side scripting language. This is important, as it ensures that the application is as accessible as possible.

The Access database is the heart of the application. The database performs two main functions. Firstly, it enables the management of user information such as site name, and password. Secondly, the database is used to manage the pages produced by each user.

User pages are stored in the database because this offers advantages in terms of manipulating the data. The pages could have been stored in separate html files on the web server, however this would have produced great inefficiencies. For example, in the case of editing and saving a page, one would need to:

a) read the database to find pointers to the files which the user owned
b) Locate and read the files contents, and rename the file to show that it is currently open.

c) Present the file contents for user editing

concurrent users and database size, and thus would not tolerate high levels of usage. An Access database was used for this prototype because of the higher costs involved in hosting an SQL server database, and the fact that the Access solution would suffice for prototyping needs.
d) Take the updated content, and write the updated file using the original file name

  e) Delete the old file

With the database implementation, a page update consists of reading the record to be updated and presenting this to the user, accepting the updated content, and overwriting the existing record with the new data. The database takes care of file locking, and with the use of SQL the time taken to select and update records is minimal. The database implementation means that the database engine takes care of managing data, rather than the server processor. Therefore the code for reading, writing, and locking records is self contained within the database, and needn’t be rewritten at the ASP layer. In sum, the database implementation utilises the database engine’s strengths of managing and processing text, ensuring that the application runs quickly and efficiently.

The database comprises of two tables; User and Page (see figure 30 below). Each user can have many pages, and each page is owned by one user. All pages have a master page (apart from each user home page). Since a ‘master page’ has the same attributes as a page, this relationship is represented as a recursive relationship on the Page table.

Figure 30) Easyweb database design
User home pages (for which there is no master page) are represented by a null value in the MasterPage field. The page content is the HTML output from the WYSIWYG page editor.

**Phase 2 prototype interface design**

The interface design for the phase two prototype draws on usability principles taken from HCI literature as well as web usability guidelines. It was important to ensure that the design was informed by both traditional and web oriented usability principles due to the unique nature of the web platform.

One of the first usability issues was to ensure that the site was usable at a variety of screen resolutions. It is estimated that during July 2004, half of web surfers had their monitors set at 1024 * 768 pixels, and just over one third had monitors set at 800 * 600 (w3schools.com, 2004). The interface was designed to ensure that users at the lower resolution would not need to scroll horizontally as this is highly degrading to usability. Although dimensions can be specified in percentage terms so that content adjusts to fill the screen whatever the resolution, this makes the positioning of page elements unpredictable. Given the importance of the positioning of elements for interface design, a fixed page design was adopted. In order to accommodate the third of web users who have their monitors set to 800 * 600, the width was fixed at 720 pixels (see figure 31). The 80 pixel buffer is included because some users have toolbars running up the side of their browser window. The unavoidable consequence of this decision is that surfers on a 1024 * 768 resolution see a lot of white space. The white space was broken up by centring the page.

Both web usability and usability engineering guidelines state that consistency is important in interface design. The Easyweb interface has a number of consistent features. Firstly, a standard page template was applied across the site (figures 31 – 32). This comprised of; a standard header (font type, size, colour, position) – indicating the area of the site the user is currently viewing, and the current user status (logged in / out); a standard font (Arial) for the page content, and a green box around the page. These features are crucial in web sites and web applications,
because they help to orient a user. Sites that are inconsistent in appearance can cause users to think that they have surfed to another site.

The site manager section is where most of the functionalities are accessed from (figure 32). Tab navigation was implemented for this part of the application, because of the widely recognised ease of use of tabs. Tabs are a highly effective interaction metaphor which have become commonplace on the web (Krug, 2000).

Beneath the tabs, the title for the current form is shown, which corresponds closely with the tab label. The active tab is shown in a darker colour to reinforce the association between the current form and the tab. On the top right of the form, a ‘Help’ link is displayed. This links to context sensitive help which is found at the bottom of each form. This link is important because on some pages, the content can grow vertically (for example the ‘your web pages’ page) pushing the help information beneath the fold. By including this link above the fold, users will always be aware that help is available.

Another important consideration for web usability is download time. The longer a page takes to download, the less usable it becomes. Laboratory experiments have shown that system response times affect user satisfaction and confidence in the system. Response times for offline systems must be very low – preferably under a second, however there is a little more tolerance for slightly higher response times with web applications, because users understand from their experience of the web that pages take time to download. However thresholds of acceptability still apply. Nielsen (2000) recommends that pages are designed to download in less than 10 seconds, as this is the limit for keeping the user’s attention. If the computer takes longer than 10 seconds to respond, the user will switch to another task in between operations and lose track of what they were doing.

The time taken for a page to download depends upon the amount of information on a page and the speed of the internet connection. Despite the growing share of broadband internet connections, over two thirds of UK internet users accessed the web with dial-up connections in May 2004 (National statistics online, 2004). Again the approach taken is to design for the lowest common denominator (i.e. assume a
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56K modem connection), thereby ensuring access for all. To meet the ten second response time, pages were thus designed to be no larger than 34Kb.

In order to keep pages below the 34Kb limit, the interface for this application contains almost no images. Indeed, the only images present are those used to create the tabs, and these have been optimised for maximum speed using image editing software. Rather than including the tab label in the image, the labels are superimposed over the tab images in plain HTML. This is important because users relying on screen readers will not be able to read the label if it is presented as an image. Furthermore, the font size of the plain HTML label can easily be adjusted via browser settings, whereas the size of a font embedded in an image is determined solely by the screen resolution. Indeed many image labels produced for an 800 * 600 display are illegible when the resolution is changed to 1024 * 768.

While there is a need to keep images to a minimum to avoid lengthy download times, users also find text only pages boring. An interface which is visually unappealing is just as likely to be rejected by the user as an interface which takes too long to download, therefore a compromise must be reached. A good strategy for attaining this balance is to make the most of low bandwidth colour elements within page designs. This can be achieved by applying colours to table cells and borders, fonts, horizontal lines and so on. If used effectively, these splashes of colour can enhance pages for a nominal bandwidth cost. Actual images need only be used when a more complex graphic is required. Furthermore, graphics can be repeated throughout a page at no additional cost, since they only need to be downloaded once. Adoption of these principles ensures that the maximum bandwidth to aesthetic ratio is achieved. Low bandwidth colour elements included in the Easyweb interface include the text only Easyweb header ‘Easyweb site manager’ (figure 32), the green border around the interface, and the secondary khaki green used to group elements and distinguish between table rows.

The font for the site has also been carefully selected to aid usability. Research shows that sans serif fonts are much easier to read on screen, therefore the Easyweb interface utilises the Arial font. The specification of absolute font sizes was also avoided in the HTML coding of the interface, as this ensures that users can easily
adjust the font size through their browser. Fig 33 below shows the font size set on
medium, and then largest.

Figure 33) Avoiding absolute font specification ensures that font sizes can be
overridden with browser settings.

Another important accessibility issue is the level of contrast between foreground and
background colours. In this design the background is white or light khaki, and the
main text is black or dark green. The design also uses the standard blue underlined
font for unvisited hyperlinks. The use of such conventions assists with the ease of
learning (Krug, 2000).

Finally a standard footer has also been applied to the site manager pages (figures 34 -
39). This comprises a text only version of the tabs, plus links to sign out and the
home page. Including links again at the foot of the page is important as it saves the
user from having to scroll back up to the top of long pages.

Another important usability principle is feedback (Nielsen 2001). The Easyweb
interface provides feedback for all of the main interactions such as saving pages (see
figure 40) and registering to use the service (see figure 42).

The design of error messages is also important for usability. This system avoids
using obscure codes, and conveys the error message in plain English. For example,
if a user presses ‘Edit’ on the ‘your pages’ page without first selecting a page to edit,
the system displays the dialog ‘You did not select a page to edit’, along with a back
link (figure 43).
Meeting requirements

Although the phase 1 prototype implemented most of the requirements defined at phase 0, two requirements were unfulfilled; the implementation of page templates to encapsulate user content; and the implementation of automatically generated site navigation. These requirements were however addressed in the phase two prototype.

Page templates

While the user is given full control over the content and layout of the main body of the page, when a page is viewed, the system encapsulates the user content within a preset template. The user selects their preferred template via the ‘themes’ tab on the site manager (figure 34).

The predefined page templates aid usability of the sites produced with Easyweb because they restrict the page content to a width of 720 pixels (see figure 44). This ensures that users with screen resolutions set at either 800 * 600 or 1024 * 768 will be able to view the site without having to scroll horizontally. They also implement high contrast foreground and background colours so that the pages are accessible to visually impaired users.

Automatic navigation links

The requirement for the system to automatically generate site navigation links has been met in the phase 2 prototype. The getting started wizard allows users to select a default information hierarchy based on the type of site (business or personal), and the site manager enables users to develop the information architecture by specifying parent pages for each page in the site. The information architecture specified by the user is used to automatically generate navigation links when the site is viewed (see figure 45). The navigation links are built into the page templates. The navigation elements consist of top level links (shown at the top and bottom of each page); Breadcrumb links (shown at the head of each page); and child pages (shown in the navigation pane on the left of each page). This comprehensive suite of site navigation elements means that Easyweb can support sites with deep information hierarchies.
Implementation of phase 1 recommendations

User evaluations of the phase 1 prototype resulted in the production of the following requirements for the phase 2 prototype:

1) The page editor must be changed:
   a. the main content editor must be given more prominence
   b. help information must be provided
2) The publish/unpublish function must be moved to a more prominent position
3) The interface must be made more visually appealing

As can be seen by comparing figures 16 - 29 with 31 – 43, the interface was made more visually appealing by making the forms more colourful.

The page editor (figure 38) underwent several transformations in response to requirements 1 and 2. First the page description and keywords text boxes were repositioned below the main content editor (contrast figure 25 with figure 38). Help information was added to the page to explain the purpose of the various boxes. This was accessible via the ‘Help’ hyperlink (top right), which linked to the Help anchor at the bottom of the page. The save buttons were moved into a position that was consistent with the buttons shown on the ‘Your pages’ page (figure 32). This extra consistency between pages should help to improve ease of learning. The repositioning of the page description and keywords boxes also reduced the level of clutter above the main content entry box. This helped to improve the visibility of the save buttons. Finally the buttons were repeated beneath the page description / keywords fields, so that users did not have to scroll back up to the top to save their changes.

In response to requirement 2, the publish/unpublish page function was removed from the page editor (figure 38) and placed on the ‘your pages’ page (figure 32). The parent page function was also moved to the same place. This greatly simplified the page editor interface, and should ensure that users are more successful in editing their pages.
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The impact of these changes upon the ‘Your web pages’ page can be seen in figure 45 below.

Figure 45) Comparing the phase 1 site manager with the phase 2 site manager

Most obviously, this has resulted in an increased number of buttons along the top of the pages table. In an effort to compensate for this, the select all / clear all buttons were replaced with a check box to provide this functionality. If the top check box is ticked, a Javascript function checks or clears all of the pages, dependent upon the current state of the check boxes. In order to preserve space above the fold, the help information has been moved below the pages table. The ‘Help’ hyperlink remains clearly visible above the fold to ensure that the help information can be found. The ‘publish / unpublish’ and ‘change page parent’ controls are more effective in this location because they are more visible here, and can also be used to alter many pages at once (thus increasing system efficiency). In the phase 1 design, if the user wanted to unpublish the whole site, they had to open each page in the page editor, and select ‘no’ on the ‘publish page’ control before saving and exiting the editor.

A further alteration to the ‘Your pages’ page was to move the delete button to the end of the row – so that it was as far from the ‘Edit’ and ‘Add new’ buttons as possible. The delete button was also offset from the other buttons. This reduces the likelihood of accidental operation of the delete button. Furthermore in order to improve system safety, operation of the delete button results in the display of a page showing the page(s) selected for deletion, along with a prompt requesting confirmation that the user does indeed wish to delete the page(s) (see figure 39). The WYSIWYG editor also features an undo button so that edits can be rolled back.
Phase 2 user evaluation results

The goal of the phase two user evaluations was to see whether or not the updated interface was more usable than the phase 1 interface. In order to answer this question, the tasks were repeated with a fresh set of participants under the same conditions as those experienced by the phase 1 participants. The new participants were filtered so that their ability levels were as close as possible to those of the phase 1 participants. The same data collection methods were used. This ensured that an objective comparison could be made between the two prototypes. The results of the phase 2 user evaluations are presented below.

Table 12) Phase 2 Task results

<table>
<thead>
<tr>
<th>Task ID</th>
<th>Task</th>
<th>Mean difficulty rating* (standard deviation)</th>
<th>Mean number of errors (standard deviation)</th>
<th>Mean time taken (standard deviation)</th>
<th>% of participants that passed task</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Getting started</td>
<td>1 (0.00)</td>
<td>0 (0.00)</td>
<td>2.25 (0.43)</td>
<td>100</td>
</tr>
<tr>
<td>1 A</td>
<td>Register to use Easyweb</td>
<td>1 (0.00)</td>
<td>0 (0.00)</td>
<td>2.25 (0.43)</td>
<td>100</td>
</tr>
<tr>
<td>1 B</td>
<td>Sign out from Easyweb</td>
<td>1 (0.00)</td>
<td>0 (0.00)</td>
<td>1 (0.00)</td>
<td>100</td>
</tr>
<tr>
<td>1 C</td>
<td>Log back in to Easyweb</td>
<td>1 (0.00)</td>
<td>0.25 (0.43)</td>
<td>1 (0.00)</td>
<td>100</td>
</tr>
<tr>
<td>2</td>
<td>Using the wizard</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 A</td>
<td>Create a personal site</td>
<td>1.25 (0.43)</td>
<td>0 (0.00)</td>
<td>2.25 (0.43)</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>consisting of a home page,</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>and a ‘My hobbies’ page</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Adding content to</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Designing a usable online web authoring and publishing system

| 3 A | Add the sample text to your home page and apply the same font style and spacing as indicated in the sample. | 1 | 1.75 | 3.75 | 100 |
| 3 B | Save the changes, and exit from the page editor. | 1 | 0 | 1 | 100 |
| 3 C | Add the sample text to the ‘My hobbies page’ | 1 | 0.25 | 2.25 | 100 |
| 3 D | Insert the sample picture beneath the text you just entered. | 1.75 | 2 | 3.5 | 50 |
| 3 E | Change the font of the text to Times, and make the text bold. | 1 | 0 | 1 | 100 |
| 3 F | Add the sample bulleted list to the page beneath the photo | 1 | 0 | 1.25 | 100 |
| 3 G | Save the changes you made to the page | 1 | 0 | 1 | 100 |
### Designing a Usable Online Web Authoring and Publishing System

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>3 H</td>
<td>View your website</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>(0.00)</td>
<td>(0.00)</td>
<td>(0.00)</td>
<td>100</td>
</tr>
<tr>
<td>4</td>
<td>Managing your website</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 A</td>
<td>Delete the ‘My hobbies’ page</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>(0.00)</td>
<td>(0.00)</td>
<td>(0.00)</td>
<td>100</td>
</tr>
<tr>
<td>4 B</td>
<td>Add a new page and save it</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>(0.00)</td>
<td>(0.00)</td>
<td>(0.00)</td>
<td>100</td>
</tr>
<tr>
<td>4 C</td>
<td>Find out which page has been viewed the most</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>(0.00)</td>
<td>(0.00)</td>
<td>(0.00)</td>
<td>100</td>
</tr>
<tr>
<td>4 D</td>
<td>Unpublish a page</td>
<td>1</td>
<td>0.5</td>
<td>1.25</td>
</tr>
<tr>
<td></td>
<td>(0.00)</td>
<td>(0.87)</td>
<td>(0.43)</td>
<td>100</td>
</tr>
<tr>
<td>4 E</td>
<td>Change the display name of your website</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>(0.00)</td>
<td>(0.00)</td>
<td>(0.00)</td>
<td>100</td>
</tr>
<tr>
<td>4 F</td>
<td>Delete an unwanted image</td>
<td>1.5</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>(0.5)</td>
<td>(0.00)</td>
<td>(0.00)</td>
<td>100</td>
</tr>
<tr>
<td>4 G</td>
<td>Change the theme of your website</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>(0.00)</td>
<td>(0.00)</td>
<td>(0.00)</td>
<td>100</td>
</tr>
<tr>
<td>5</td>
<td>Managing your account details</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 A</td>
<td>Change your email address</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>(0.00)</td>
<td>(0.00)</td>
<td>(0.00)</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>Mean</td>
<td>Mean no.</td>
<td>Mean total</td>
<td>Mean</td>
</tr>
</tbody>
</table>

---

84
Table 13) Phase 2 user satisfaction survey results

<table>
<thead>
<tr>
<th>Statement</th>
<th>Mean rating*</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>I enjoyed using this system</td>
<td>5</td>
<td>0.00</td>
</tr>
<tr>
<td>The wizard is easy to use</td>
<td>4.5</td>
<td>0.50</td>
</tr>
<tr>
<td>The page editor is easy to use</td>
<td>5</td>
<td>0.00</td>
</tr>
<tr>
<td>I am satisfied with the system</td>
<td>5</td>
<td>0.00</td>
</tr>
<tr>
<td>The system helped me to build pages quickly</td>
<td>4.75</td>
<td>0.43</td>
</tr>
<tr>
<td>The system is flexible</td>
<td>4.5</td>
<td>0.50</td>
</tr>
<tr>
<td>The system is easy to learn</td>
<td>5</td>
<td>0.00</td>
</tr>
<tr>
<td>I didn’t get lost using the system</td>
<td>3.5</td>
<td>1.12</td>
</tr>
<tr>
<td>The screen design was clear</td>
<td>4.75</td>
<td>0.43</td>
</tr>
<tr>
<td>The publishing process was simple</td>
<td>4.75</td>
<td>0.43</td>
</tr>
<tr>
<td>I could easily find the functions I needed</td>
<td>4.25</td>
<td>0.43</td>
</tr>
<tr>
<td>The language used was easy to understand</td>
<td>5</td>
<td>0.00</td>
</tr>
<tr>
<td>There was enough help information onscreen to guide me through</td>
<td>5</td>
<td>0.00</td>
</tr>
</tbody>
</table>

* (1 = Strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = Strongly agree)

Phase 2 user evaluation results discussion

Table 12 shows that participants encountered very few problems with the phase two prototype. Indeed, task failures were limited just to task 3 D, where 2 participants failed. This was surprising because participants had not had any difficulties with this task in the phase 1 user evaluations. The task required participants to insert a picture
beneath some text which they had entered. This excerpt from participant A’s observation notes highlights the extent of the difficulties encountered:

Participant A (PA) exited the page editor, and selected the images tab. She then entered the phrase ‘safari picture’ into the upload box, and pressed upload. This resulted in a system error, as her entry did not relate to a file on the system. PA then returned to the page editor, and scanned the icons. First she selected ‘Add image’, which presented the dialog for adding the URL of an image already on the web. PA realised that this was not right either, and after rescanning the icons, selected ‘upload image’. She then entered ‘safari picture’ into the upload box, which caused the following error message to be displayed; ‘The image uploaded is of the wrong file type’. The participant was clearly stuck, and had to be shown how to locate the image on the computer using the ‘Browse’ button, so that it could be uploaded.

Both of the participants that failed to insert an image consulted the help information at the bottom of the page editor. Unfortunately, help information was not provided for this task. The ‘image upload’ dialog box also did not include help information. The next prototype must include support information for this process. Throughout the phase 1 and phase 2 evaluations, participants were confused by the ‘Add image’ button. Most of the participants actually tried this button first, when they wanted to upload an image. The ‘Add image’ button needs to be relabelled to better reflect its functionality. More generally, the system would benefit from a more advanced ‘insert image’ interface which provides the user with the option of selecting an existing image from their account, or uploading a new one. Perhaps the ‘add image’ function (which actually enables users to reference a web image hosted elsewhere, within their page) could be incorporated into the advanced insert image interface. This would mean that just one insert image icon would be required on the page editor.

The problems with image management are further reflected in the mean participant rating of 1.5 for the difficulty of ‘Deleting an unwanted image’. Implementation of the new ‘insert image’ interface (recommended above) should improve user confidence and ability in image management.
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**Strengths**

On the plus side, the Phase two user evaluations indicate that the design alterations based on the phase 1 recommendations were highly effective. In the phase two evaluations, all of the participants inserted page content into the correct field in the page editor (as opposed to the page description field), and all successfully applied the unpublish function (task 4 D). This suggests that the updated page editor is more usable, and the relocation of the publish/unpublish function to the ‘your pages’ page was beneficial.

Table 14 below shows the aggregate data for the phase 1 and phase 2 user evaluations. The figures all point to increased usability of the phase 2 prototype. Phase 2 participants;

- rated the tasks easier
- made fewer errors
- completed the tasks more quickly
- passed more tasks
- and gave higher user experience scores

**Table 14) Comparative statistics**

<table>
<thead>
<tr>
<th>Value</th>
<th>Prototype 1</th>
<th>Prototype 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean task difficulty rating</td>
<td>1.44</td>
<td>1.08</td>
</tr>
<tr>
<td>(1 = easy, 2 = ok, 3 = difficult)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean no. of errors</td>
<td>0.59</td>
<td>0.24</td>
</tr>
<tr>
<td>Mean total time taken</td>
<td>34.25</td>
<td>29.5</td>
</tr>
<tr>
<td>Mean participant pass rate</td>
<td>87.5%</td>
<td>97.5%</td>
</tr>
<tr>
<td>Mean user experience rating</td>
<td>3.56</td>
<td>4.69</td>
</tr>
</tbody>
</table>

**Redesign requirements**

The phase two evaluation has shown that processes of inserting and managing images are not well supported by the system. The next prototype should therefore
incorporate a more effective interface for inserting and managing images. Furthermore, two participants suggested that the system should include a built in gallery of images to choose from. This is an excellent suggestion and is recommended for the next prototype. In sum, the next prototype must include an improved image insertion and management interface which;

- enables users to select images from their account for insertion into a page
- enables users to insert an image which is hosted elsewhere (i.e. integrate the existing ‘add image’ function)
- enables users to upload a new image (i.e. integrate the existing ‘upload image’ function)
- includes concise support information for achieving these tasks
- offers a built in gallery of images
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Conclusion

The goal of this project was to design an online web authoring and publishing system which could be used by people with no prior web design experience. In phase two, participants with no web design experience used a near fully functional prototype to produce their own websites. The four participants, guided by a task sheet, built their sites from scratch in under half an hour (on average). Although the sites were very basic, they conformed to web usability and accessibility criteria such as being fully visible at different screen resolutions, using high contrast foreground and background colours, implementing flexible font sizes which could be overridden by browser settings, and offering comprehensive site navigation links. Participants gave the system an overall satisfaction rating of 4.69 out of 5, and a mean difficulty rating of 1.08 (1 = easy, 2 = ok, 3 = difficult) for the tasks they completed. This suggests that the project was successful in achieving its overall aim.

It is felt that the user-centric method for developing this system was key to the successful outcome, as many small details which seemed logical and straightforward during the design stages were found to cause all sorts of problems during the evaluation sessions. Without the detailed user feedback which this approach offered, these design mistakes would have become more deeply engrained into the system with every design iteration, leading to a much less usable system than is currently seen. The interaction design framework is therefore commended to anyone embarking on a similar project.

Although the system enables users to develop their own web sites, it is by no means ready for market. A tool that makes web authoring and publishing accessible to everyone must be monitored, as users could put up illegal or offensive content. The system therefore requires an administration interface with tools for identifying system misuse. As the user base could theoretically reach many hundreds of thousands, procedures for automatically identifying illegal or offensive content would need to be implemented. For example, software for recognising obscene images could be used to check images as they are uploaded. Such automated systems would be used in conjunction with simpler means of identifying system
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misuse such as providing clear advice for reporting system abuse by email or an
anonymous form. The development of such administration interfaces and monitoring
systems could form the basis for future studies.

Other possibilities for extending this project stem from suggestions and requirements
offered by participants which unfortunately fell beyond the scope of this study. These
included; the development of more advanced components for easy integration into
users’ Easywebs, such as discussion forums, chat rooms, and e-commerce solutions;
an interface for users to design their own themes; modification to the WYSIWG
editor so that it generates code which is more in line with emerging web standards
i.e. valid XHTML and CSS.
Bibliography


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Appendix A: Scripts used during evaluation sessions
Welcome to the Easyweb study – greeting script

Thank you very much for participating in this study. The goal of this exercise is to improve my understanding of the ease of use of Easyweb and its effectiveness. The results of the evaluation will be used to refine the design, and will be reported in a study submitted as part of the MSc programme which I am currently undertaking.

I will be videotaping only what appears on the computer screen, but what you say will also be captured. Your face will not be in shot, and your identity will remain confidential.

Please sign and review this statement of informed consent. Please say if you have any questions regarding this document, or the exercise you are about to undertake.

Procedure explained

We’ll start with a general overview of Easyweb. Easyweb is a web based tool for building web sites. It aims to make web design a simple process that can be achieved by anyone with basic web and computing experience.

The purpose of the exercise is to explore the Easyweb screens, to see whether or not the tool is easy to use. I’m also interested in your opinions on which features are helpful, and which aren’t.

As you use Easyweb, please be assured that it is the system is being tested and not you. As you tackle each task, please feel free to work at a pace which is comfortable for you.

As you work on the tasks, imagine that you have decided to build your own website using this tool, and please feel free to create your own fictitious content where appropriate.

If you feel that you are unable to complete a task and would like to stop, please say so and we’ll move onto the next task. Before we proceed, do you have any questions at this point?

Introducing the exploration task

Before we begin the tasks, I’d like you to explore Easyweb independently for up to 10 minutes.

Feel free to explore any areas that appeal to you.
If you complete your exploration before the 10 minutes are up, let me know and we’ll get started on the tasks.
Familiarise yourself with the mouse, keyboard, monitor etc. surf the web – use the mouse / keyboard etc.
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**Script used to direct participants’ behaviour**

Please read each task, and then begin working on Easyweb. Again, as you explore please think aloud – tell me your thoughts, what you are looking at, and what you find confusing.

Please let me know when you feel you have completed each task.

Prompts: “what are you thinking?”; “What is confusing you?”; “[if time exceeds 5 minutes – I need to ask you to stop working and proceed to the next task]”

When all tasks are completed – participant given post-test questionnaire consisting of items derived from QUIS user satisfaction questionnaire.
[ give user satisfaction questionnaire ]
Appendix B: Phase 0 user evaluation tasks
Task 1: Build a 3 page personal web site

The site has the following pages:
- Home page
- Photo gallery
- Links page

The content for each page is presented below. Positioning and styling of elements is up to you.

Try to ensure that each page contains links to the other pages in the site.

Page 1) Home page

<< Main body text >>

Welcome
Welcome to my web site. Here you can find out about me, see my photo gallery, and view my links page.

About me
My name is [ name ]. I am [ age ] years old, and I was born in [ town / city ]. I am currently employed as a [ job ].

Favourite things
My favourite bands are [ performers / artists ]. I like to read [ book types / authors ]. My favourite places are [ place e.g. Cornwall for holidays, and Sheffield for its nightlife ]. I enjoy [ list hobbies and interests here, e.g. sports, eating out, going to the cinema etc.].
Page 2) Photo gallery

Please select 2 or more images for your gallery, and give them suitable captions.

Select from;
Butterfly.jpg

Crab.jpg

Fishy.jpg

Llama.jpg

Tapir.jpg

Seal.jpg

Page 3) Links page

My favourite sites
www.google.co.uk
www.sheffield.ac.uk
www.bbc.co.uk

Music and film links
http://www.imdb.com/
http://www.mtv.com/
http://www.nme.com/
Task 2: Build a 3 page web site for a small clothes shop called ‘Fancy Clothes’

The site has the following pages:
- Home
- Our products
- Our location

The content for each page is presented below. Positioning and styling of elements is up to you.

Try to ensure that each page contains links to the other pages in the site.

Page 1) Home page

Welcome to FancyClothes.com. If you want a snazzy outfit, you've come to the right place! We offer fancy clothes for men and women. See our products page for more information.

We are based in the heart of Snobville. See our location page for details of how to find us.

We hope you enjoy using our website. If you would like further information, email us at sales@fancyclothes.com.

Page 2) Our products

Posh tuxedo; posh dress; materials

Page 3) Our location

Address

<< Logo at the top of the page >>

<< Main body text >>

Welcome to FancyClothes.com. If you want a snazzy outfit, you've come to the right place! We offer fancy clothes for men and women. See our products page for more information.

We are based in the heart of Snobville. See our location page for details of how to find us.

We hope you enjoy using our website. If you would like further information, email us at sales@fancyclothes.com.

<< Picture of tuxedo (tuxedo.jpg) with caption “Posh tuxedo” >>
Page 2) Our Products

Posh tuxedo

Our posh tuxedo is made from the finest Italian wool, and is available in all sizes.
£1000.00

<< Picture of tuxedo (tuxedo.jpg) with caption “Posh tuxedo” >>

Posh dress

Our posh red dress is made from the finest Italian silk and lace. This little number is sure to make you the bell of the ball.
£1000.00

<< Picture of posh dress (poshdress.jpg) with caption “Posh dress” >>
Materials

Our clothes are made from the finest materials. See our suppliers’ web sites for more information;

Suppliers of exquisite silk: www.fineitaliansilk.com
Suppliers of luxurious lace: www.fineitalianlace.com
Suppliers of sumptuous wool: www.fineitalianwool.com

Page 3) Our Location

Address

2 Snob Way,
Poshville,
South Yorskshire,
S1 2XX

Tel 0114 123 4567
Fax 0114 234 5678
Email sales@fancyclothes.com

We are located just over the road from the tourist information office in the city centre.

We are open every day from 9.00am to 5.00pm.
Appendix C: Web design questionnaire
Web design questionnaire

Thanks for taking the time to look at this. Please type your responses to open ended questions at the appropriate points, and where ticks are required, feel free to copy and paste this tick ✓ next to your selection, or simply put an X.

If you would like to be entered into the £10 prize draw, please insert your email address here:

Demographics
Gender: M  F
Age:  20-30 31-40 41-50 51-60 61+

1. Computing experience
On a scale of 1 to 5 (1 being no experience, 5 being fully competent), please rate your experience and knowledge for each of the following:

1.1 Day to day tasks (e.g. copying and pasting files, starting programs etc.)
No experience Moderate experience Fully competent
1 2 3 4 5

1.2 Use of a word processor:
 a) Creating and saving documents
No experience Moderate experience Fully competent
1 2 3 4 5

 b) Formatting text (changing the font, making text bold or underlined etc.)
No experience Moderate experience Fully competent
1 2 3 4 5

c) Inserting, positioning, and resizing images
No experience Moderate experience Fully competent
1 2 3 4 5

1.3 Use of the internet
 a) Browsing web pages
No experience Moderate experience Fully competent
1 2 3 4 5

 b) Using web applications (e.g. searching the web, making online purchases, using online discussion forums)
No experience Moderate experience Fully competent
1 2 3 4 5
2. Web design experience

2.1) Have you ever done any web design?

Yes  No

If Yes, please indicate your level of experience by answering the questions below;

2.2) Please tick (√) all that apply;

- I have produced a personal web page, or small personal site
- I have produced other sites in my spare time
- I have been paid to do web design
- I can write HTML
- I can code using languages such as Javascript and VBscript

2.3) Please indicate which of the following activities you undertook when doing web design; (tick √ all that apply)

- Conducted interviews with key stakeholders i.e. The person(s) who requested the site, and other relevant parties
- Gathered content for the website (existing paper / electronic documents, images, etc.)
- Digitised paper based content
- Grouped and arranged the information into a hierarchy e.g. Home page
  - Our products
  - Our location
  - Contact us
- Designed page templates
- Built the site using the page templates
- Uploaded the site to a web host

Please give details of any other important activities you undertook while doing web design:

2.4) Please indicate which tools you have used for web design (tick √ all that apply):

- Microsoft FrontPage
- Macromedia Dreamweaver
- Content Management System (please specify system name (if known) and where it was used i.e. company name):
- Yahoo! Geocities
- Lycos Tripod
- Other(s): (please specify)
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2.5) If you ticked any of the tools above, please indicate how useful the following features were:

a) Pre-defined page templates (colours, images, styles, sample content and layout)
   Not useful Of some use Very useful Not applicable
   1 2 3 4 5 X

b) WYSIWYG editor (Word processor style interface for page design)
   Not useful Of some use Very useful Not applicable
   1 2 3 4 5 X

c) Automated site navigation links (i.e. links are produced and maintained as you specify the page hierarchy)
   Not useful Of some use Very useful Not applicable
   1 2 3 4 5 X

d) Page building wizard:
   Not useful Of some use Very useful Not applicable
   1 2 3 4 5 X

e) Please describe any other features which you find especially helpful:

3 a) Please rate the following tasks in terms of technical difficulty and time consumption:

<table>
<thead>
<tr>
<th>Task</th>
<th>Difficulty</th>
<th>Low</th>
<th>Medium</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coding HTML</td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Designing page templates</td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Positioning elements on a page</td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Inserting and maintaining site navigation links</td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Uploading files to a web host</td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

b) Please describe any other web design tasks which you consider to be technically challenging or time consuming:
4) a) What features do you think a web authoring tool for people with little or no web design experience should possess? *Tick ✓ all that apply:*

<table>
<thead>
<tr>
<th>Simple page management section for;</th>
<th>Tick</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Adding new pages</td>
<td></td>
</tr>
<tr>
<td>• Renaming pages</td>
<td></td>
</tr>
<tr>
<td>• Deleting pages</td>
<td></td>
</tr>
<tr>
<td>• Defining the site structure</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Word processor style interface for;</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>• editing and formatting text</td>
<td></td>
</tr>
<tr>
<td>• inserting bulleted lists</td>
<td></td>
</tr>
<tr>
<td>• inserting tables</td>
<td></td>
</tr>
<tr>
<td>• inserting images</td>
<td></td>
</tr>
<tr>
<td>• inserting hyperlinks</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Simple image management section for;</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>• Uploading images</td>
<td></td>
</tr>
<tr>
<td>• Renaming images</td>
<td></td>
</tr>
<tr>
<td>• Deleting images</td>
<td></td>
</tr>
<tr>
<td>• Viewing images</td>
<td></td>
</tr>
</tbody>
</table>

Predefined page templates
Wizard for producing pages
Automated navigation links
Simple page meta tag editor (contents, description)

b) Please describe any other features or characteristics which a web authoring tool for beginners should have:

5) Please provide your details below, if you are interested in doing a short trial of the web authoring tool being produced for this project;
Name:
Email:
Phone:

Thanks for your response. Please save the document and email it back to me at lip03joh@sheffield.ac.uk
Appendix D: Tasks for the phase 1 / phase 2 user evaluations
Tasks

Pretask – Explore Easyweb
Please take a few moments to explore the Easyweb pages, and familiarise yourself with the system.

Task 1: Getting started
A. Register to use Easyweb.
B. Sign out from Easyweb.
C. Log back in to Easyweb.

Task 2: Using the wizard
A. Create a personal site consisting of a ‘Home’ page, and a ‘My hobbies’ page. Apply a theme of your choice.

Task 3: Adding content to your site
A. Add the sample text (fig 1.) to your home page and apply the same font style and spacing as indicated in the sample.

Figure 1) Home page sample text

Welcome to my web site. Here you can find out about me and my hobbies.

My name is [name], and I was born in [town / city]. My favourite colour is [colour].

B. Save your changes and exit from the page editor.
C. Add the sample text (fig 2) to the ‘My hobbies’ page.

Figure 2) My hobbies sample text

My favourite hobbies are [hobby1] and [hobby2]. I also like to visit safari parks. Here’s a photo I took at my favourite safari park:

D. Insert this picture beneath the text you just entered (you must upload the image ostrich.jpg from this computer’s desktop):
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E. Change the font of the text to Verdana, and make the text bold.
F. Add this bulleted list to the page, beneath the photo:

I also like to listen to music. My favourite artists are:

- [ artist ]
- [ artist ]
- [ artist ]

G. Save the changes you made to your page, and exit the page editor;
H. View your web site.

[ task survey ]

**Task 4: Managing your website**

A. Add a new page and save it.
B. Delete the page you just added.
C. Find out which page has been viewed the most.
D. Unpublish a page.
E. Change your site’s ‘site display name’.
F. Delete an image from your account.
G. Change the theme of your website.

**Task 5: Managing your account details**

A. Change your email address.
Appendix E: Post task surveys and interview questions
## Post task surveys and interview questions

**System:**

1) Please rate your feelings toward the following statements;

<table>
<thead>
<tr>
<th>a) I enjoyed using this system</th>
<th>Strongly disagree</th>
<th>neutral</th>
<th>strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>b) I found the page wizard easy to use</th>
<th>Strongly disagree</th>
<th>neutral</th>
<th>strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>c) I found the page editor easy to use</th>
<th>Strongly disagree</th>
<th>neutral</th>
<th>strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>d) I am satisfied with the system</th>
<th>Strongly disagree</th>
<th>neutral</th>
<th>strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>e) The system helped me to build pages quickly</th>
<th>Strongly disagree</th>
<th>neutral</th>
<th>strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>f) The system was flexible</th>
<th>Strongly disagree</th>
<th>neutral</th>
<th>strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>g) The system was easy to learn</th>
<th>Strongly disagree</th>
<th>neutral</th>
<th>strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>h) I didn’t get lost using the system</th>
<th>Strongly disagree</th>
<th>neutral</th>
<th>strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>i) I am satisfied with the pages I have produced</th>
<th>Strongly disagree</th>
<th>neutral</th>
<th>strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>
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j) The screen design was clear
   Strongly disagree neutral strongly agree
   1 2 3 4 5

k) The page templates were effective
   Strongly disagree neutral strongly agree
   1 2 3 4 5

l) The publishing process was simple
   Strongly disagree neutral strongly agree
   1 2 3 4 5

m) I could easily find the functions I needed
   Strongly disagree neutral strongly agree
   1 2 3 4 5

2) Were there any aspects of the system which you really liked or disliked?

3) Which aspects of the system do you think are appropriate for a beginners’ web authoring and publishing tool?

(Phase 0) Please rate the difficulty level for each of tasks you completed:

<table>
<thead>
<tr>
<th>ID</th>
<th>Task</th>
<th>Difficulty rating (1 = easy, 2 = ok, 3 = difficult)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Creating 3 pages</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Applying page templates</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Adding text</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Formatting text</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Inserting images</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Resizing and positioning images</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Adding external hyperlinks</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Linking between pages</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Publishing the site</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Viewing the site</td>
<td></td>
</tr>
</tbody>
</table>

(Phase 1 / 2) Please rate the difficulty level for each of tasks you completed:

<table>
<thead>
<tr>
<th>Task ID</th>
<th>Task</th>
<th>Difficulty rating (1 = easy, 2 = ok, 3 = difficult)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Getting started</td>
<td></td>
</tr>
<tr>
<td>1 A</td>
<td>Register to use Easyweb</td>
<td></td>
</tr>
</tbody>
</table>
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<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1 B</td>
<td>Sign out from Easyweb</td>
</tr>
<tr>
<td>1 C</td>
<td>Log back in to Easyweb</td>
</tr>
<tr>
<td>2</td>
<td>Using the wizard</td>
</tr>
<tr>
<td>2 A</td>
<td>Create a personal site consisting of a home page, and a ‘My hobbies’ page</td>
</tr>
<tr>
<td>3</td>
<td>Adding content to your site</td>
</tr>
<tr>
<td>3 A</td>
<td>Add the sample text to your home page and apply the same font style and spacing as indicated in the sample.</td>
</tr>
<tr>
<td>3 B</td>
<td>Save the changes, and exit from the page editor.</td>
</tr>
<tr>
<td>3 C</td>
<td>Add the sample text to the ‘My hobbies page’</td>
</tr>
<tr>
<td>3 D</td>
<td>Insert the sample picture beneath the text you just entered.</td>
</tr>
<tr>
<td>3 E</td>
<td>Change the font of the text to Times, and make the text bold.</td>
</tr>
<tr>
<td>3 F</td>
<td>Add the sample bulleted list to the page beneath the photo</td>
</tr>
<tr>
<td>3 G</td>
<td>Save the changes you made to the page, and exit the page editor.</td>
</tr>
<tr>
<td>3 H</td>
<td>View your website</td>
</tr>
<tr>
<td>4</td>
<td>Managing your website</td>
</tr>
<tr>
<td>4 A</td>
<td>Delete the ‘My hobbies’ page</td>
</tr>
<tr>
<td>4 B</td>
<td>Add a new page and save it</td>
</tr>
<tr>
<td>4 C</td>
<td>Find out which page has been viewed the most</td>
</tr>
<tr>
<td>4 D</td>
<td>Unpublish a page</td>
</tr>
<tr>
<td>4 E</td>
<td>Change the display name of your website</td>
</tr>
<tr>
<td>4 F</td>
<td>Delete an unwanted image</td>
</tr>
<tr>
<td>4 G</td>
<td>Change the theme of your website</td>
</tr>
<tr>
<td>5</td>
<td>Managing your account details</td>
</tr>
<tr>
<td>5 A</td>
<td>Change your email address</td>
</tr>
</tbody>
</table>

**Post evaluation interview**

1) How did you feel about your performance on the tasks overall?
2) What did you like about Easyweb?
3) What did you dislike about Easyweb?
4) What would you say was the best thing about Easyweb?
5) What would you say was the worst thing about Easyweb?
6) What did you find confusing or difficult to use in Easyweb?
7) Tell me about what happened when – problem
8) Does it do what you want it to?
9) How would you suggest improving Easyweb?
10) Are there any additional features which you would like to see on Easyweb?
11) Do you think it is something that you would use?
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Appendix F: Figures 3 – 45 (excluding 30, 33)

Figure 3) Description meta tag used prominently by Google – contrast the descriptive text for FishingWorld.com (no meta data offered) with that of The-Fishing-Network.com (meta data provided).

Figure 4) The University of Sheffield MUSE service
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Figure 5) MUSE personalisation interface

Figure 6) Yahoo! Page builder interface
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Figure 7) Yahoo! Page wizard, links form

![Yahoo! Page wizard, links form](image)

**Build your Personal Page**

**Enter your favorite links**

Type in your favorite links. Visitors to your page will then be able to go to these pages. Below are some suggested links. You can change or delete these.

<table>
<thead>
<tr>
<th>Link Name (ex. My favorite page)</th>
<th>Web Address (ex. <a href="http://www.yahoo.com">www.yahoo.com</a>)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Yahoo!</td>
<td><a href="http://www.yahoo.com">www.yahoo.com</a></td>
</tr>
<tr>
<td>2. Yahoo! Chat</td>
<td>chat.yahoo.com</td>
</tr>
<tr>
<td>3. Yahoo! Games</td>
<td>games.yahoo.com</td>
</tr>
<tr>
<td>4. Yahoo! Photos</td>
<td>photos.yahoo.com</td>
</tr>
</tbody>
</table>
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Figure 8) ‘View the page / make changes’ page displayed upon completion of the page wizard (top half). Bottom half below.
Figure 9) Lack of feedback on the image upload dialogue

Figure 10) The Tripod page editor interface
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Figure 11) Pressing ‘Add picture’ results in the display of ‘Add it here’ buttons.

Figure 12) Participants did not notice the function to ‘Delete this item’ at the foot of the text editor form.
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Figure 13) Controlsite ‘new article’ interface (top). Bottom below.
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Figure 14) The published article is encapsulated by the standard page template

Figure 15) Meta data editing form
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Figure 16) Prototype 1 login screen

Figure 17) Prototype 1 registration screen
Figure 18) Prototype 1 registration confirmation screen

Figure 19) Prototype 1 – new users can choose to start with the wizard, or with a blank site
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Figure 20) Prototype 1 – wizard step 1

Figure 21) Prototype 1 – wizard step 2
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Figure 22) Prototype 1 – wizard step 3

Figure 23) Prototype 1 – wizard complete
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Figure 24) Prototype 1 – Easyweb site manager

Figure 25) Prototype 1 – Edit page form
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Figure 26) Prototype 1 – Themes form

Figure 27) Prototype 1 – Images form
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Figure 28) Prototype 1 – Site name form

Figure 29) Prototype 1 – My details form
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Figure 31) Prototype 2 – Home (The interface is designed to be accessible at both 800 * 600 and 1024 * 768 screen resolutions).

Figure 32) Prototype 2 – Your web pages, a consistent look and feel is applied across the system
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Figure 34) Prototype 2 – Themes

Figure 35) Prototype 2 – Images
Figure 36) Prototype 2 – Site name

**Easyweb site manager**

**Site name**

These are your site address and site display name details. To change either, enter the new version into the corresponding box below, and press the related ‘Apply new …’ button.

- **Site address**: www.easyweb.org.uk/Prototype
- **Site display name**: FancyClothes.com

New site address: [Enter new site address]  
New site display name: [Enter new site display name]

**Help**

The site address forms part of the web address which you enter into your browser to find your site on the internet. The display name is shown at the top of all of your web pages.

Figure 37) Prototype 2 – My details

**Easyweb site manager**

**My details**

These are your details. To make changes, enter the new information into the appropriate box, and press the relevant ‘Apply new …’ button.

- **Forename**: Fred  
  New forename: [Enter new forename]  
  Apply new forename

- **Surname**: Bloggs  
  New surname: [Enter new surname]  
  Apply new surname

- **Email address**: print@eval.com  
  New email address: [Enter new email address]  
  Apply new email address

- **Password**: ********  
  New password: [Enter new password]  
  Apply new password
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Figure 38) Prototype 2 – Page editor (top). Bottom below.
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Figure 39) Prototype 2 – Confirm delete dialogue

Figure 40) Prototype 2 – page saved feedback in red
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Figure 41) Prototype 2 – Easyweb registration (top). Bottom below.
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Figure 42) Prototype 2 – Registration confirmation

Figure 43) Prototype 2 – Plain language error dialogue
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Figure 44) Prototype 2 – User content is encapsulated by preset page template

Figure 45) Prototype 2 – Navigation links are automatically generated based on the user defined information architecture