

"Does User-Centred Design Create Usable Websites? A Comparison of Design Methodologies."

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1. Abstract

In maturing, the web has reached a stage where it is not simply enough to have a simple site announcing your presence. Users demand more. Building upon relevant, but forgotten, work concerning graphical user interfaces as well as emerging web-usability standards an alternative approach to user-centred web design is attempted. The resulting methodology incorporates focus groups, competitor analysis, online surveying, prototyping and iteration in an attempt to illustrate the breadth of user-centred design. The efficacy of this approach is established by comparing the completed design to a one built to the same brief but with no user-input. The results indicate a degree of superior usability for the user-centric design. However, the author advises caution when considering these results in the broader context of their applicability to the web-design industry, citing the lack of empirical foundation in current usability assessment. The implications for user-centred web development are presented and wide ranging suggestions made for further investigative research.

2. Review

The web exists to serve us, it is a tool, a resource, an environment where we achieve things. No medium that performs such functions can exist without regard for the user. The question is whether enough attention is being paid to this user or whether the tool is constantly being re-designed merely to look new. Regardless of whether the fundamental technologies under-pinning the web are evolving (and the gradual move to broadband access suggests they are), the face of the web changes on a constant basis. We log on to our favourite sites to see them altered, navigation shifted, menus obliterated, advertisements added. It is tempting to assume that this is all occurring under the banner of 'change for change's sake' but this would be wrong. Practitioners are emerging, even in these fledgling days of the web, that demand websites shape-up to meet the needs of the public, placing the user back in the centre of the circle. As interface designer, Bruce Tognazzini stated: "All of a sudden, the beauty of the page was everything and usability took a permanent back seat... ...The sorry state of the web is a wakeup call. It's time we listen." [Tognazzini, 1998a]

But where did the web go wrong? In its infancy, the web stood out as a predominantly textual interface with unidirectional links [Gill, 2001], an interface system that was simple and effective. From this period the expansion of supportive technologies allowed the web to increase its abilities and begin to show graphics, sound, animation, delineated pages and so on. The difficulty was that this progress outpaced expectations and in the rush to keep up, the body of work that was amassing to support the development of Graphical User Interfaces (GUIs) was soon left behind. Layout was being copied from print media [Nielsen, 1999c] and the whole structure of the web, contextual links, simple forward-back navigation was being squeezed aside in the name of progress. The problem was that no-one really knew where to turn, the GUI model was not able to scale to fit the increased volume of information that needed to be represented and world of typography and hypertext seemed too archaic to have its place in the brave new web world.

Experiments with print-media-influenced design were disastrous. Pages became huge scrolling behemoths of textual and graphical confusion [Nielsen, 1999c] that took an age to download over modest modems and were unreadable across different systems and platforms; fonts changed, window sizes and colour palettes all introduced unforeseen variance. Navigation, previously a simple process of clicking textual links and forward and back buttons, became a quest to provide users with as much information as possible as quickly as possible. Navigation bars became either unwieldy nightmares so crammed with information as to be utterly disorientating, or so deficient in cues as to be worthless [Tognazzini, 1998a]. The reason for this was that web designers were coming from graphic design backgrounds, communicating content was achieved with layout, but what is beautiful is not universally

usable [Tractinsky et al., 2000]. What developers were forgetting was that the web is able offer more than an electronic copy of a brochure, prospectus or a newspaper. It web offers interactivity on an enormous scale and as much effort is required in the development of interaction as is poured into the visual layer.

To enjoy an experience on the web you need to be able to feel that your actions are successful, that you are achieving something, or at the very least, not wasting your time. To make us feel successful on the web we do not want to have to wait, get lost or to question trust and credibility. Web designers have begun to feel the need to address these issues [Flemming 1998], assessing why users get frustrated, disappointed and confused. The difficulty in addressing these issues is knowing where to start, designers have not warmed to the idea of being constrained by guidelines that are difficult to follow [Borges 1996] or too ambiguous to apply with consistency (e.g. Fleming's navigational guidelines [Flemming, 1998]). Likewise, whilst the pious tone of some usability texts [Nielsen, 2000a] based largely on anecdotal evidence has inspired many to adopt new approaches to web design, others have found themselves questioning their validity or at least their less that subtle condemnation of graphics. Of course, many of these well-intended attempts at improving the web appear to make common sense [Bevan, 2001], and a large quantity of this work is to be ignored at one's peril. However, a note of caution must be sounded when assuming that a site meeting such criteria has a guarantee of usability. The issues that these guidelines raise are often particularly specific e.g.: "Top Ten Mistakes in Web Design", [Nielsen, 1999b] 'Using Frames', 'Long Scrolling Pages', 'Non-Standard Link Colours'. For this reason, these rules have begun to find their place in the early stages of the web design process where developers need explicit guidance.

User-centred design has existed in software development for some time [Shneiderman, 1998, Preece et al., 1994] and with the arrival of usability evaluation on the web it was only a matter of time before it became adapted to fit the design process for this medium. User-centred web design involves the understanding of human behaviour in order to support it with the available technology, to take account of idiosyncrasies, to predict where problems occur and design to prevent them. To understand how this can be done in the context of web design we must look to those that are involving users at the design stage. Fuccella and Pizzolato [1999c] describe a comprehensive method for involving users in site design. From the very earliest of phases where users think about potential content, through to establishing a specific visual layout, the entire process involves close collaboration with a focus group of users. Evidently this creates a substantial amount of data from which meaningful analysis is perhaps time-consuming to extract. The advantages of such a method are obvious, put simply if the site is designed by its audience to fit their expectations then surely it cannot fail when it is released?

The problem is that users are not always the best people to consult on what is usable. Though this may sound absurd, the grounding for this statement is empirically valid. The Hawthorne effect [Preece et al., 1994] indicates that users are not particularly good at reporting fallibility to others, and Nielsen [2001d], drawing from psychological theory, hypothesises that users are not good at being able to disseminate between what is good/bad about web design, particularly in group situations. The situation thus stands that we know websites are often difficult to use and that we must support the users by integrating their needs into the design phase. We also know of two methods to do this, follow established guidelines which may be rigid or ambiguous, or follow focus groups and risk being swamped with information, or worse, misinformation. In order to investigate this problem, this study will attempt to blend the different processes of user-centred design together by using the following techniques: Focus group methods similar to those described by Fuccella and Pizzolato, [1999b] surveys designed around to direct the focus group to answer explicit questions focussing on established usability elements, and by following a comprehensive usability checklist [Bunnyfoot, (References 7.2)]. During the user-centred process, a prototype site will be developed that will be evaluated by a focus group and returned to the design process for modifications before the site can be completed [cnet (References, 7.2), Fuccella & Pizzolato, 1999a]. Alongside this process a different version of the site, working to the same brief, will be developed with no user-input. This site will include some elements of contemporary web-design, attempting to appear as an innovative and novel solution. The two sites will then be carefully compared against two forms of usability evaluation, the much vaunted Ten Usability Heuristics [Nielsen 2000a, 1994, Flemming, 1998, Instone, 1997] and the more specific Bunnyfoot checklist [References 7.2] and online LIFT evaluation metrics [References 7.2].

By performing this study it is hoped to indicate several important issues with regards to user-centricity on the web. Firstly that user-centricity is necessary, secondly that it is misapplied, thirdly that it is particularly difficult to quantify and finally that it is not without its faults. The web design industry is clearly in need of the user-centred approach to save it from the blind experimentation, but usability doctrine is beginning to reach a dangerous stage. A stage that is where recommendations are emerging to suggest sites *look* and *feel* the same: "Users prefer your site to work the same way as all the other sites they already know" [Nielsen, 2001c]. What this study aims to discover is the half-way point, a cautious blend of the two, where innovation is encouraged with the user as co-pilot, ensuring any mistakes made along the way are not as disastrous as they could have been.

3. Methods

The introduction established that this study aims to create two web sites whose usability can be compared since they work from the same design brief although created from different perspectives. This brief is to design and build a website to support a University Rowing Club for alumni members (the 'Old Blades'). The activities of this club involve socialising and rowing events and it is necessary to use the site to promote financial investment for the existing student team.

The first site will work from the brief according to a user-centred design track, incorporating the views of the site's target audience (rowing-orientated, web-aware graduates aged 21+). The second will work as an independent designer might, developing a site that will expand their portfolio and with no input from the potential user-base..

The following sections describe the methodologies employed to create the solutions and compare them. Descriptions of the sites, the findings at each stage of the process and the comparison, can all be found in section 4, below.

3.1 User-Centred Design (UCD)

The first facet of website design has traditionally been the opening of the editor program on one's workstation where the first translations of the mental picture in the designer's mind will make their way into Hypertext Mark-up Language (hereafter HTML). With the advent of WYSIWYG editors the process becomes more visual and designers are able to doodle with designs directly on to the screen and the site is rendered (in some form) behind the scenes. Often designers find it necessary to take time to sketch ideas on paper and go through the type of creative review and layout-planning that has been taking place in print media for many decades. Site design can adopt skills learnt in the print media industry such as layout, but it cannot adopt them all. Print media does not have the dynamic of the web and the more these parallels are considered the more tenuous they become.

One thing that is not often considered in print media is the direct consultation with the end-user during the design phase but already in the web's relative infancy, the virtues of such a methodology are being extolled [Fuccella and Pizzolato, 1999c]. The process aims to integrate user-feedback with the designer's formal understanding of the implementation issues. In the first instance the users should not be bound by limitations of currently available implementations, they should be allowed to believe that anything is possible on the web and therefore their creative process can be as free as they wish. From this stage the design team can establish what is achievable from the users' design and respond

to them with an adaptable wire-frame. Once settled this wire-frame is easily converted into a text-based site and subsequently into the graphical realisation of the brief.

For the most part this study will closely resemble the procedures established by Fuccella and Pizzolato [Fuccella and Pizzolato, 1999b] in the design cycle of the user-centred website. As they stress, their methodology is not a universal guideline and the multifaceted nature of the web ensures that there is much scope and necessity for an individual interpretation and modification of the methods that they describe. The stages we employ in this study are a little less ambiguous and pin-down the user's likes and dislikes of web use as opposed to being a search for a definitive site structure.

3.1.1 Stage One: Definitions

Working from the given brief, we needed to establish an audience for the site that we could consult during the design phase. The University of York's established rowing team has a well-used website (circa 250 page impressions per week). Part of this site had been designed to cater for former members and has proved particularly popular. The site also contains news pages and a message board where alumni post messages and can read existing articles. From this message board we were able to recruit five people with an interest in both the alumni club and rowing websites to take part in the study. The study comprised three men and two women who had all accessed the web from off-campus. Their means of access was an important factor as we were able to obtain an audience with many different browser configurations, browsing styles and network connection speeds - the way in which our audience viewed the web would be markedly different. We offered no incentive to participate in the study in order to reduce the risk of non-representative participation. Additionally, each participant was permitted to leave the study at any time.

From this established base of users we were interested in obtaining information regarding their current experience of the web. We were interested in what pages they regularly use, what they like/dislike about sites, what features they considered to be important/extraneous. We were also concerned with their expectations of the new site, for example, what categories should the site be divided into, what features would be appropriate. This information was obtained via an amalgamation of competitor analysis and focus group work.

Participants were invited to take part in a focus group session where we began by observing their usage of an established site that closely resembled the brief given. Either the system they viewed the site on was a fast (10Mbps) connection or a modest modem (33.6kbps) connection depending on the

day they were available. Both system set-ups employed Windows running at 1024x768 (16bit or more colours) screen resolutions and they were free to choose either Netscape 4.7 or Internet Explorer 5.

We chose three English alumni boat clubs (Ortner, Bentham and Bacon) whose sites vary in complexity a little and closely resembled the designer's brief. The order in which participants viewed the sites were randomly assigned so as to reduce order effects and they were invited to explore the sites further looking for information we had previously found [Appendix 8.1]. Following the structured navigation we suggested participants explore the sites looking for any other information that might interest them. By doing so we ensured that we were not influencing their navigation paths to suit our design. Throughout these explorations we closely monitored the nuances of their behaviour: For instance, whether they used the back button, scanned pages before making a navigation choice or simply picked the first thing they saw. Moreover, whether they expressed frustration or delight and whether windows were re-sized or other system settings altered to suit their preferences.

Having audio-recorded and noted their behaviour (assisted by the use of a mini-disc device), we then asked that they complete a brief on-line questionnaire. The purpose of which was to provide more quantifiable data than might be discovered from the resulting transcriptions of their browsing behaviour. The items for this questionnaire were determined using a combination of established usability guidelines [Nielsen, 2000a, Bunnyfoot (References 7.2)] and self-designed questions. The questions were selected to produce answers identifying the principal roles the site should fulfil, the elements likely to gain, retain or lose users, and the experience users would be seeking from the site. Each participant completed one questionnaire.

After the questionnaire was completed, participants were gathered together to discuss what they had found and invited to informally share their experiences of the web and their proposals for the new website. Again, this session was audio-recorded with their full consent.

3.1.2 Stage Two: Prototyping (The Wire Frame)

Following the production of such a vast quantity of data regarding web usage we were faced with the mammoth task of 'sketching out' a wire frame that would provide the first step to answering the brief. The first objective was to establish what categories had been rated highly and were common to all participants. We employed card sorting to structure these items into similar categories before determining common category labels. Items that were not common to more than one member were discarded (details in *Results* section).

The aim of the wire frame is to focus the information given from the users without the distraction of visual elements. Consequently, the wire frame began as the very basic of sketches on paper resembling a static display diagram where areas for content and navigation were determined. This process was completed for every single category identified in the card sort exercise. For every item (that is 'individual page') the display was sectioned and arranged taking note of issues such as layout consistency from the previous level in the hierarchy. Simple boxes represented expected areas for graphical items.

From this expanse of sketches the design was transcribed into HTML. At this point it was necessary to make some crucial decisions such as whether frames or tables should be used in the design. Again, these decisions must were based on the users' responses in Stage One regarding their experience of the web. Do users know what frames are? Do they care about meaningful URLs? How quickly do browsers render tables? Such questions cannot be avoided forever and it is of some benefit that they can be answered at such an early stage.

When interpreting the sketches in HTML we used Cascading Style Sheets (hereafter CSS) to ensure that consistency was maintained in terms of typography and element spacing, this is of course optional and depends on your expected site audience and their predicted technical set-up. Other elements such as JavaScript are best left out at this stage unless they perform an integral part of the navigation experience (e.g. generating a pop-up window). It may also be employed at this stage if you are designing for an audience you know to have such capabilities (e.g. a Local Area Network (LAN) where you can be sure everyone on site uses the same browser and system set-up). Discussion regarding the merits of CSS in wire-frame prototypes is dealt with in section 5.2.1 below.

A working model of the site was developed quickly and was navigable throughout every item determined in the card sort exercise. Mock-text (also called 'greeked-text') and boxes for graphic items mimicked content but the navigation system and the site's structural feel was complete.

3.1.3 Stage Three: The iteration

The working model, our 'wire-frame' was published online for the benefit of our target audience to gain a look and feel for the project. Following this we were keen to establish whether any further adjustments to the design would be necessary before we realised the site with content and visuals. Consequently we invited the focus-group participants to use the site and complete another questionnaire specifically targeting the wire-frame design, inviting them to add constructively to the design process. Unlike the questions posed in Section One, these items were designed to capture the

faults of our wire-frame. There were open boxes for users to comment freely on topics as broad as 'navigation', 'layout', 'content' and 'emotions'. Each topic was given a brief introduction that would encourage the user to think broadly and laterally. Regarding 'navigation' users were requested to respond as to whether they felt that the movement around the site was natural and intuitive, or whether areas of the site were obviously sign-posted and links labelled clearly. Other questions included whether any areas of the site were organised in a confusing manner, whether at any point users felt lost, uninformed, or unable to backtrack, or whether the path through the site felt logical.

These questionnaires also queried the technicalities of browsing that users may or may not consider, such as complementary colour schemes, frame resizing, page titling, printing and so on.

Completion of these questionnaires was executed at a later date, off-campus and away from the focus group in the users' own time. It was decided that having users comment on the design directly to the designer might not produce the sort of fluid and honest responses desired.

From these responses we collated observations by category and then listed items that were either raised more than once or that concurred with usability guidelines. For these items, we established which items if any were conflicting and were resolved to make the necessary amendments to the site

3.1.4 Stage Four: Completion

At the same time that amendments were made from section three, graphic items and visual identities were developed to fill in content spaces already reserved in stage two. Before these are added to the site, it is useful to reserve the wire-frame to be the 'text-only' version of the site if this is required.

Any use of JavaScript and Dynamic HTML (hereafter DHTML) was added at this stage providing it did not conflict with any previous stage or user-recommendations and that it enhanced functionality suggested in the original prototyping.

For reasons of brevity only one visual identity was created and implemented. However, it is possible that multiple versions may be introduced to the target audience with modifications produced through iterative assessment.

3.2 Dynamic Designed Site

The method that results in the creation of a dynamic site is free of any particular constraints. In order to maintain a contrast, the dynamic site was designed *before* the user-centred site and would not contain any elements from that later design. The only requirements were that the site should contain graphic elements, some level of JavaScript, DHTML and CSS. The content was determined to fit only the initial brief given and categorisation and site structure were left to the creativity of the designer.

The nature in which this site was constructed was using layout as the starting point. What should the site look like? Brief sketches on paper were quickly re-produced using the WYSIWYG editor in MS FrontPage and the site developed as new graphical elements were introduced. Some arbitrary decisions were made regarding the site structure using a quick 'brainstorming' session, as this would affect the layout, and these were integrated into the navigation part of the design.

Once a basic layout was completed, the templates were produced for each section of the site. As these were established it became possible to add the functionality of the design by writing the necessary JavaScript for the navigation system and the DHTML that would provide the expected behaviours for other page elements

For specific details as to the construction of the dynamic site for this study, please consult the *Results* section.

3.3 Cross-Comparison

The completion of both sites enabled the third phase of the study to take place. There exists an abundance of literature on the subject of web usability testing [Scapin et al., 2000]. As stated in the introduction it is beyond the scope of this project to extensively establish the most robust of the systems though discussion of their relative merits is appropriate and is dealt with in section 6.

In order to quantify the data of comparisons between the two sites we employed several usability heuristics to assess the success of each site. Primarily the sites were compared against Nielsen's 10 web heuristics [Nielsen, 1994, 2000a]. We employed the services of five independent web users to evaluate both sites using the Nielsen heuristics and their guidelines as presented by Nielsen [Nielsen, 1994, 2000a, Instone, 1997]. They were asked to score against each heuristic on a scale of 0-4 where 0 suggested the site had no problem in this area and 4 suggested a critical failing [Nielsen, 1994].

Secondly, the sites were checked against the Bunnyfoot checklist [References 7.2] By ticking-off elements on which the sites included or excluded on these scales, we were able to obtain a qualitative measure of the sites' usability. There were various items upon which the sites could not be assessed with this checklist as they were not relevant. Items that were not relevant to the sites included the domain name (both sites were hosted locally), image maps, animation, multimedia and site-wide search facilities.

Both sites were also checked on usableNet's LIFT service. [References 7.2] though the difference in size of the two sites makes this method of comparison rather tenuous.

4. Results

The design of the two sites followed the pattern as outlined in the methods section. However, in order to understand how these methods actually shape real sites, the following section provides a comprehensive account of the user-centred design process and will detail the ideas that led to the final build of the 'dynamic' site. The results will follow from the cross-comparison of the sites and the appropriate statistical analysis. Full versions of the UCD site at both the prototype and completed stages and the dynamic site are all included on the enclosed electronic media [Appendix 8.3]

Analytical discussion of the procedures and their relevance is considered later in the 'Discussion' section.

4.1 User-Centred Design

4.1.1 Stage One: Definitions

As detailed in the methods section the chosen brief for this study was to produce a web site providing for a university alumni club for the rowing team. Shneiderman as well as Fuccella and Pizzolato [Shneiderman, 1998, Fuccella and Pizzolato, 1999b] Describe competitor analysis as being a useful tool to clarify some of the aims of the design and to highlight limitations of existing solutions. By taking this forward and integrating it with a focus group scenario we were able to highlight a large number of potential usability errors in site design and also to establish what usability failings, as defined by Nielsen and others, are important and which are considered inconsequential.

4.1.1.1 Focus Group Responses

We collated the information observed of the users' behaviours and arranged them by the sites they had viewed. It was considered that grouping observations by participant would produce a profile of the user as opposed to a picture of the effect a site has on its audience. We now present a brief summary of the principal observations made by the focus group for each site.

Bentham

Bentham is the alumni club for the University College London Boat Club (UCLBC). They are an active rowing club and their site is integrated into the template for the main UCLBC pages. These are developed as complicated HTML tables with the almost industry-standard header graphic and left-

aligned navigation pane. Appendix 8.2 illustrates this layout. Primary site links are categorised into six button-style images with rollover effects. These categories remain constant throughout the site. For each category there are specific text-based links below the buttons. The main content section occupies a strip of white space below the main header and requires scrolling on a 1024x768-pixel display.

Participants in the focus group found little to interest them on this site though the design was considered quite aesthetically pleasing:

[Note: P refers to a particular participant, MOD indicates the focus group moderator.]

P2: *"...the graphics look quite professional, it reminds me of a CD-Rom..."*

P3: *"...yeah, but it seems limited to the main UCL site, those options [the section-specific links] seem like an after thought."*

P2: *"...I guess. And they look a bit messy, you think there are more links than there really are..."*

MOD: *"Why do you say that?"*

P2: *"...'cause they don't fit on one line so the text kinda wraps round ... it looks like ... [counts] there are 18 links, but there's only [counts again] 10..."*

P3: *"yeah, that's true. And there [are] seven that contain the word 'Bentham' it's a bit dull isn't it?"*

When using the site to find the email address for Bentham most of the users clicked straight to 'How to contact the Bentham BC', one user even commented:

P1: *"...this seems pretty obvious, you know where you're going..."*

However, one participant seemed drawn to the purple buttons and clicked 'Home' when asked why she had done that the participant replied:

P4: *"...uh, I'm not sure really ... I just wanted to start from the beginning..."*

Clicking 'home' took the user to the main page for UCLBC and her next step was simply to click the (now dark purple and 'unselected') Bentham Boat Club button, taking her back to the same page she started from. Her next click did indeed take her to the correct page.

Users' comments seemed to centre on the lack of interesting or current information about the club, they mentioned that constitutions, fixture lists and the vague '21st Century appeal' link did not capture the imagination. On the positive side, the colour scheme was liked, the site appeared to run quickly (browsers cached the principle re-used layout graphics) and they were keen to discuss the 'Ergo

Ladder', (an indoor rowing-machine training system similar to a Squash Ladder where members compete against each other's training times). Participants liked the idea of "...*staying competitive even when you're not training in the same city together anymore!*" This feature was marred with disappointment when the focus group discovered that it was still 'under construction' at the Bentham site.

Ortner

Ortner is the alumni section of Reading University Boat Club (RUBC). The website is independently hosted from the RUBC site. The website harks back to the earlier days of the web presented as it is on a single HTML page with a fade background, several font colours and clearly delimited tables. The page is dominated by a substantial header graphic, below which is a scrolling text Java applet and 'New Stuff' laid out in a table. Links are presented in an invisible column running down the left-hand side of the screen. These links are a mixture of single words and multi-worded links with a short text description. Appendix Fig. 8.2 details the general layout out of the Ortner homepage.

The focus group found this site unappealing. Disparaging comments were made from the moment the page appeared:

P3: "...that banner [main header graphic] is the first thing you see and it's so big, it looks really tacky..."

P5: "...it just gets in the way. What I want to see when the page opens, er, and after such a long wait...is, um, information. Y'know, like my next click, where's that going to be?"

P1: "Maybe. [pause] But at least you know you've got the right page."

P5: "Or the wrong one." [laughter]

P3: "...and that box that pops up [referring to a JavaScript alert box that displays joining information] really annoys me. I had to keep clicking it away."

The above indicated that the group did not like to scroll past large graphics that do no more than announce a page or click past superfluous browser 'tricks'. Other comments centred on other elements of the page layout.

P2: "The page is really clogged with text, there doesn't seem to be much of an attempt to organise it. You're eye is not led to anything in particular."

P1: "When I'm browsing at work that last thing I want to do is waste my lunch hour scanning more text, I want to be spoon-fed with the information I'm going to be interested in."

MOD: "Can you explain that a bit more for me please?"

P1: "Like the BBC site. It's obvious where the news is, where the links are, where the in depth articles are. There's organisation on the BBC site and there isn't really anything here that comes close."

P2: "Come on, you're not comparing like with like here! The BBC has thousands of bits of um, information on it, you could read this whole site in like, a couple of lunch-hours."

P1: *"But I wouldn't want to. I'm put off because it looks lazy. [pause] Having said that, If I was a member I'd look at it anyway."*

P2: *"So there's not much of a need for them to bother then!"*

Observing the usage of the site the focus group took little time in finding the required information [Appendix 8.1] and having explored more seemed to warm to the overall detail of the site.

P5: *"I have to say it's pretty ugly but I'm not put-off because, and this is what I s'pose I look for, the site's well, erm quite full with stuff isn't it?"*

P2: *"...yeah, I guess. There's not much on here that you wouldn't want on our site."*

P4: *"...but better designed."*

MOD: *"Better?"*

P4: *"It needs thought, a bit of thought and you've got a reasonable attempt."*

Additional observations that were recorded were that every single member of the focus group maximised their browser window when looking at this site. Focus group members also clicked one link away from the homepage and spent a brief time on the resulting pages before clicking the back button to try a new section. One participant explained why she was doing this:

P4: *"I like these links, they're descriptive, not cryptic like you find on other sites. It kinda makes you want to look at the pages because you have a taste of what's on it. [pause] Nothing looks like a dead end."*

Users were enthusiastic about the range of options available on the site, from finding out what famous oarsmen have rowed for RUBC, to buying kit, a caption competition, the latest news from RUBC and the invitingly titled 'Ortner Challenge Day'. As one participant summarised:

P5: *"They're a big club, they've got a lot going on and most of it is documented online."*

One user commented that the page footer, 'This site is always being updated', was a mistake as the date that followed was nearly a month behind. All users did agree though that the general tone of the page was quite humorous and they even suggested that this would gloss over the poor design.

Bacon

Bacon is the alumni club for the University of Nottingham Boat Club (UNBC). This page is built using frames and is the only competitor site being tested to do so. The site is presented in two frames, the left column provides the navigation (a simple list of five sections in text form beneath the University's logo) and the background is a distinct sandy colour [Appendix 8.2]. The right frame serves-up content and the initial page is presented on a white background, providing a distinction with the navigation

frame. There is no border to the frameset and the navigation frame is set to appear the same width regardless of window size or display resolution.

The focus group greeted this site positively. Remarking on the apparent simplicity of the design, one participant described it as a "no nonsense" site. The information we selected for them to discover was found quickly and with no errors by all participants.

The comments they began to make appeared to raise some doubt in their minds after a brief time exploring the site on their own.

P1: *"This is a resource for club members and no-one else. There's precious little on here to interest anyone not rowing for Bacon."*

P3: *"True."*

P5: *"Still, what's there isn't that useful to them either is it?"*

MOD: *"Why not, what's missing?"*

P5: *"Race results for a start, they're a really good club, I mean they win plenty of races, a real force in rowing. There's no mention of that on here."*

P1: *"Yeah, I clicked on 'Glory Days' to find out about their wins and it was all about Nottingham Uni. Boat club, old stuff, no mention of their HORR [major Thames rowing race] performance."*

This discussion continued for some time. We attempted to discover what would make this site a better resource for people interested in the club.

P3: *"I reckon that the odd page about them having fun off the water might help, it's a bit dry."*

P1: *"There's the odd bit of stuff in 'Newsletters' but that's not exactly the place you'd expect to find it. ...Though that picture [points to picture of a BBQ at Henley Royal Regatta] suggests you might find some stuff there."*

P3: *"That actually annoys me. You think that the site's only got what's listed on the left [the navigation frame] but then you click to the pages and there's these fiddly bits immersed in the text. It doesn't exactly stand out, content-wise."*

Aside from the diluted content, participants also began to question the colour scheme:

P2: *"This isn't as slick as the Bentham site. It looks like it took two minutes to set-up."*

P3: *"yeah, you're right ... I hate it when sites use those backgrounds [referring to textured backdrops on a couple of pages]. They just look daft."*

P2: *"...and make the text..."*

P3: *"...yeah, the text difficult to see."*

P2: *"It's not consistent."*

P3: *"Which it could so easily be. Perhaps more than one person's fiddled with it over the years!"*

One participant noticed that the site used frames and said that he would not be able to bookmark it properly. Half of the participants maximised their browser windows, all doing so after clicking on a

page with graphics on. The 'back' button was less extensively used with many of the participants using the left navigation frame to go directly to their next point of call. However, one participant did comment that:

P3: *"Those arrows next to the text [points to arrow graphic to the left of navigation frame links] make you think that there's another list inside that page."*

MOD: *"Can you explain what you mean."*

P3: *"...erm, well, y'know, like a menu bar on Word or something. The arrow says that there's another menu."*

The comments had shown that aesthetic design impressed users (Bentham) as did broad content (Ortner) but that all three showed serious flaws in organisation. Though apparently not enough to way-lay users in the process of discovering information. We were able to determine, even before the questionnaire, that users wanted a sleek, aesthetic, consistent design. They wanted plenty of varied content, useful features to ensure longevity and links that were descriptive, concise and unambiguous. What they did not want to see were textured backgrounds, large blocks of text, disjointed graphics and slow page loading.

From these comments, and encouraged with the breadth of discussion that had been raised, the next stage of the UCD process was the issuing of the questionnaire. The aim of this was to focus the opinions into more quantifiable data and go some way to establishing the categorisation, hierarchy, features and dynamics of the forthcoming 'Old Blades' site. The following section details *the process that led to the formulation of the questions*. Results from the questionnaire survey itself are presented later.

4.1.1.2 Establishing the Initial Questionnaire

It is crucial to establish what data you are trying to harvest from your participants before building questionnaires. The aim of this study has been to obtain information regarding the users' experience and expectations of the web. Many usability assessors have produced versions of assessment guidelines and much of this material is similar [Scapin et al., 2000]. It is beyond the scope of this study to establish a definitive usability scale and user-experience analysis but it remains an important element of the user-centred design process. So that the focus group material was quantifiable in the core categories for the users' web experience, items were developed that would provide information regarding the following principal scales.

Section One: Usability - explicit.

An amalgamation of the work of the Bunnyfoot heuristics (themselves based upon Nielsen [1994 and 2000a]) and that of Fuccella & Pizzolato [1999c] and Blom & Monk's work on web credibility, (Blom & Monk, 2001) produced items (questions) that referred to specifically-identified areas of concern for web-usability. We questioned whether the specific problem/feature was present in the sites that had viewed and whether the feature was considered personally important to the participant's experience of the web. Thus the item was presented in two parts, the first a simple true or false, and the second a five-value Likert scaled [Preece et al, 1994] answer to the question: *"Please indicate how important this [web design feature] is to you in terms of your interpretation of a usable website?"* Possible values were permitted from *"very useful"* to *"very detrimental"*. Nineteen items were developed, a sample of which requested response as to whether the site was just as usable after the size of the window was altered, whether the back button worked on individual browsers and, whether all the textual links were meaningful and accurately described the information to which they were linked. A complete list of these items is available in the appendix [Appendix 8.3]

Section Two: Expectations - general.

An appropriate method which allowed participants to think broadly and laterally concerning the type of alumni rowing site they would like to use, would encourage them to think generally about their expectations of the site. Therefore, in the second section we offered two open questions. The first encouraged a few thoughts regarding the content and functionality of the websites such as: *"What content or functionality is needed for a website to be useful to you?"* In order to clarify our request, we demanded that the user considered the content that they actively sought on the website they regularly use.

The second question was designed to clarify the features and design elements of the user-centred site. Consequently, users were asked to record which tasks they would like to be able to perform with the 'old-blades' website which would make the site usable and useful. This would encourage answers that were both productive to for the designer harvesting users' web-design preferences, but were also ambiguous enough to ensure that participants' answers cover a broad range of topics. As a catalyst for their thoughts but without too much bias we added direction which encouraged users to consider the tasks that they could perform on similar web-sites.

Section Three: Categorisation - Explicit

Card sorting has been used for some time in interface design [Preece et al., 1994] and has recently been applied to web page design [Fuccella & Pizzolato, 1999c] as a method for establishing the categorisation of the site. It is of paramount importance as it affects the very structure of the site, often down to the file-store level.

The method we employed was to highlight categories already found on the three competitor sites and ask the participants to rate them according to their importance on a scale of 1-10. The categories were separated between content and tasks. For example, the content options included:

- Latest News
- Social Events
- Old Photographs of UYBC [the university rowing team].

Conversely, the task options included:

- Search facility for the site
- Order club merchandise online
- Sign-Up for membership

A complete list is available in the appendix [Appendix 8.3]

Participants were also able to specify any sections that were not mentioned in our categories but that they thought would be useful and which also needed to be rated.

Section Four: The catch-all.

The final section of the initial questionnaire was designed to capture the user's further thoughts raised by the process had raised. We posed the following invitation for users to complete:

"...anything you particularly like or dislike when using websites. Think of sites that you regularly use that stand out for good design, and of those sites that you can't stand using or could be designed that little bit better to get more out of them..."

4.1.1.3 Results from the Initial Questionnaire

Section One

Table 4.1 *Responses to the Section One of the Initial Web-Usability Questionnaire, Mean Scores and Rank.*

[Scoring: Very Useful = 5, Quite Useful = 4, No effect = 3, Quite Detrimental = 2, Very Detrimental = 1]

Question	Mean	Rank
The site uses frames for layout (e.g. navigation bar and main page).	5.0	1
The 'back' button works on your browser.	5.0	1
All textual links are meaningful and accurately describe the information they link to.	4.7	3
The location of the page being viewed is clear.	4.7	3
The site uses a domain name (web address) that is easy to spell & remember.	4.3	5
The navigation system is intuitive.	4.3	5
Pages load quickly.	4.3	5
There are no links on pages that link to the page itself, e.g. 'homepage' link on the homepage.	4.3	5
The pages are consistent in layout.	4.0	9
Links change colour when you've visited them.	4.0	9
page titles (the words in the title of the browser window) are meaningful and would be appropriate for bookmarks	4.0	9
A search facility exists.	4.0	9
Pictures have 'tool tips', i.e.. When you position the cursor over the picture, it describes it.	3.7	13
The background colour and text colours are similar and do not provide a good readable contrast.	3.7	13
The site has just as much visual impact when you alter the size of its window.	3.3	15
The site is just as usable when you alter the size of its window.	3.3	15
The text size is uncomfortable (either too small or too large).	3.3	15
The colours of links are consistent throughout the site.	3.0	18
Extra windows pop up.	2.7	19

Section Two

Table 4.2 *Responses to the Section Two of the Initial Web-Usability Questionnaire, requiring participants to specify content, functionality or tasks they would like to have included on the new site.*

	Participant 1	Participant 2	Participant 3	Participant 4	Participant 5
Function	None	News of current squads	Communicate with Old Blades	Message board	None
Content	All pages accessible from each other	Up to date info.	None	Contact point for Old Blades	None
		How I can be involved			
		What services it can offer			
		Links to other resources			

Section Three

Table 4.3 *Responses to the Section Three of the Initial Web-Usability Questionnaire, Requiring Users to Rate the Importance of Various Categories, Mean Ratings and Rank.*

Ratings ranged from 1-10 in terms of importance, 10 = very important.

Content	Mean	Rank
racing events	9.67	1
simple list of past members	9.67	1
what other Old Blades are doing now	9.33	3
latest news about the Old Blades club in general	9.00	4
social events	8.33	5
old photographs of uybc	8.33	5
merchandise for sale	8.33	5
Messages from the current club e.g. captains' reports, president and equipment officers reports.	8.33	5
fundraising ideas	7.33	9
past results	4.33	10
Tasks		
searchable directory of former members	9.00	1
search facility for the site	8.67	2
printable newsletter	8.67	2
browse photographs by 'thumbnails' (small pictures that when clicked reveal larger print)	8.33	4
sign-up for membership	6.33	5
order club merchandise online	5.67	6

Section Four

Table 4.4 *Additional Comments made regarding likes/dislikes the users find on the web on Section Four of the Initial Web-Usability Questionnaire.*

Dislikes	Likes
Large blocks of text Too many/Large pictures Pop-Up windows Text unreadable due to low contrast	Easy navigation Simple hierarchy Knowing your location Clear labelling of links

4.1.2 Stage Two: Prototyping (The Wire-Frame)

4.1.2.1 Categories and Structure

We began by listing all the items from sections two and three of the stage one questionnaire, leaving out any item scoring below 5 on section three (i.e. past results). These identified elements for site content and were written on cards; these cards were then sorted into semantically meaningful groups. We did not stipulate that items could only belong to one group. Once groupings had been established,

each member of the focus group was invited to describe by email. These descriptions became the group labels, identified as follows:

Group: *News about the club*

Contained: latest news, printable newsletter and a report from the president

Group: *Members of the club and the membership arrangements*

Contained: Ability to find a former crewmate, details of what they were currently doing and sign-up information

Group: *Information about the racing and social events, opportunities to meet up.*

Contained: all types of Old Blades' events, social and racing.

Group: *Contact information, how to get in touch*

Contained: various methods of getting in touch with the Old Blades

Group: *Archive material, bits we want to see again*

Contained: photos of uybc and a few articles about life at uybc

Group: *Fundraising contributions and opportunities to give money back to the club*

Contained: Information on Gift-aid donation scheme and opportunity to buy the latest uybc kit.

Through qualitative evaluation of these results, site categories and labels were simplified in the following manner:

Table 4.5 *Simplified categories for the User-Centred site developed after card sorting*

News	Membership	Meet-Up	Archive	Contact	Contribute
Latest	Find a crewmate	Forthcoming Events	Photographs	Email addresses	Gift-Aid support uybc
Newsletter	Where are they now?	Previous Events	Memories of uybc		Buy uybc gear
President's Report	Sign-up for Old Blades				

In order to maintain the semantic grouping whilst simultaneously simplifying the results, where possible we chose single descriptive words for the categories. Where the expected content was not

apparent from just one verb or noun, we developed short phrases based on the words used by the participants. At this stage we were cognisant of the comments made at the focus group regarding the preferences for unambiguous, descriptive yet concise link titles. Areas of the site where interactive tasks can be performed such as searching for a crewmember were given verb-based descriptions to indicate their more active content, like 'find a crewmate'. We considered it more encouraging to use words that would actively stimulate the site-user, for example 'meet-up' was preferred to 'meetings'. The former suggests dull administrative meetings, the latter hints at old friends informally meeting-up with each other.

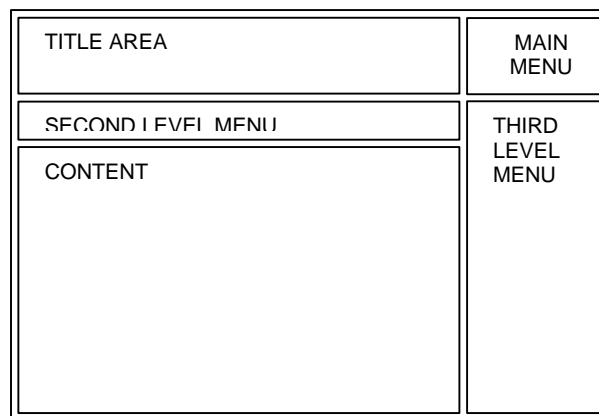
The final hierarchy permits future expandability by covering a broad semantic base. The archives for example could easily be expanded to include video footage of races or details about boats and equipment. Likewise, any further methods for fundraising could be added to the contribute section. A more detailed search mechanism could be integrated into the 'find a crewmate' page with little difficulty, indicating that the structure has plenty of room for expansion.

During the focus group session several users had expressed interest in sections on the competitor sites that they considered should be included in a future design. Of these, the exception which did not appear in the questionnaire responses was the 'Ergo Ladder' as featured on the Ortnor site. Given that this feature is implemented on the main University of York Boat Club's website it was felt that it would remain absent from the wire-frame. This would clearly provide the opportunity to add this functionality if it were to be raised in the responses from the Stage Three questionnaire.

4.1.2.2 Layout

Based on the lack of disdain for frames shown in the participants' comments (frames were considered 'Very Useful' in the initial questionnaire), a provisional static-display sectioned the site into areas for navigation and content. It was felt that a simple framed design would host a menu to cope with the principal five categories and remain constant, whilst a section-specific menu would dynamically appear to provide the lower-level hierarchy. Should there be any page-specific links these could be built into the overall design by occupying a reserved column on the right of the content page. Figure 4.4 shows the static display diagram at this initial phase.

Figure 4.4 *Initial Wire-Frame Layout of the User-Centred Site, showing delimited areas of page content.*



The design was arranged to ensure that progress within categories was as quick as possible. Once inside a category on a website, our observations of usage suggested that users navigate inside that level of hierarchy, exhausting the options, before moving to the next category e.g. If viewing the latest news (identified as the primary item for the site's audience) users would be likely to navigate to the 'president's report' or the 'newsletter' as opposed to exiting the category to get to 'memories' or another second level item outside of the news category. Our users appeared to navigate around semantically similar pages before moving elsewhere and had expressed a preference for sites that worked from a central, static, navigation area.

Direct links across categories may disorientate the user and it was felt that a degree of simple orientation would be required at every level in the hierarchy. Given that navigation is dependent on possessing the knowledge of where you are, where you are going and where you have come from, it was important to signal where the user was at each stage of the navigation process. This was achieved by colouring the link in the *main menu* frame that corresponded to the category the user was viewing in a different colour to those corresponding with alternative categories. The text in the *title area* also changed at this time to indicate the category being viewed. Likewise, any link that appeared in the *second level* menu and corresponded to the page being viewed was deactivated and coloured differently. Consequently, we aimed to construct a site with the minimal number of self-referential links - an important issue raised by our focus group:

P1: "One thing I can't stand is getting trapped in a circle on a website ... y'know where you click a link and it just takes you back to the page you're viewing again..."

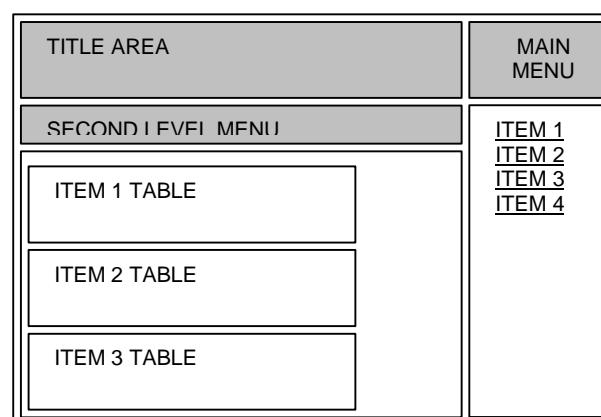
P5: "yeah yeah, I know what y'mean"

P1: "...Especially when the link is labelled weirdly and seems to bear no resemblance to the page you're reading anyway".

To be able to construct the site in this manner and reduce the amount of JavaScript we embarked on the creation of a series of framesets, all of which would follow the main template shown in figure 4.4 and would produce meaningful URLs in the location bar in the browser. By organising the underlying file-structure of the site we allowed each section to have a bookmarkable URL - often a problem in frame design. The re-cycling of the initial template allowed a working model of the site to be produced in a matter of hours.

Difficulties arose in the formatting of section content pages. Consistency and textual clarity was trumpeted in the focus group as being an important consideration in website design and with this in mind we produced similar readable layouts for as many pages as possible. Where there were multiple items listed in chronological order on a page (e.g. 'latest news', 'forthcoming' and 'past events', 'memories of uybc', and 'where are they now?') we placed these items in delimited tables. (Fig. 4.5) The page contained all the items including (the often-forgotten technique of) within-page bookmarking in order to provide quick access. In this way, users were able to select news items with speed as the entire page was already loaded and contained no graphics.

Figure 4.5: Organisation of page content for several pages in the User-Centred site. Items in the content frame are accessed by links (underlined) in the third-level menu in the right-hand frame.



The other pages presented the content in text form in the *content* frame and attached additional links to the *third level menu* frame. The 'Photos' page, the 'Archive' section and the 'Find a Crewmate' page in the 'Members' section required this method to be slightly modified.

The 'Photos' page was arranged so that the third-level menu frame could hold either thumbnail images or simple text-descriptions of the photos. A simple click could switch between the two options providing functionality and speed of navigation for both fast and slow connections to the Internet.

Choosing a photo from this frame would present it in the content frame. Further to suggestions made in the questionnaire in stage one, we added information regarding the file size of the image so that users would be able to decide whether to spend the time downloading it or not.

The 'Find a Crewmate' section was designed to provide a fast search for members on a website without database functionality. By this it is meant that we were unable to write a program to search a database of members and present this information, instead we had to develop a crude but effective solution in HTML. The solution was to provide a two stage (two-click) process to the search. First, users would select the initial of their crewmate's surname in the *third-level menu* frame. This would then lead that frame to display the christian names available for the chosen surname. Selecting the appropriate christian name would present the member's details in the *content* frame. At the christian name display, the option to return directly to the surname search was included if the user had made an error or wished to search again.

The other interactive elements of the site were the forms. Forms needed to be developed to allow users to buy kit, sign-up to the membership list or send information to the club. These forms were designed to be short and descriptive. The form was announced with a descriptive title including 'want to let us know what you've been up to?' and sections for completion were given clear descriptions such as 'your text for submission'. On the kit-purchase page we presented a bookmark link to each available item of kit in the *third level menu* frame. Clicking here would display an image and description of the item for sale. The form for this page did not include JavaScript validation at the prototype stage but this would be a simple addition in later development.

4.1.2.3 General design features.

The site was developed to fit into a browser window 600 pixels wide. It was also centred within the window to ensure that it appeared with less white space in windows of a larger dimension. The content was arranged to be top-aligned in the *content* frame to ensure that the need to scroll was minimised. Serving-up internal page bookmarks in the *third level menu frame* was intended to reduce the number of individual page requests and thus ensure the site loaded quickly. Each category included a preliminary page in the *content* frame before the user had selected any link in the *second level menu*. This was to provide a general description of the category to which they had navigated to and allowed them to make an informed choice about their next navigational step, acting like a pre-emptive 'help' screen.

4.1.3 Stage Three: The Iteration

4.1.3.1 Survey Design

The follow-up survey was designed to capture the users' feelings regarding the prototype site as produced for stage two of the UCD site. The idea was to use established usability heuristics to pinpoint areas where the site was succeeding or failing (and subsequently could be improved upon in the stage four completion). Consequently, we highlighted the areas of 'Navigation', 'Layout', 'Content' and 'Emotions' for participant's attention. The questions were open-ended to encourage an unconstrained fluidity of response for each category. Direction was suggested for each category but leading questions were avoided or balanced where possible. For example, for 'navigation' the following clarification was added:

"Do you feel that movement around the site is natural and intuitive? Did you feel that areas of the site were obviously sign-posted, links labelled clearly? Were any areas of the site organised in a confusing manner? Did you ever feel lost, un-informed or unable to backtrack? Did your path through the site feel logical?"

The final element of the follow-up survey was presented to establish any final technical changes that users would like added or removed in the eventual design. This was dealt with by establishing the following item:

"Through your experience of web browsing you may be aware of other issues in website use that this site may excel or fail on. Please list any items not mentioned [in previous questions] that affected your experience, you may wish to consider the following questions... Did pages load quickly? Was there any need to re-size of windows, frames or fonts? Was there adequate support for 'bookmarking', printing and so on? Did the site appear the same on all your browsers? Were pages titled adequately? Is any of this a problem?"

4.1.3.2 Survey Results

Navigation

Participants' comments focussed on the rigidity of the navigation system. As one participant stated:

P3: *"...it's sometimes hard to find a link to a page you know to exist on the site in another section without going through the menus. I'd like to be able to follow a link from a news item about the next dinner to an area in the events pages that provides full details without having to click meet-up and then forthcoming events."*

Although this functionality had been accounted for in the prototype design at stage two, an example of it was not placed into the prototype to demonstrate.

The other issue that was raised in the navigation section was the absence of links returning to the homepage. More than one user commented that they had tried to click the *title area* to get back to the beginning. Despite this issue being raised in the focus group, an oversight during the creation of the prototype meant it was missed out.

Content

The majority of the content met user's expectations. There were only a few additions to content suggested: A direct link to the latest results from UYBC was suggested by *all* participants though this feature was not ranked highly in the stage one questionnaire. Two participants suggested this should go in the 'news' category.

One participant suggested that the facility to submit content for relevant pages (e.g. organising an event or information about former members) should be added to each page where such a feature would be useful.

Pictures of kit items, both front and rear were suggested for the Purchase Page.

Layout

Two participants commented on the size of the text used for the menus, one stating that it looked "*too large and cumbersome*", another suggesting "*some kind of roll-over or button effect*". The reason for the modification was mooted as being "*necessary for the actual content of the pages to stand out and occupy more room*".

Emotions

Movement around the site was described as "*natural*" and that the speed of the pages made the site feel "*really efficient, I wasted no time at all finding things*". Another participant commented that the site

had a "*human feel to it. There are plenty of sections that appeal to the sentimental alumni amongst us, encouraging us to meet up and reminisce about the old times*".

4.1.4 Stage Four: The Completion

The completion of the user-centred site involved two processes. Process one was to add the features and modifications suggested at stage three and process two was to add the site's visual identity.

A link was added to the *main menu* that would link back to the homepage. The width of the *main menu* was reduced, expanding the width of the *title area*. This also influenced the *third level menu* and *content* areas of the site, contracting the former and widening the latter, allowing more width to the main content pages. The consistency of *third level menu* layout was improved. Each section that had the structure detailed in Figure 4.5 now had identical layout.

The specific requirement to have a direct link for UYBC results was added. This linked to the main UYBC results service providing details of past and current racing results. This added content was originally dropped at the card sort (stage two) due to the low score on the questionnaire. Thus its most suitable position was in the 'news' section and the link was added to the *second level menu*.

Additionally each page that relied on user-contributions such as the 'Memories' page included a link to allow users to contact the Old Blades to submit new items. The presence of a page that detailed the whereabouts of former members deemed that a further page focussing on the notable former members was unnecessary.

Visual identity continued on the scheme as determined by the Old Blades established colours. To improve consistency between this site and the University Club the same font was used for the logo. A low file-size image was created for the *title area* background and rollover images were developed for the *main menu*. These were the only visual identity items added to the site globally; individual pages would have graphics arranged in the appropriate areas. The kit purchase page was provided with images of each item of clothing that showed the rear design when the mouse was clicked or rolled-over it.

The final amendments involved the creation of a non-frames text version of the site. From the initial homepage a no-frames option was available in the <NOFRAMES> HTML tag. This ensured that any

non-frames capable browser would be able to view the site effectively. The vast majority of content on the site was made available through this route.

4.2 Dynamic Designed Site

4.2.1 Categories and Structure

A half-hour brainstorming session established a list of ten items that could be included in the site to meet the given brief. Items were considered that would provide some measure of interactivity (e.g. viewing photographs, buying kit) and that would provide useful information (e.g. contact addresses, latest news, forthcoming socials).

The structure of the dynamic site was determined by the desire for the site to work from four simple coloured buttons (see Layout, below). Four sections provided the top level of the hierarchy with various sections expanded from these nodes. It was envisaged that further second-level nodes could be added at any time within this framework should they be required by the specific page content. From each of the four top-level nodes users would be able to reach a common 'contact' section which itself consisted of two sections. The structure was established as follows:

Table 4.6 *Hierarchy for the Dynamic Designed Site; Top level categories and their second-level nodes.*

Gossip	Social	Benefit	Memories	Contact
Old Blades News	Future	Gift-Aid Info.	Photos	Post letter
Uybc News	Past	New uybc Kit	Stories	Send email
	Join the Old Blades			

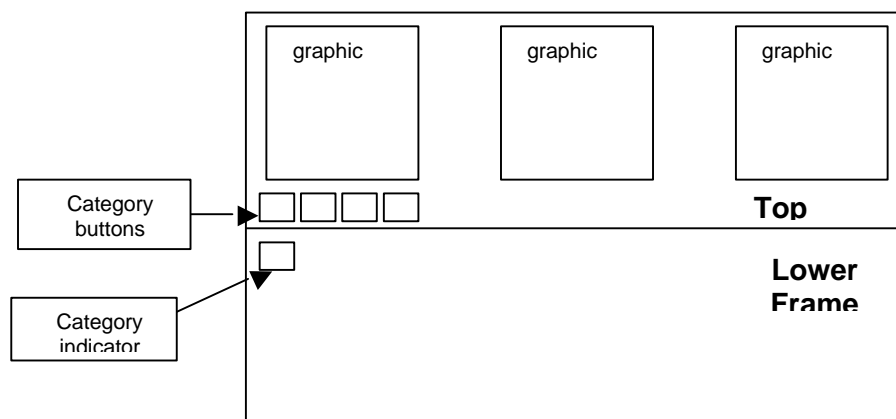
Category labelling was not given any thought other than that which was first suggested in the brainstorming session.

4.2.2 Layout

Layout was considered before the categories had been established. A contemporary design was sketched on paper that would stand out from the competitor sites and would work from a non-intuitive explorative interface of coloured buttons.

Each top-level category was colour-coded a different shade of blue. As users navigated the site the colour used in each section would alert them to which part of the site they were viewing. The site was divided into two frames split horizontally (see Fig. 4.6). The top frame contained three watermark-style graphics which were all visible on the home page but which appeared and disappeared according to the user's chosen category. It also contained the four category navigation buttons. Categories were selected in the first place by choosing one of four coloured squares in the top frame - the category buttons - these were not labelled. As a category was selected, one of the top-frame images would disappear and be replaced with the colour-coded menu for that category containing the second-level nodes as items. Clicking one of these menu items would serve the content into the lower frame.

Figure 4.6 *Screen Layout for the Dynamic Designed Site Showing Frame Split and Navigation Controls. Homepage View.*



All individual pages displayed in the lower frame had the same header format. The page was headed with the appropriate coloured category indicator followed by the category name. Below this the content was laid out according to requirements, for example the 'stories' page was a text-based list of items whereas the 'photos' page was a selection of thumbnail images and the future social events were presented as a collection of tabulated items.

There were three additional items common to every category menu. These allowed the user to either return to the homepage, go directly to the contact page or to hide the screen by replacing the site with a blank page¹.

¹ A feature common to many early network games where the errant employee may conceal what they are doing should their employer become suspicious of their non-work related activity. This feature is appearing on many websites as employees begin to surf the web during office hours.

The overall design of the site was minimalist. There was a substantial amount of white space and a contemporary look and feel to the layout with low contrast grey text on white backgrounds and subtle blue shades to provide occasional emphasis.

4.2.3 Features

Below each category menu and on the homepage a custom-written JavaScript detected the age of the document being viewed in the lower frame and built a graphic to tell the user how 'fresh' the page was. This was dynamically updated every time the user clicked a link.

A second feature developed for the site was a pop-up news item JavaScript. By selecting a news item from the gossip pages a JavaScript rendered a table [References 7.2 overLIB] to present the chosen item in the frame.

As stated above, the site was entirely navigable through the four coloured buttons in the top frame. The users were not instructed at any point to select these buttons, giving the site an explorative feel. This non-intuitive menu system is common to many entertainment-orientated sites where the user is encouraged to explore and 'work' for the information they are looking for.

4.2.4 Content

The site was provided with content specific to the structure defined above. The 'Gossip' pages presented both news specific to alumni members and news of the main university club. The 'Social' page provided details about past events, future events and the opportunity to sign-up to the club. The 'Benefit' section allowed members to view details about the gift-aid fundraising scheme and provided a simple mechanism to view and order items of boat club merchandise by email. The 'Memories' section allowed users to view old photographs or read members' recollections of life in the university team. Finally, the 'Contact' facility allowed Old Blades to either send an email or use the postal address information to send a letter.

4.3 Cross Comparison

4.3.1 Nielsen's Heuristics

Using a five point scale of magnitude where 0 indicates a complete meeting of requirements and 4 indicates a critical failing of the requirement [Nielsen,1994], the sites were evaluated against Nielsen's 10 usability heuristics [Nielsen, 2000a]. Listed below in table 4.6 are the *average score for each usability* heuristic with the number of errors, or elements, on which the site failed.

Table 4.7 *Number of occurrences and magnitude of failures relating to 10 usability heuristics, listed for both site designs.*

Evaluated heuristic	User-Centred Site		Dynamic Designed Site	
	Occurrences	Magnitude	Occurrences	Magnitude
Visibility of system status	1	0.5	3	2
Match Between System & Real World	0	0	4	3
User control & freedom	2	1	3	3
Consistency and standards	3	2	3	3.5
Error prevention	1	1	2	3.5
Recognition rather than recall	2	1	3	3
Flexibility & efficiency of Use	0	0	2	3
Aesthetic & minimalist design	0	0	1	1.5
Recognition, diagnosis & recovery from error	0	0	1	3.5
Help & documentation	2	0.75	1	3.25
TOTAL	11	6.25	23	29.25
AVERAGE	1.1	0.63	2.3	2.93

4.3.2 Bunnyfoot Guidelines

Of the 30 items on the Bunnyfoot [References 7.2] checklist, 27 were relevant to the user-centred site and 25 to the dynamic designed site. The user-centred site was 85.19% in concordance with the checklist on relevant items. The dynamic designed site was 28% in concordance.

4.3.3 LIFT

As stated in the Methods section, the two sites were fed into the LIFT usability measurement program online.[References 7.2].

Table 4.8 *Summary Results from LIFT evaluation of the UCD Site. Five = Most severe, one = Least severe.*

UCD, LIFT evaluation	
Average Severity of Usability Problems Found	2.22
Average Usability Problems Found per page	8.57
Number of pages surveyed	111

Table 4.9 *Summary Results from LIFT evaluation of the Dynamic Design Site. Five = Most severe, one = Least severe.*

Dynamic Design, LIFT evaluation	
Average Severity of Usability Problems Found	2.25
Average Usability Problems Found per page	6.43
Number of pages surveyed	22

By way of a comparison, we present LIFT's usability results for BBC News and Yahoo.com [References 7.2]

BBC News has an average severity of 2.69 per problem found, whilst Yahoo has an average severity of 2.36 per problem found.

5. Discussion and Analysis

Previously, this study has focussed on the details of what occurred from conception to completion of both sites. To this point we have not considered the merits of what took place and whether they have anything to teach us with regards to many issues in usable web design. We will begin by analysing the user-centred process from focus group, through surveying, prototyping, iteration and completion. Following this there will be discussion of what exactly constitutes a usable website. Before we conclude the study with suggestions for the progression of research into web usability, limitations in the study's methodology will be explored.

5.1 Involving Users in Design

5.1.1 Focus Groups and Competitor Analysis

Focus groups have been touted as the key to effective user-centred web-design [Fuccella & Pizzolato, 1999c] and have formed the initial phase of the user-centred design process for this study. However, it is never wise to blindly assume that the method is without its problems and focus groups, for all their usefulness, encourage a rather limited view of the user's experience.

Social psychology, often neglected in other disciplines, has a vital role to play in the analysis of the worth of focus groups. Studies indicate that people are not always genuine in group situations [Brown, 2000], whether this means they contribute false information or they simply do not contribute at all the consequences for usability focus groups are obvious. Imagine that your focus group is composed of supposedly 'web aware' young people testing a new site with an innovative interface. After letting the users explore the site by themselves in their own time you might wish to ask them whether they reached a hidden 'VIP' area of the site, if the majority of the group had found it and one member of the group had not, chances are that user will say they did. Likewise, a user is unlikely to admit in front of a focus group and usability analyst that they did not know how to use a basic browser function, like manually entering a URL for example. Failing to disclose a problem with a site they are viewing or have experienced in the past will clearly limit the number of issues an exercise such as a focus group is attempting to raise.

Beyond peer pressure, even the most honest of users are not always good at explaining what they are doing or explaining erroneous behaviour [Reason, 1990] and this is due in some part to the problems of divided attention [Eysenck & Keane, 1995] but may also have its roots in the fallibility of human memory. Nielsen [2001d] astutely alerts us to the limitations of the user's recollections of their

behaviour and their over-rationalisation of web site problems. For example, in our focus group session, users commented on the failure of a particular site to organise the page properly, offering up the simple solution that it should be "better organised". This may well be the case but their over simplification of the problem offers us no insight as to what constitutes "better organisation". Nielsen also asserts that what users think they want on websites is not always what they would want in practice. Whilst a speculative suggestion of a web-based 3D Virtual Tour of the university's boat house was met with much approval during the focus group, the implementation of this on the site would require the user to spend time downloading plug-ins and the file itself and would no doubt lose its novelty appeal rather quickly. Likewise, the inclusion of a type-in search facility for past members sounded like a great idea to our focus group, yet such a design would require some intensive programming to produce a solution that would account for spelling errors. With the method we employed on the site [see *Results section 4.1.2.2*], the user relies on recognition as opposed to recall when searching, a much more cognitively reliable system [Eysenck & Keane, 1995] and therefore more usable.

The solution to the fallibility described above is to ensure that users are watched as well as audio-recorded during their competitor analysis. Ideally this would involve a combination of eye tracking and mouse tracking. It would be naïve to suggest that merely following the mouse-pointer is an indication of where the users eye is tracking. The speed of the human eye is such that whilst a user may be moving their pointer over one page element their eye focus is on a distinctly separate area. Taking data from this type of low-level analysis would indicate which areas of the website are really getting the users' attention, not those they perceive to be affecting them. The benefits of close observation must be considered in the light of the Hawthorne effect such as described by Preece et al. [Preece et al., 1994] where participants under observation did not behave in a 'natural' manner. Monk et al. [1993] alert usability evaluators to the potential problems of an empirical approach where the conditions do not either mirror the real world nor adequately control all of the variables of human behaviour. Focus groups evidently strike some sort of happy medium and their results should be considered in this light.

This is, of course, not to say that users are to be disbelieved entirely. The fluidity of participants' responses garnered in our limited study was an encouraging to say the least. Despite being given rather shallow competitor sites to consider, they were able to raise numerous usability issues. Quite how many usability issues can be raised by such small populations is the subject of recent debate between Spool [2001] and Nielsen [2000c]. Nielsen, working from earlier studies of non-web interface design, established that five users would capture 85% of usability errors. However, as Spool illustrates, these earlier studies' results are anachronistic and in the new information-architecture of

the web with "millions of pages of complex data where users have to make many personal choices" it may be time for a significant revision of the idea that five users is enough. This is not without contention, Spool's testing methodology was specifically designed to "accentuate problems that arise in the purchase process", and as such would not be a true reflection of the day-to-day usage. Web-site users are not on a mission to break the system. Our results indicated similar results to Nielsen, of the errors located in the heuristic evaluation [see Results, section 4.3.1] 54.5% were located by the first three users. These results must be considered in the context that evaluators were working from heuristic guidelines and were therefore pre-disposed to be searching for errors.

What we often found frustrating in the focus group session was that users seemed somewhat naïve about the web. Observations would occasionally see participants lingering over problems with the site design that, as more analytical web-users, we may have considered a minor obstacle to our progress. For example one user, P4, as described above [see Results section 4.1.1.1] clicked 'Home' to search for an email address despite the presence of a 'How to Contact' button. It would be wrong to assume that this is the fault of the user. As described in the methods above, the participants in the focus group were all graduates with an awareness of the web and a clear willingness to participate in a study of this kind. The problem is thus not with the user, but with the design. Nielsen [2001b] observed similar behaviour by website users and is wise to point out that designers should not expect users to continue to tolerate their design if it is confusing or complex. However, Nielsen is discussing this problem from the perspective of the e-commerce industry where competition is of paramount importance and often a better solution exists on a competitor site just one click away. As this study shows, where the option does not exist - there are not competing sites for your club - users will tolerate bad design. Discussing Ortnor boat club's site, participants had this to say:

P2: *".... you could read this whole site in like, a couple of lunch-hours."*

P1: *"But I wouldn't want to. I'm put off because it looks lazy. [pause] Having said that, If I was a member I'd look at it anyway."*

P2: *"So there's not much of a need for them to bother then!"*

In conflict to Nielsen's belief, it appears users *do* "...have the desire [or] the time to learn the idiosyncrasies of individual websites" [2001b] where no competitor option exists.

This underestimation of sites' potential audiences extends to the very type of site they are attempting to view. Nielsen fails to consider that users may approach sites with differing expectations. The user of a site such as BBC News would not perhaps be willing to untangle a complicated interface in order to read the presented news items, they are likely to be there to read the news, gain information quickly and accurately and if they cannot do this they can be catered for elsewhere. By contrast we might

suggest a bored teenager might be visiting web sites for the express purpose of being entertained. As such this teenager may well see a non-intuitive interface as an exploratory challenge, he or she may be willing to spend time figuring out which navigational item leads to which destination in the pursuit of cerebral entertainment. Indeed, sites such as Nike [References 7.2] regularly undergo complete interface overhauls presumably in order to keep their customers 'on their toes', make the site appear fresh, challenging and entertaining to experience. Users should not be pigeonholed into categories that assume they all behave in the same manner online. Consequently a thorough analysis of the browsing style and tolerance and 'user experience' requirements needs to be assessed at the focus group stage. A clear example of this with relevance to our study can be seen in the following extract from one of comments we received following the completion of the dynamic site.

"I spent a minute looking at the screen thinking 'what now?' when it first loaded, once I got the idea that the coloured buttons did everything I was pleasantly surprised to consider that someone had thought to make the site more than just a list of pages"

It is worth noting however that such an effect is unlikely to persist. Once the site has been viewed, the non-intuitive navigation ceases to be a challenge, once learnt, the system still has to be used on subsequent visits and if it is not particularly usable then these subsequent visits may well become few and far between.

5.1.2 Surveying, The Questionnaires

The principal aim of the surveys employed in this study was to obtain quantitative and organised data regarding the participants' experiences and expectations of current web design. Using a combination of survey design ideas, the questionnaires were expected to harvest users' awareness of web design features and potential usability problems. However, Section one was in hindsight, a badly constructed approach. Whilst the questions were formed of usability checklist items [Bunnyfoot (References 7.2)] they were presented in a manner that may well have confused our participants. Most of the questions were to receive a 'True' response followed by a variety of responses. For example, the question: "the site is just as usable when you alter the size of its window?" was easily answered in the first part (a simple true or false), however, the second part, "Please indicate how important this is to you in terms of your interpretation of a usable website" proved difficult for participants to agree upon. Participants appeared to interpret the answers in one of the following two ways, either "having a site which is usable regardless of window size is a good thing, choose 'Very useful'" or "having a site which did not do this would be bad, choose 'Very Detrimental'". We interpret this behaviour to be akin to the "glass half full or half empty" analogy, depending on the respondents' optimism or pessimism they focus on either the feature's presence or it's potential absence. Such confusion is clearly not desirable and

further consideration would need to be made regarding the wording of the survey items and instructions.

Beyond section one of the initial survey, we received a large body of opinions regarding the content and tasks for the expected site. Coming on the back of the focus group session and the initial survey questions, the participants would hopefully be in the right frame of mind for considering the features they would like to see on the site. Such explicit requests for participant's thoughts on this issue were approached with caution considering the advice discussed above concerning the occasional disparity between what users *think* they want and what they would actually *use*. Our aim however, was not to stifle these responses and the fluidity of responses, combined with users' reaction to our own suggestions in section three, produced a varied and ordered 'wish-list' from our focus group.

Fuccella and Pizzolato [1999c] adopt a more iterative approach to their surveying, returning multiple times to user-groups with updated assessments of their requirements for a new site. This approach is well ordered and ensures the site category structure is clearly defined from the viewpoint of the intended audience. It is our belief however that such a methodology is unnecessarily iterative. Following our obtaining the 'wish-list' from our users, a simple card-sort exercise established clear semantic groupings. A single email inviting users to comment on these groupings produced no amendment of them other than the category labelling. This procedure indicates that users have a well-defined mental representation of the site structure at an early stage. Providing that a solution is based upon these suggestions, further changes are unnecessary. The benefits of removing iterations are obvious in terms of the time spent during the development process. Whilst we conceded the results may not have the absolute clarity obtained by the multiple iterations suggested by Fuccella and Pizzolato, we contend that users would happily tolerate solutions that are a good approximation of their preferences.

Working from the supposition that users are more vocal about experiences they dislike than those they enjoy (good design is invisible, bad design is intolerable), the final section of our initial survey was intended to capture web design features that we should avoid at all costs. However, following the survey we managed to obtain an equal list of both good and bad. The dislikes of design appeared to concur with other studies [Flanders (References 7.2)] and acted as golden rules in the construction of the prototype. We are aware of one particular 'dislike' (contrast) mentioned that *was* a feature of the eventual solution and this will be discussed in a later section.

Survey two, which followed the completion of the prototype, was developed to determine the efficacy of our solution and to establish what amendments would be required before completion. The results of

this survey provided useful material to account for in the latter stages of the site's development. For example, the survey was able to highlight the absence of the homepage link from the menu system. This feature is considered crucial to the usability of websites and should have been included in the prototype but was omitted due to an oversight. Thankfully the second survey acted as a backup, directing the designers to the error.

Aside from the suggestions made regarding the homepage link, other comments focussed on the speed of direct navigation. Participants were keen to assert the value of links between categories being embedded in page content. For example, they were interested in the ability to select a person's name in a news article and have it link directly into that person's biographical entry in the 'find a crewmate' section. Such a facility had been accounted for in the design process but had not been demonstrated in the prototype. The advantage of the site as it had been constructed was that it treats every page as if it were the homepage. By this it is meant that anyone coming to the site via a search engine or external link could potentially reach any page, -it would be crucial to make the entire site reachable from any page for this reason. Consequently, location cues are presented on every page allowing users to orientate themselves.

Other material obtained in the second survey suggested the modification of the menu appearance. By moving to a graphical-based version of the menu we were able to reduce the area required for the navigation elements and provide the advanced effects of image rollovers, which afford a useful level of interaction feedback. Participants in the final questionnaire were able to affect the site in terms of content by requesting the addition of the results of the rowing team's recent races. This item had previously been identified in the earlier focus group and questionnaire, however its subsequent low rating meant that it was dropped from the final hierarchy. Clearly, when the site was viewed at prototype level, the absence of this information was felt to damage the site's usefulness and its worth increased in the eyes of the user - another indication that we should not consider the users initial comments to be entirely representative of fact.

At this second stage questionnaire it may be more effective to gain detailed data regarding the efficacy of the design by engaging in observation of target users using the site. The depth of data we received in the initial survey through the focus group and participants' use of competitor sites was not echoed in the second study and, considering its obvious value in the first stages of the site's development, was perhaps foolishly ignored. The greater variance possible in responses to the open-worded questions used in the second questionnaire did not aid us in the retrieval of quantifiable data regarding the efficacy of the prototype solution. Improvements to such a questionnaire would need to focus on user rating of design elements, content, functions and the 'look and feel' of the site rather than woolly

descriptions. However, it remains our opinion that the best solution at this stage of the design process would be to combine observations of prototype usage with quantifiable survey data. The argument that this study considered in the design of the user-centred site was that participants would not be as vocal about a prototype when discussing it with the people who had designed it. It is of course possible that we under-estimate participants' willingness to criticise, particularly in circumstances where such criticism could genuinely be perceived as constructive.

5.2 The User-Centred Solution

5.2.1 Design of the Prototype

Guidance on the creation of prototype sites is scarce to say the least. Whilst authors are keen to assert the value of such an approach, the methods to construct a design are lacking. IBM [Web Guidelines, References 7.2] and c|net [References 7.2] provide brief descriptions of the early mock-up phase based on user-input but the principal web-design best-sellers [Flemming, 1998, Nielsen 2000a, (source – Amazon)] pay lip service to the techniques for going beyond the blank canvas armed with a large amount of user-centred design data.

In order for us to begin making marks on this blank canvas we attempted to work from established layout stereotypes. Perhaps the most widely recognised layout on the web is that of the masthead supported by a navigation frame (or bar) [Farkas & Farkas, 1999]. This design idea appears to be borrowed to some extent from print media, though we acknowledge the comparison is tenuous [1999c]. The compliance with standards, whether official or industry acknowledged has to be of benefit to users. Consistency is a principal component of usable design and breaking user-expectations for the sake of radicalism is not advisable. Our design focussed on applying the standard with a variation that would allow users the same constant navigability they expect, with the advantage of utilising the previously un-used masthead section (referred to as the *title area* above). In doing so the content dominates the lower frame, when additional navigability is required the second level menu opens on the right-hand side of the screen, ensuring content remains the priority on the left side. By having the navigation appear to the right, if the browser window is too narrow for the entire site the content is still visible. To ensure that users viewing the site are aware that navigation is available on the right side, clear instruction is provided on every section. The page was presented at six hundred pixels wide, observations of the web currently suggest that the lowest common denominator with regards to screen size that should be accommodated for is six hundred and forty pixels width. Taking into account the width of scroll bars and browser 'decoration' we restricted our site to six hundred and made the site

appear in the central column of a three-frame layout. Having the other columns set proportionally wide meant that the site would appear centrally, bordered by white space on larger screen sizes.

Developing the prototype constricted us to the consideration of layout on a basic level. We allocated areas for content, areas for action and areas for visuals. At this early stage we were able to gain an effective look and feel for the site, swiftly organising pages to reduce the potential for usability problems such as excessive scrolling and separating areas for different node hierarchies [Farkas & Farkas, 1999]. By choosing a frame-based solution we were courting controversy in the area of usability [Nielsen, 2000, Bunnyfoot, IBM (References 7.2)] but our interpretation of frames *supports* usability. One of the principal failings of frame-based design is that it breaks browser history and favourites. Bookmaking pages or clicking the back button does not work in the expected manner. However, by ensuring all our framesets built into the top-level frame we made sure that each set of framed pages was treated as a whole page. Bookmaking in the user-centred site does, for the most part, reflect the page being viewed at the time. An important consideration when deciding to use a frame-base solution was our knowledge of the user-base. Of the people that responded to our original call for participants, the vast majority had new-generation browsers that deal with frames in an appropriate way. Historical problems such as printing and bookmarking are much improved and we were confident that our solution would meet with users' approval at the stage three iteration. A remaining problem of the frame-solution was that it requires multiple server-requests each time a set of pages is rendered by the browser. Re-cycling of files was used in the structure to attempt to increase the quantity of material the users' browser would cache to speed up the process. The simplicity of the navigation system and the parsimonious approach to HTML code would further support low download times. The final advantage of developing unique frame layouts was that it afforded us the ability to give each page a relevant title. When viewing the browser window minimised or when bookmarking, the page title would succinctly and accurately indicate the page content. In traditional frame designs the page title remains that given in the top-level frame and bears no relevance to the principal framed-page being viewed.

The alternative to frames when designers need to structure precise layout is the use of tables. There are several reasons for us not choosing to use tables in our design. Firstly, tables produce a large quantity of HTML code. In order to create a carefully delineated and structured layout, multiple tables would be required, the complexity of nested tables causes delays in browser rendering, Netscape Navigator (below version 6) for example takes a notoriously long period of time to draw complex tables. Combine this with download time, and you have an unacceptable delay in page presentation. Furthermore, applying consistent styles through tables with the use of CSS is fraught with difficulties. Netscape has a bewildering lack of standardisation in its implementation of CSS in tables.

Consequently the time taken to produce consistent cross-browser compatible CSS would increase development time. Additionally, it was expected that the eventual solution would be updateable by several members of the club, able to add news articles, member's reports and so on. Finding the relevant section amongst a confusing array of table HTML would make this more difficult. If one HTML tag is missed in a nested table arrangement it can produce a particularly complicated display problem that is difficult to pinpoint and resolve. By providing pages in defined folders and in simple HTML code the site becomes more open to general amendments that remain within the established (CSS-based) style consistency.

When designing the wire-frame we took one particular risk, we decided to employ the club's colour scheme from the outset. In doing so we were breaking with the original idea that the wire-frame should be devoid of any visual treatment. We felt, however, that part of the users' navigation experience of the site is based upon the recognition of page elements. With a plain text-based wire-frame it would have been more confusing in our opinion to simply have different areas of text on the screen, none of which would be demarcated in ways familiar to web users. Rarely on the web do we find pages that have navigation areas that are the same colour as the content page and are not distinguishable in any visual way. This preliminary visual treatment involved the use of the club's colour scheme as it was felt that this would be what the users would be expecting. In applying this colour scheme, we were cognisant of the slightly low contrast between foreground and background and were keen to ascertain users' response to this when they reviewed the design. As indicated in the results section above, whilst users indicated in the initial survey that low-contrast text/background combinations were a problem, they were not sufficiently concerned about the issue to demand we change the scheme having viewed the wire-frame. Evidently the users tested were comfortable with the colour scheme, whether any sight-impaired users would be as comfortable with the design remains to be seen. Though, as later discussion will indicate, we have incorporated other features to increase accessibility across the site.

The wire-frame serves as the first realisation of the designer's mental representation of the solution. It also is introduced to the users to allow them to experience the site free of the distractions of visual material. It gives them an explicit feel of how they navigate the site. The ease and intuition of the site is presented to users by suggesting they try to perform tasks they would expect to be able to on the site. Following the comments we received in the stage three survey, it was apparent that its worth was invaluable. The design, whilst not *dramatically* incongruous to users' expectations, clearly had some flaws. However, because the site was so simple in its construction, these flaws were easy to amend in the later design stage.

5.2.2 The Completed Solution

In creating a visual identity and completing the placement of graphical elements in the UCD site it was important to maintain the standards developed in the wire-frame. The clear allocation of visual areas in the layout made this task relatively straightforward. Any graphic items that were placed in the pages were given 'ALT' attributes. These attributes enable written descriptions to be attached to images on screen so that text-based browsers and read-aloud systems for the sight-impaired can correctly interpret the site. This was especially important as we developed graphic replacements for the navigation text in the main menu. It was decided that the effect of the navigation process may benefit from creating text 'buttons' for each main category that would incorporate a rollover effect when selected, enhancing interface-feedback. The text is given a 'selected' effect by adding a temporary arrow when the mouse is placed over the item and if the category is currently being viewed then the text appears white.

A further development in the completion of the user-centred site was the creation of rollover effects on the 'kit purchase' page. It was considered that users might like to see both the front and back of the kit that they were purchasing as most items on offer have multiple designs and features. To reduce the need to open more pages or windows and to keep the page simple, rollovers were created so that when the user moved their mouse over the image of the kit item it flipped to show the rear. This feature was described in the text on the page so as not to confuse the viewer. Having a structure to design for assisted the creation of images. Dimensions were already defined and guesswork reduced as the process became a little like painting by numbers. Whether this stifles creativity is another matter and one which is dealt with below.

Aside from the development of the visual layer there were some structural changes made as detailed in the results section. The placement of the results section into the news category seemed to fit neatly with the semantic grouping formed in the early stages of development and was a simple transfer of the information from the external site of the rowing team to the content frame. This was a good indication that a site developed with user-input does not mean that it is not adaptable. Providing the same rules are applied when adapting the site as were applied in the initial design then you can be secure that the site will continue to meet your audience's needs.

Mock text was swiftly replaced with relevant content and it appears that this is one of the wire-frame's many additional benefits. As the site evolves from skeletal to information-rich a large amount of HTML work is saved by having placement areas set aside. In these areas, instead of mocked-text it is proposed that content is described, the author of the content and its due date for inclusion, this way

larger organisations can keep a detailed log of what has been replaced and what is still pending, all the while the site continues to appear visually consistent.

Fuccella and Pizzolato [1999a], IBM amongst other recommend the creation of multiple versions of the visual identity of the site. For reasons of brevity this approach was not taken in the current study though its merits are clear. Consider, for example, the possibility that at the prototype stage we only defined that there would be four display areas, dealing with content and three dynamic menu systems. We could mock a solution that simply represented four frames but the layout of these frames bore no resemblance to our expected final design - the only thing being assessed at that stage would be the feel of the site. Then, at this completion stage, the designer could offer multiple layout options for those frames and users could make a decision as to which would be preferred. Such a methodology does of course increase development time beyond the process described in our study but the benefits for usability may well be considerable.

5.3 The Dynamic Design

In producing the dynamic site the intention was to create a site that mimicked the more innovative style of web design. That is to say there was an attempt to make the site intentionally non-intuitive, different looking and engaging. The design, as described above, contains a large percentage of white space - a principal borrowed from print media - and a navigation system developed to perplex the novice user. Beyond this contemporary feel the content was the result of simple brainstorming and was therefore entirely subject to the designer's interpretation of the brief. Developing the layout through WYSIWYG editors and incorporating features such as JavaScript controlled DHTML not only followed the pattern of many small-business web design strategies but flew in the face of usability teaching [Nielsen, 2000, Tognazzini, 1998a].

When compared later to the user-centred site it became apparent that there were considerable similarities, particularly in the hierarchy. Whilst not as rich as the latter user-centred solution, the dynamic site contained a similar organisation of links. This may of course indicate a paucity of potential pages given the subject matter - what else *can* you have on a rowing club alumni site? - But it does not indicate how valuable the missing sections would be. Were the site to go 'live' in this form, would users miss the 'find a crewmate' section, the recent results or the 'where are they now?' pages? Results from the second questionnaire in the user-centred process suggest they would as they indicated clearly that the 'results' section was sorely missed. Evidently, there is value in the group-wide category surveying as utilised in the user-centred process.

The dynamic site was not particularly accessible. Without a frame-enabled browser, it was impossible to access any pages beyond the index page, even with a frames browser the JavaScript behaved temperamentally on anything but the latest browsers. The low-contrast text - grey on white - was difficult to read at high resolutions and users' eyes were drawn in multiple areas of the screen for navigation and content, there was no Gestalt ordering of items.

The site did include two features that might be construed as useful. The first was the inclusion of dynamically created 'page freshness' indicators. Though developed using JavaScript and graphics, a text-based solution is possible and accurately displays how old the page being viewed is - such a feature could allow users to avoid content they know they have read previously. The second feature was the orientation information provided by colour coding the categories. Combined with simple headlines the colour schemes immediately linked the navigation frames to their content and allowed the user to locate themselves within the hierarchy.

Page titling was consistent across the site. The site was developed using the traditional frame method and the top-level frame (and therefore its title) stayed consistent throughout browsing. The navigation method did, however, modify both frames of the parent simultaneously using JavaScript and in doing so enabled the 'freshness' of the lower frame to be repeatedly checked and updated in the top frame. By using the same three-image design to the top frame we tried to create the impression that the images appeared and disappeared dynamically when browsing the site. This effect may have been enhanced by the use of a randomly generated image in each location. It may also have been possible to eliminate the need for different top frames by producing one page with all the different versions in hidden DHTML layers. By invoking a script from the navigation buttons, various images and menus could have appeared by a simple re-adjustment of the layers' visibility attributes.

Consultation with users after the completion of the dynamic site suggested it was rather light on content but several enjoyed the innovative layout, whether that layout was enough to gloss over the usability problems remained to be seen.

5.4 Web Usability Evaluation

The benefits of usability evaluation lie in the degree to which their findings create a standardisation of web sites. Whilst the creation of user-centred websites seems a straightforward process - get some users in, ask them what they like and dislike about the web, design accordingly, show it to them for a few changes and complete - the methods that accurately assess the success of web pages are far from simple. Though standards are emerging for specific areas such as accessibility [Bobby

References 7.2] or the correct use of HTML and CSS [W3C References 7.2] there is considerable debate as to what makes a good usable website for the average user. This study chose to employ the method of heuristic evaluation as developed by Jakob Nielsen, considered *nemine contradicente to be a usability expert*. This evaluation was based upon work carried out by Nielsen when the web was in its infancy [Nielsen 1994] and discussion of web usability guidelines [Scapin et al., 2000] indicates to us that some form of standardisation is occurring. A principal problem of usability evaluation is that it treats every site as having the same objective, that every site has the same type of audience and same experiences of web use. Suggestions for category-based evaluation are emerging in the literature [Scapin et al., 2000] and the analysis below will include a degree of discussion on this topic.

Alongside the heuristic approach favoured by the aforementioned web usability studies, the sites were compared on a freely available online evaluation program. The shortcomings of this method we based in part to the substantial variation in site structure, but other variables and failings in the system are discussed below.

5.4.1 Comparison findings

Upon first sight, the comparison statistics appear to fully support the hypothesis that the user-centred site is more usable. However, closer inspection of the roots of these results may lead us to question the depth of validity.

The heuristic evaluation indicated that the UCD site had half the number of usability errors as found on the dynamic site. This finding is all the more curious when we consider that the number of pages (as indicated in the LIFT assessment) is nearly five times greater. Admittedly, not all of these pages have an effect on content as they form the code structure of the site the number of pages displaying information is still notably lower on the dynamic site yet it generates is nearly double the number of errors per heuristic. The average magnitude of problems found on the dynamic site was over five times greater, reaching an average of 2.93. The Bunnyfoot checklist indicated that the dynamic site was compliant with just 28% of usability 'standards', with the UCD reaching 85%+ compliance. It appeared that the heuristic evaluation and checklist methods were measuring similar usability problems, but what were these problems in real terms, what elements of the dynamic site were so unusable and what was so successful about the UCD site?

Examining the statistics for the heuristic evaluation we can see that the largest number of errors on the dynamic site occurred in the 'match between system and real world' and that the greatest magnitude of failing could be found on error recovery, consistency and error prevention. In real terms

the dynamic site failed because it did not 'speak' to the user in natural terms during the navigation process. Link titles on the navigation areas were not clearly indicative of what would be displayed after clicking on them (e.g. on the social section, links were labelled 'future' and 'past'). There did not appear to be a natural movement around the interface, users clicked a coloured box in the left area of the display for the categories, then what appears to be a small text link in the top-frame. This text link is instead a graphic link, clicking on the text yields no response, clicking the icon next to it causes content to be served into the lower half of the page. During this sequence the eye was drawn around the screen but to little useful effect. Having the content material deposited in just one half of the horizontally split screen does not match with the vast majority of websites thereby breaking convention and confusing users' expectations. Information simply did not appear in a natural and logical order. The use of a small icon as the link next to descriptive text causes unnecessary confusion by requiring the user to pick one of two conventional link methods - the text or the graphic. As text is the more common method of linking on the web, the user will more often than not choose the *wrong* option in this case. With regards to error recovery we must consider the back button as the users' 'undo' option. When the wrong link is clicked on, users turn to the back button on their browser to return to their last known safe state from where they can attempt a new procedure. In the dynamic site the news section, potentially the most visited area of the site, is built using JavaScript to display news items in boxes. Moving the mouse off the news item link causes the item to disappear, clicking the back button does not bring the box back but clears the new item list, such an effect could well disorientate users. Continuing with error recovery we find that no pages that have similar content offer the opportunity to switch between them should the user have clicked the wrong link. For example, if the user wanted to read about boat club news he may quite reasonably select 'Old Blades news', when the page is presented (which deals with news about the Old Blades organisation, not the boat club) there is no suggestion that the user might like to look elsewhere. A suggestion could be to add the text 'Looking for Boat Club news instead? [Try this page](#)' to the page, thus providing a useful exit route to the correct information.

Error prevention on the dynamic site is dreadful. The very nature of the site's non-intuitive interface encourages error by inviting users to explore the site it draws them in to making intentional errors in order to learn where various items are. Whilst this may be entertaining for the web user with plenty of time and patience, the first time user may well be put off a site, particularly if this navigation method was extended to all other areas of the navigation procedure. At least in the dynamic site evaluated here the non-intuitive nature of navigation is limited to the initial categories and there are just four of them. However, on each of the category navigation pages in the top frame there is no text to indicate what will occur when any of the links are selected, there is little explanation or attempt to stop users from making errors.

Consistency is a broad term in the context of web site evaluation. It can refer to consistency across the site or consistency with established web-browsing metaphors. In the dynamic site solution we see a break down of consistency with web browsing metaphors but, due to the nature of style sheets, the site remains internally consistent. The pages within the site are referred to consistently, each category top frame has the same format, header, description, category-specific links, site-wide links. Across the site all the site-wide links are consistently labelled. All the text is within the consistent colour scheme but there is variety in the type of link used. In some cases this is a text-based button (e.g. site-wide links) or purely text (e.g. news items) or graphics (e.g. category-specific links, photo thumbnails). Such internal variation is suggested by Instone [1997] to make sites "hard to use" but in this case the minimalist nature of the presentation means that it is relatively clear which areas of the screen are active (i.e. links) and which are simple content. Where the variation becomes awkward, yet still not really unusable, is when we consider the 'social' category. 'Future events' in this category appear in a tabulated list formatted in colourfully delineated boxes, however the semantically similar 'past events' appear as a list of paragraphs, there is no apparent need to for the difference as surely both pages supply the same type of data? If the pages do not appear similar it may make the user think they are viewing a different *type* of information.

Beyond these heuristics, the Bunnyfoot checklist produced some alternative usability failings. The dynamic site was poor at cross-browser compatibility, though the site worked on both Internet Explorer and Netscape Communicator, only the most recent versions (IE 5.5+, Communicator 4.7, Netscape 6) supported the advanced JavaScript required to control the news items. Incompatibility with the JavaScript in older browsers rendered the news page completely useless and caused multiple display errors on other pages. Furthermore, when the site was viewed at screen resolutions below 800x600 pixels or the window was reduced in size then it became inoperable due to the lack of scrolling functionality in the top frame. There was also no support built into the site for browsers that do not render frames, the pages were unusable. If graphics or style sheets were disabled in the browser settings the site became increasingly difficult to use. More specifically, if style sheets were not used then the navigation buttons are not coloured and are displayed as transparent boxes, invisible to the user. Perversely, if image rendering is removed entirely then the site does retain some functionality as the place-holder outlines of the images describe the navigation buttons. An additional consequence of the use of style sheets in this site is that the fonts are described in fixed units thereby rendering the browser-based option of increasing the font size useless. Font size is often increased by users with sight impairments in order to read the pages more clearly, restricting font size discriminates against this potential audience.

The dynamic site also fails to apply other web standards. The use of blue as a link colour is considered to be the "standard across the web and what users know and expect" [Bunnyfoot, (References 7.2)] (whether this is the case or not is a matter of debate [see section 5.4.2]) and on this standard the dynamic site fails. The text-based links are presented in light grey which, beyond being difficult to read in terms of contrast, does not change colour when visited. Users may lose track of where they have visited and this could lead to them repeating routes around the site unnecessarily [Farkas & Farkas, 1999]. Any attempt to bookmark pages in the dynamic site will result in two problems. Firstly, the framed nature of the site means that the actual configuration of the bookmarked page might differ from the users intention. Secondly, the title of the bookmark is taken from the *page* title which remains constant throughout the dynamic site, providing little descriptive information.

There are, however, elements on which the dynamic site shows reasonable usability according to the results. The pages, largely due to the repetition of images, the small file sizes used and the simple HTML, display at speed even over a modest modem connection. By caching the small number of repeated images, new pages are rendered quickly when they contain previously viewed graphics (e.g. the category top-frames). By contrast the advanced JavaScript rendering of the news items is sluggish as it calls on multiple files to perform the action of displaying each news table. This delay could potentially damage the users' perception of interaction by broadening the gap between action and interface feedback [Norman, 1998]. By this it is simply meant that when the user clicks the news item, if it does not appear within a reasonable time then the action may be deemed as having failing. The important issue to consider in this case is that 'reasonable time' varies on the web. Users who have a slow connection to the web may be more tolerant in waiting for pages to appear and actions to occur than those with fast connections on account of them being used to wait. However, in the example concerning the news items, the JavaScript creation of the news does not initiate the progress indicator in the status bar of the browser, in short, the user on a slow connection or with a slow processor has no idea that the an action is taking place.

Where the dynamic site failed the UCD site seemed to excel. Scoring 85% conformance with the Bunnyfoot checklist and averaging a heuristic magnitude that Nielsen describes as 'cosmetic problem' that 'need not be fixed unless extra time is available', the site appears to be a usability success. It is, of course, not without its problems and a detailed analysis of the application of usability principles to the site follows.

Where the UCD site succeeded most effectively can be seen by the lack of errors discovered in flexibility and efficiency, aestheticism, and real world conventions. The site can be considered efficient in that it caters for cross category browsing. Whilst the novice user may be happy with navigating the

site via the menu system, the experienced user can move between sections by using internal page links confident that they are always kept informed of their location within the hierarchy by the display of location cues in the menu system. Bookmarking is effectively supported with each category and individual page having unique titles that succinctly describe their contents and the bookmarks accurately preserving the content of the framed pages. By ensuring bookmarking is supported the site also contains an ability to be linked-to by external sites, no pages are orphans - all are contextualised by their position in the site's structure. The structure of the file system enables URLs to be meaningful and help the site remain expandable - new directories can be added and new pages without damaging the existing URLs, preserving external links and bookmarks.

The layout of the pages conforms with Gestalt principles by grouping relevant concepts and items. Within this layout there are clearly delineated areas for content and navigation, for example all the menu systems are rendered in dark purple and content in the white frame. No area of display contains extraneous information; rarely-required information is kept accessible but does not interfere with the principal display (e.g. contact information). This clarity is maintained by creating apparently dynamic menus that appear only when needed, i.e. if a menu bar is not necessary it is simply not there. An advantage of such controllable depth is that it reduces error. Users are not tempted into taking the wrong direction through the site by clicking on irrelevant links. Having a small number of consistent links on the main menu makes it more likely that users will be aware of those links [2000b].

Despite the strict control of available menus as described above, users are still able to jump up and down the hierarchy - for example, if you are embedded in a search for a crew member it is entirely possible to return directly to the site or category homepage in one click. The supporting of behaviours such as this are considered as important emergency exits and they allow frequent users the freedom of unconstrained rapid traversal. Less frequent or novice users would find navigation through the hierarchy natural. Link dialogue is explanatory and, as a consequence of the card sorting exercise, semantically consistent. Furthermore, the language used includes elements relevant to the rowing community e.g. (crew member). There are no circular links (where links on a page are self-referential), though there *is* support for users who may, for example, click on the link for the category they are currently viewing - the page returns to the category homepage.

The site is not without its problems though. Referring back to consistency issues raised in discussion of the dynamic site, we can point to the use of style sheets as a problem. Though recommended by many design guidelines to promote consistency, style sheets can cause problems. Employed even in the initial wire-frame of the UCD site, the style sheets as used here do not demonstrate good behaviour when links are used. When clicked, the majority of text-based links on this site do not

change colour to indicate, when the user returns to the page, that they have been visited. Whilst this is touted as a problem [Nielsen, 2000a, Instone, 1999, Farkas & Farkas, 1999], it is proposed that in this UCD example the user is not concerned. None of our participants complained about the lack of support for the visited-link standard. A reason for this may have been the continued support of other navigational aids. In the UCD site, any time the user clicks a category or sub category link then the status of that link changes. The category item is shown as white text instead of lilac and does not have a rollover and a sub-category (second-level menu) link is turned white and disabled. The user can be confident that they know their location and do not seem bothered about remembering where they have been before. However, if the site was full of content it may well become more necessary to support visited links as users could begin to forget what they had seen and what they had not [Farkas & Farkas, 1999].

A further controversial choice in the design of the UCD site was the use of lilac and purple as colour schemes. The luminance of these two colours is, nevertheless, quite widely spaced and the contrast is preserved even when the display is set to a colour depth of 256. When viewing the smaller text for the main category menu JavaScript rollovers are used to promote user feedback, promoting the responsiveness of the interaction process [Flemming, 1998], particularly important given the size of the font used in the menu. All graphics on the site are given ALT tags to support text-to-voice browser systems and to act as tool-tips for new generation browsers such as Internet Explorer 5 and Netscape 6. Even being viewed in a browser with all images turned off the site is entirely usable. The menu system graphics used are repeated and pre-loaded reducing download time. Text-based browsing is, unlike the dynamic site, fully supported. From the main homepage there exists a text-version option from which all pages in the site are reachable and the HTML used in the site attempts to conform to established guidelines [W3C, (References 7.2)], using contextual tags in preference to stylistic ones. Such attention to detail is designed to allow the site to be viewed by larger numbers of people on a variety of platforms and devices. A final advantage of the strategy to design for accessibility was the relevance of a neat and ordered hierarchy. Cognitive psychology tells us that short-term memory is limited to around seven items [Eysenck & Keane, 1995]. If a menu system is being read back to a user using text-to-voice browsing software and is longer than seven items, it is likely to be remembered incorrectly. The user may remember only a selection of the first and last items. The careful planning of the information architecture of the UCD site meant that problems such as this (which may not be restricted to the sight-impaired) are avoided. A balance needs to be struck with the breadth and depth of the hierarchy, but limited to seven items wide seems to make psychological sense.

The final usability consideration upon which the UCD site achieved success was the assistance offered during browsing. At each stage of the site full descriptions were given of what was contained in

each category and the method of reaching it. Though we expect the majority of our users to be of above average intelligence [Nielsen, 2001b] there would be no sense in not trying to prevent error when the option to do so was so simply achieved.

Comparing the two sites using the LIFT evaluation tool online produced an alternative result. The severity of problems found on both sites were both very similar. However, the dynamic site generated fewer problems per page assessed, 6.43 to the UCD's 8.57. There are substantial problems with the automated findings generated by the LIFT report and for this reasons they are discussed in detail in section 5.4.2.

The two sites are evidently different when compared against usability checklists and heuristic evaluation. The UCD site meets many of the established criteria having taken them into account throughout the design process, there are notable exceptions from this list such as the maintenance of web standards regarding link colours and the use of frames. Where these standards have been disregarded, measures have been considered that maintain the site's usability - the devices have been used to enhance, not to detract. By contrast, the dynamic site, whilst aesthetically pleasing and innovative in its approach to design only succeeds on usability heuristics by accident and not design. The question stands whether web developers can trust their instincts to design sites that meet many of these criteria without considering them in the design phase. Before we consider the role user-centred design may have to play in the web design industry it is worth sounding a note of caution and considering the true efficacy of usability evaluation itself.

5.4.2 The Efficacy of Usability Evaluation

Usability evaluation is a substantial topic. An enormous body of material exists with its roots in software and systems development. When the web began to develop a large amount of this material was left behind, perhaps intentionally as the web pioneers were keen to forge a sense of frontier spirit and allow the information architecture to grow organically. It cannot be forgotten entirely and neither can it be applied unremittingly. To pick apart the emerging application of web usability is beyond the scope of this study, particularly given that many are already beginning to do so [Scapin et al. 2000] and thus it is considered more pertinent to advise caution when defining web sites as usable/unusable based on advice that has migrated from another medium.

The principal benefits of the heuristic evaluation method are that it is both rapid and easy to conduct, however they can be considered to be overly generalised. This lack of specificity introduces

unwelcome variance as evaluators struggles to interpret them in a consistent way. Nielsen's heuristics [Nielsen, 1994] were developed from the study of Graphical User Interfaces (GUIs) and the method of converting them for use on the web has been rather vague, consequently web developers find it difficult to "properly interpret them according to the context, and to know when and how they can be used." [Scapin et al. 2000] But before we assume that all GUI-based evaluations are not applicable, Scapin et al. provide some evidence for the role they have to play in establishing an effective web usability framework [Scapin et al. 2000] but the GUI model does not scale well. The web is a huge information resource, representing this using traditional GUI development models, overwhelms the user [Norman, 2001]. Alongside the awkward integration of GUI-based research into web usability, the absence of typography principals indicates once again the lessons are not being learnt from the past. Typography on the web is limited by the ability to render numerous fonts on a variety of platforms without the use of graphics, but typography is not just about fonts. The principals of effective use of white-space, kerning and delineated text are disregarded in favour of presenting whatever material is supplied into a given content slot, regardless of readability.

The current non-standardised approach to application calls in to question the ability of heuristics to define a usable site. A web designer that works from these heuristic guidelines cannot imply that their website is usable, just that they meet those particular guidelines. Given that in this study the UCD site was developed with the use of user-directed questions built from the Bunnyfoot and Nielsen/Instone heuristic guidelines it is hardly surprising that when assessed on these criteria the site performed admirably. Likewise, any site that fails to meet the criteria should not be considered to be unusable *per se*. Guidelines are, of course, a step in the right direction but to employ them in isolation is to suggest a degree of complacency.

Nielsen's guidelines are narrow in their vision, they almost completely disregard the role of graphics in web design. Based, at least to some extent, in the noble cause of accessibility, the problem with this viewpoint is that it is unrealistic. The subtle application of graphics across a website can enhance a website. This may be the consequence of cultural differences Nielsen has not considered - sites in the United States are particularly text-intensive. Moreover, the real world *requires* that graphics be used in web design. Branding is not built with blocks of text, branding is built with images, defining a visual impact. There can be no commercial sense in a brand removing its visual identity when it designs for the web, visual stimulation is as important for the retailer as it is for the consumer, the challenge is to create elements that satisfy both the need to establish a visual identity and to enhance user interaction. Likewise, Nielsen is impervious to the idea of animation on the web despite the possibility that, if executed with care, animation can enhance the user experience (e.g. the rollover menu system used in the UCD site).

A difficulty with web development guidelines is that web sites contain multiple elements. There exist guidelines concerning navigation function, aesthetic design, use of colour, hierarchy, use of metaphor, structure of HTML and so on. The scope of these development checklists and heuristics varies from the context of pages, sections and the site as a whole. This is where the LIFT evaluation method is heavily flawed. It concentrates on analysing the low-level structure of the HTML, building an idea of what the site will be like to use. It has strict application of HTML validity and basic page elements and cannot accurately assess how the site behaves. For example, the UCD site employs style sheets to ensure text and link consistency across the site, the LIFT method does not account for CSS and thus picks up on the minor variations in the <BODY> tag throughout the site to suggest that there is no consistency in link presentation. Additionally, LIFT asserted that the website did not contain correct <META> tags to provide content description and key words for the site. However, the META tags used in the UCD site were valid HTML and contained a substantial list of keywords and description. Aside from the META and CSS problems, LIFT determined that NOFRAMES functionality was not incorporated into the UCD site; as described above, this is simply not the case, with a fully working text version available from the front page. The LIFT method counts every single occurrence as a separate error; with some 111 pages, the UCD site had 111 META tag errors alone giving the site an apparently disastrous usability score. When combined, the false reporting of errors renders the results of the LIFT test completely incongruous to those found with traditional methods of evaluation.

Web usability evaluation as it stands is effective at revealing flaws and poorly designed solutions but is ineffectual in producing uncontroversial proof that a site is usable. By contrast, such guidelines are unable to cope with designs that employ innovative and original approaches that bear no resemblance to established principles yet remain eminently usable. A broad approach to web usability evaluation needs to emerge that is a blend of empirically grounded heuristics and broad-spectrum user testing. Over reliance on heuristics and guidelines is to assume that users *behave* in a similar rigid fashion, conversely, over reliance on user observation is to assume that the problems your chosen focus group have found are the *only* problems on the site. Given that there is still some way to go before we have usability recommendations that are comprehensive enough to guarantee some degree of web usability we must proceed to consider the implications for the development and design process itself.

6. Conclusions

6.1 Implications for User-Centred Web Design

The wider implications of rigidly applying web usability guidelines stretch beyond the contradictions of what is usable/unusable. Ben Morley, a British-based advocate of the user-centred approach suggests that usability be considered in tandem with memorability and relevance to create "*desirable websites that attract and retain online customers more successfully than the competition*" [Morley, 2001]. What is being suggested here is that online companies do more than make their sites usable, they innovate in their approach to the interface, ensuring that the site reaches out to the target audience by providing material that the user cannot ignore. There is plenty to be said for this suggestion as it hints that usability is not the single most important factor. To encourage an over-reliance on usability as the principal factor in design and development, is to stifle creativity in what remains a fledgling media.

Back in 1998, Bruce Tognazzini the Apple-trained interface designer suggested that web design had ignored the important advances made previously in GUI design, likening the web experience to the "black cave" era of pre-GUI interfaces where users had no truly visible navigation structures - "*there is no structure within the browser that illuminates anything but the most primitive move-backwards, move-forwards navigation.*" [Tognazzini, 1998a]. It was suggested that the reason for this was that the majority of designers are unschooled in the fundamentals of interaction design and are employed purely for "*scholastic background or artistic talent, not their real-world design understanding*". Though this may be the case, they must be doing something right. The huge growth in e-commerce could not have occurred if the vast majority of websites were unusable, the public would not have the patience with new technology if it was repeatedly failing, Tognazzini seems to be missing something.

What this something is is that good design need not follow convention. If a new media agency was called upon to build a website for a photographer, a portfolio of pictures for example, they are able to approach the site in a novel manner. The site does not need to follow sight-impaired guidelines for accessibility, it does not need to support text-based browsing. The audience of the site might well be defined as being young media creatives, these individuals are likely to be technologically minded and therefore run new version browsers including plug-ins such as Flash. They are looking for the navigation to be more than a few clicks on text, demanding something experience-led. Consequently the designer can be a little more experimental in his approach provided that he or she supports the basic function of displaying the portfolio. As described in the introduction to this study, definitions need to be made between sites that need to support usability and accessibility and those that can forge ahead and innovate, safe in the knowledge that their users are prepared for a more explorative and

immersive user experience. Provided that designers have an awareness of the users' experience and design according to their target audience is there a need for definitive user-centred approaches?

In short the answer is yes. There is no sense in innovation for innovation's sake. Re-designing a working interface is foolhardy where evidence exists to suggest that it is successful. For example, if Amazon [References 7.2] were to undergo a re-design to ensure their website was considered 'fresh' in the marketplace they would be sure to lose a considerable number of valued customers - unless of course the interface was greatly improved. The reason for this is that people like standards, standards build a sense of credibility and credibility leads to brand loyalty. This does not of course mean that there is no room for change. When Microsoft launched Windows 95 it was an interface founded on, at least some, usability principles. Maintaining those principles and modifying where necessary the Windows interface has evolved into the significantly improved and innovative Windows XP. Of course, this innovation has taken time, and it will take time for web interfaces to evolve, but evolve they will and they can take usability with them. E-commerce companies simply cannot afford to take risks with web design, get it wrong and they sell nothing. On the other hand, the world of media and the arts can begin to push the frontiers of the online interface safe in the knowledge that the same rules do not apply to them. As this sector of the industry moves forward and esoteric interfaces are tested and succeed, benefits will filter back to the E-commerce and information sites and the cycle begins again.

There is still much to learn. As the information available to us swells even further the information architecture challenge becomes all the more daunting. Skills need to be employed not just from the areas of traditional interface design but from psychology, architecture and anthropology. A fine balance needs to be struck between highly engineered web structures and aesthetics. Design too tightly to usability principles and you risk alienating users that don't think in the same way. There is no Holy Grail of interface design, it's about finding a formula that works for a given audience and a given time.

Returning to Amazon [References 7.2], it would be tempting to describe their interface as stoically effective, but in reality there are many elements in play to ensure the user is not just happy with its efficiency, but that they are tempted away to explore further, spending more money. Although Amazon's interface is not in the business to confuse the customer you could be forgiven for thinking many other sites are intentionally doing just that. Getting lost in a large e-commerce site is akin to getting lost in a supermarket, you are drawn along aisles you may never have intended to visit and get to see much more of the shop. Providing this is done in a subtle, implicit manner (e.g. Amazon's 'people who bought this item also bought...' [References 7.2]), the end result is that the user has been encouraged to buy more items but is none the wiser to the company's chosen tactics. The success

that Amazon has had with this method is aided by the fact that regardless of where you are pulled away to in the site, once you get there you know exactly where you are due to the preponderance of location information. This method of user-centred temptation is innovative and an indication that creativity of web design does not have to mean the latest art-house graphical interface and can involve a user-centric approach.

Usability engineering for the web will not be able to sit still for long. Whilst the 10 heuristics offered by Nielsen are a tempting model at the moment, the future of the web lies in broadband. Delivering data at high speeds, web interfaces have the potential to expand to realms not yet deeply considered. Three-dimensional navigation environments supported by audio and even tactile feedback are entirely possible and will demand a fundamental shift in the way we perceive our use of the web. We may begin to use the web in the same way that we execute the rest of our daily lives, as the web begins to support metaphors we are already used to with GUIs (e.g. drag and drop) the opportunity exists to create designs that are usable because they are so familiar.

6.2 Final Recommendations

The design ideas proposed above are user-centred. They are focussed around delivering an experience that is natural to the user and to do so they will continue to require the user to be a part of the development process, to test, criticise and illustrate new concepts as they emerge. The future of web design is both complex and nebulous, drawing together advances in technology with architectural creativity and cognition. To ensure that this progress is maintained with as few mistakes as possible, we must preserve the user at the heart of the process. The mechanics of how to involve the user are still critically flawed. Fundamental problems exist with user-involvement, even down to the basic question of how many people it takes to run a successful test. Beyond this question, we still need to consider the criteria upon which we assess sites, Do we forge ahead with the search for quantifiable metrics [Ivory et al. 2001, Nielsen 2001a] or explore the open-mindedness of focus groups [Flemming, 1998, Fuccella & Pizzolato, 1999c]? Some middle ground needs to be found between these contrasting ideas of strict standards and vast quantities of varyingly specific user comments. Just like there is no standard website, there is no standard answer and the solution we offer advises a blend of approaches. Taken in context, user-centred web design produces measurably more usable websites but the blanket application of these findings is inappropriate given the tenuous foundations of how we assess usability within a medium that, by its very nature, has no universal standards to which it has, or will, adhere to.

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7.2 Web Resources

Amazon: www.amazon.com or www.amazon.co.uk

Ask Tog: www.asktog.com

BBC News: news.bbc.co.uk

Bobby: <http://www.cast.org/bobby/>

Bunnyfoot Usability Guidelines and Usability Checklist, <http://www.bunnyfoot.com/resources/>

C|NET, <http://builder.cnet.com/webbuilding/0-3880.html?tag=dir>

Flanders, V.: Web Pages That Suck <http://www.webpagesthatsuck.com/>

LIFT: www.usablenet.com

NNGroup: Nielsen Norman Group www.nngroup.com

OverLIB: www.bosrup.com/web/overlib

UseIt: Jakob Nielsen's Site, www.useit.com

W3C Guidelines, www.w3.org

Web Design Guidelines, IBM: http://www-3.ibm.com/ibm/easy/eou_ext.nsf/Publish/572

Yahoo: www.yahoo.com or www.yahoo.co.uk

8. Appendix

8.1 Items To be Searched-for On Competitor Sites:

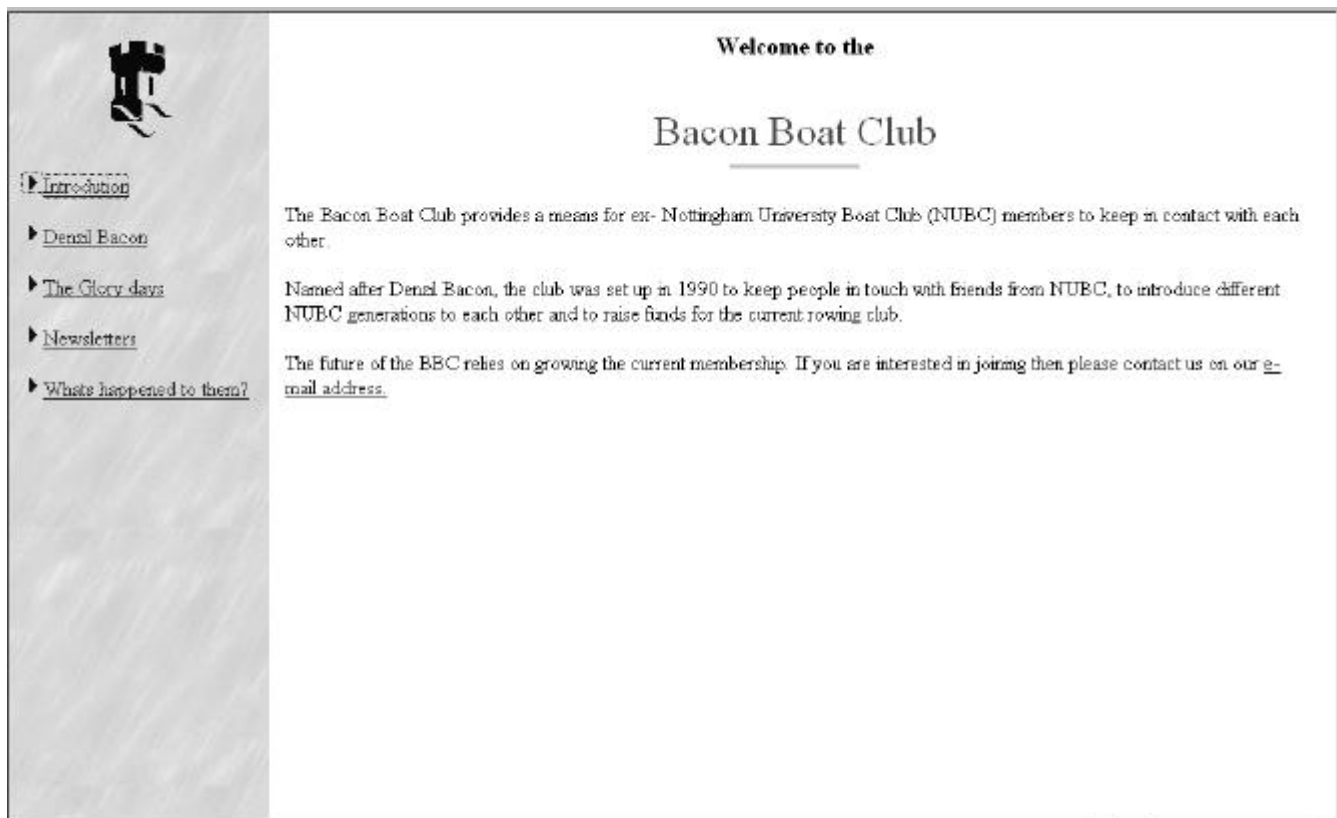
Ortner: When was the third Henley BBQ?, find and return to the homepage. Tell us some information about committee member Rob Coles. Find the latest information about Reading University Boat Club and return to the homepage. Who was treasurer in 1991? How much does a tie cost and how does one buy them? Unless stated, begin from the homepage.

Bentham: When are the next Bentham race fixtures? How much does it cost to join Bentham Boat Club? Who should I contact for information about donating? Why are Bentham so-called? Can other universities' alumni join?

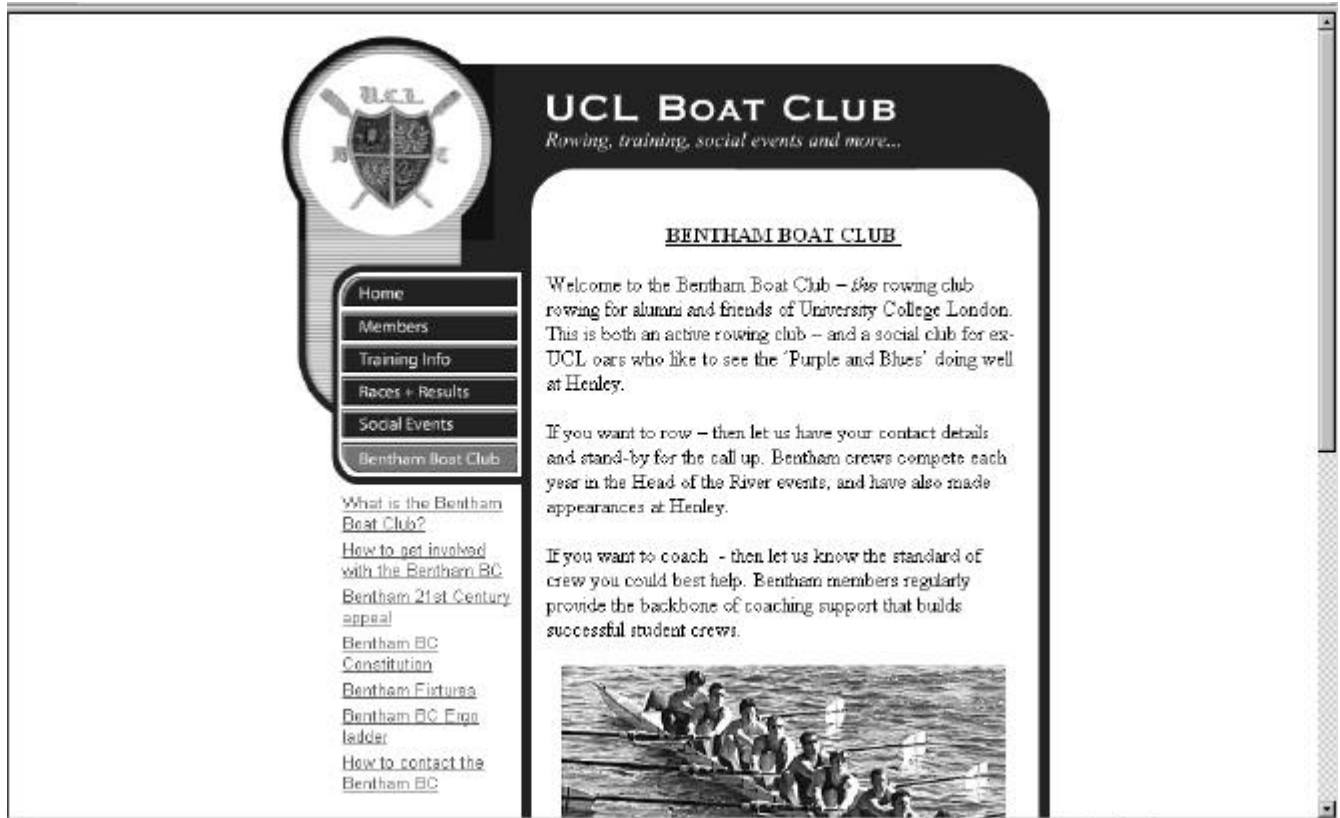
Bacon: What is Bacon Boat Club's email address? What did Nottingham University achieve at women's Henley in 1994? What's Dave Bristow been doing since 1999? Who was Denzil Bacon? Find the news about Peterborough summer regatta, 1999.

8.2 Screen Grabs of Competitor Sites

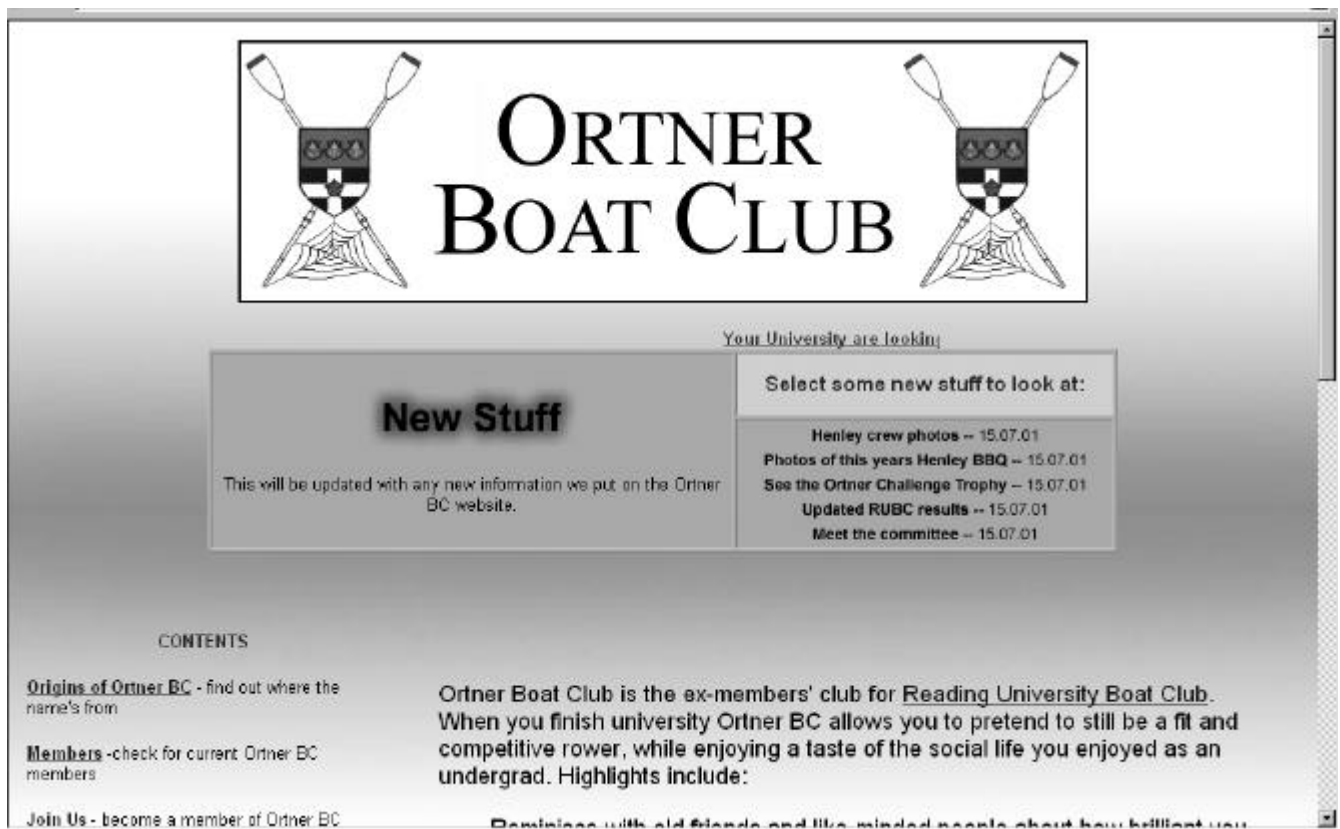
Bacon Boat Club Homepage: <http://www.baconboatclub.co.uk/>



Bentham Boat Club Homepage: <http://www.acrq40.ukgateway.net/bentham.htm>



Ortner Boat Club Homepage: <http://www.ortnerbc.com/>



8.3 Enclosed Electronic Media.

Enclosed material on Floppy disk is accessible from the project.html file. This material includes:

the initial online survey ::: to establish what users want from the site, how it should be organised and so on.

the follow-up survey ::: designed to draw out problems and successes of the prototype site developed from the initial online survey.

the proto-type site ::: written and structured according to the answers given in the initial survey, this site is a simple wire-frame of the eventual 'ideal' solution and is open to evaluation that is questioned in the follow-up survey.

the finalised ideal site ::: amendments made following further consultation with users. site given visual identity and no-frames/text version implemented.

the dynamic design site ::: built to support the brief of a website for rowing club alumni. Designed with no input from users at any stage. Consideration made only for visual impact.