

A Comparative Usability Study of Electronic Newspapers

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Abstract. On one hand, heuristic evaluation has been considered as a potential alternative for extensive user testing; on the other hand, some comparative studies showed that user testing could not be substituted by heuristic evaluation. In this basic usability study of some widely estimated electronic newspapers, we show that it is indeed the case, but moreover, that results from user testing can validate or invalidate some first results gained by heuristic evaluation. What has been interpreted as mostly important is the ability of user testing to corroborate some pre-detected usability problems highlighted by a heuristic evaluation. The heuristic evaluation consisted in examining five electronic newspapers in the light of appropriate web design guidelines, whereas the user testing consisted in carrying out a complete usability testing involving observation, questionnaires, video and interview.

1 Introduction

Heuristic evaluation consists in a usability inspection method whereby a set of various evaluators examines a predefined user interface in the light of heuristics to produce a list of usability problems each time a deviation from these heuristics is observed [7]. At the beginning, this method was restricted to the finding of usability problems, but was further expanded in allowing evaluators express severity estimates for each problem [8]. Although this expansion enhanced the explanatory power of this method, it is often argued that this method can be reductive in the sense that it does not involve testing with potential users, only evaluators.

Conversely, user testing consists in conducting usability engineering in the presence of potential users with various techniques such as observation, questionnaires, video taping, and interviews [3]. On one hand, it has been proved that heuristic evaluation is able to identify some effective usability problems; on the other hand, some comparative studies, e.g. [3], showed that we should beware of considering heuristic evaluation as a definitive alternative to user testing. This consideration overstates the actual results.

In this study, we show that it is indeed the case, although results provided by user testing can validate or invalidate some first results gained by heuristic evaluation. What has been interpreted as mostly important is the ability of user testing to corrobo-

rate some pre-detected usability problems highlighted by a heuristic evaluation. For this purpose, we first perform a heuristic evaluation on five electronic newspapers in the light of appropriate web design guidelines. We then carry out a user testing on two electronic newspapers that have been rated by users as "top newspapers". We finally discuss and compare the results of both studies. In particular, we also detail some web design guidelines that are appropriate for evaluating electronic newspapers and some of them are introduced during user testing as needed.

2 Heuristic Evaluation

2.1 Method

The first part of this study was aimed to let two expert evaluators browse existing electronic newspapers (or at least a maximum of electronic newspapers) found on the web and to identify some newspapers that seem to be the best according to their interface usability. To do this, they were asked to retain a maximum of five electronic newspapers, to select a set of relevant web design guidelines and to check if the newspapers respected these guidelines or at least some of these. The scope of this research was restricted to newspapers written in English and French. The heuristic evaluation therefore consisted in replacing traditional heuristics [7] by guidelines selected by evaluators.

2.2 Results

Five electronic newspapers with their positive and negative points were selected:

1. The Financial Times (<http://www.ft.com>) contained headlines, but not the contents at first, table of contents was all-graphic, no e-mail for contacting them was provided, navigation buttons were at the top and the bottom, no back button.
2. The Times (<http://www.the-times.co.uk>), although very complete, did not contain any detailed table of contents nor e-mail address to contact the newspaper's people, user needed to scroll a lot (e.g., for the table of contents).
3. Le Soir (<http://www.lesoir.be>) abundantly relied on the use of frames, included a contact e-mail address.
4. The Telegraph (<http://www.telegraph.com>) was especially interesting in providing links to other related subjects, a contact e-mail by subject, but no back button; it made a good use of thumbnails, of mixed links and ads, but guidance was almost non existent (it was difficult to know where we are).
5. The News & Observer (<http://www.news-observer.com>) had an overall appealing perceiving, included e-mail address, but no back button in the articles.

After this first step, which was a kind of test step to see what exists and what sort of guidelines might be found related (not especially) to these electronic newspapers. A more pragmatic method was used in the second step: guidelines relevant to newspapers were selected, grouped into categories as follows [5,10,11]:

1. Graphics

- 1.1. Use graphics critical to the information content.
- 1.2. Keep the total size of all images used on a page to less than 30 K: if a single image is critical to the information being presented, it's all right to be larger, but consider using a thumbnail of the image and linking to the full size copy. If the image will not survive being scaled down, try using a small portion.
- 1.3. Keep backgrounds pale and muted, to avoid interfering with text. If you must use background images, keep them very small (to minimize download time,) and use the slowest resolution JPEG format.
- 1.4. Use available technology tricks to minimize content access time.
- 1.5. Use small set of bullets or accent graphics repeatedly, rather than a large number only once each: because many HTML browsers cache images as they are loaded, you can achieve fairly fast download times if the images you require are mostly loaded from the image cache rather than being downloaded repeatedly.
- 1.6. Use graphical divider bars sparingly: an image file used as a divider can add a very effective accent to a page, while only adding slightly to page load time. Use bars with smaller sizes rather than larger, and use a small set repeatedly.
- 1.7. Inclusion of alternate text for each image: use of the `ALT="description"` parameter in your source to specify the text to be seen by people who choose to turn off image display while they are browsing.

2. General layout

- 2.1. As a general rule of thumb, try to make the majority of your pages no longer than one and a half screen full of text.
- 2.2. For presentations that must grab people's attention to be successful, do not make the page longer than the window: Like the fold in a newspaper, the bottom edge of the browser window will stop some people from reading further.
- 2.3. If your pages present text that people will want to read at length, it's all right to use longer, scrolling pages: scrolling the browser window allows a reader to advance in the text with less loss of mental "context" than does following a link.
- 2.4. Title header has been put on every page: it does not need to be large and bold, as long as it is recognizable as a title, separate from the rest of the page content.
- 2.5. Contact's e-mail address: every page should include the name and e-mail address of the author or person responsible for maintaining the page content.
- 2.6. For printing or saving, provide a separate link to a complete document. If you have long documents that people will want to print or save in one operation, provide a link to a complete, print- or save-able document
- 2.7. All page footers should include a standard copyright designating the author or host institution as the copyright holder of the contents of the page.

3. Navigation

- 3.1. Consider duplicating navigational headers at the bottom of your pages: if pages are consistently longer than one-and-a-half screens, it may be valuable to repeat any navigational links at the bottom of a page as well as putting them at the top, to help readers navigate without forcing them to always scroll to the top.
- 3.2. Secondary pages should always contain links back to higher-level pages.

- 3.3. The Table of Contents is always accessible: if appropriate, add a brief table of contents at the top of the page. This serves two purposes. First-time readers get a sense of what to expect from a section.
- 3.4. Avoid using a palette of graphic navigation buttons: most people will not spend time looking at the pages to learn the meaning of the buttons. Moreover, people will be creating links to your pages from other pages with dissimilar navigation landmarks.

4. System responsiveness

- 4.1. As web systems evolve from informal novelties to widespread organizational, educational and commercial use the expectations for system performance will increase. For a large organization using a local system as a management information tool the effect of the long delays caused by inappropriate use of over-large graphics or other inefficiencies in key menu areas may cripple the cost-effectiveness of the system. Most studies on user response to computing system delays suggest that waiting times longer than about 20 seconds are intolerable in routine, repetitive computing tasks [2,9]. It seems unlikely that users will be any more tolerant of web systems than they are of any other networked service or computing task.

Table 1. Results of heuristic evaluation of selected newspapers.

	Graphics							General							Navigation			
	1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4
Fin. Time	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✗		✓	✓	✓	✓	✓
Times	✓		✓	✓	✓	✓	✗	✗	✓	✓	✓	✗		✓	✓	✓	✓	✓
Elec. Tel.	✓		✓	✓	✓ ₃	✓	✓	✗	✗	✓	✓	✓		✓	✗	✓ ₇	✓	✗
Le Soir	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓ ₈	✓	✓
N. & O.	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✗	✓	✗	✗

The five newspapers from the previous stage were then evaluated with respect to these guidelines, thus providing results reproduced in table 1: ✓ indicates that the evaluation proved the guideline respected whereas ✗ stands for a non-respected guideline. Empty column 1.2. is related to a guideline which was too difficult to check consistently. Empty column 2.6. is related to a guidelines dealing with a printing version of the HTML newspaper. Some remarks should be added: (1) is valid except for the table of contents, (2) is checked by mean of a button, (3) did not include the bullets, (4) did not include graphical divider, (5) was not a real copyright, (6) is checked despite that "Back" and "Forward" buttons are not recommended (since they do not consider the history), (7) was not always checked, (8) was not applicable because of frames, (9) was considered as the best one, (10) identified trouble in seeing what the button really was.

3 User Testing

The best solution to evaluate the interface of these newspapers is probably doing a user testing; and by doing this to see whether there is some relationship between results gathered by both methods. For this purpose, an experiment where users were asked to test these newspapers was set up.

3.1 Method

Because it would have taken too much time and asked the user too much work and patience, it was decided to use only two newspapers for the experiment. As it seemed that the most important feature of the newspapers where guidelines were not always respected was the navigation decision was made to choose one from the list of the five “best” newspapers, as rated by users, and another one using frames to make a sort of contrast about navigation. The two chosen newspapers were The Times (from the top five list) and The News & Observer. Qualities subject to user testing covered: easy to use, satisfying, and efficient (ease of getting the information the user want). Stress avoiding might be a relevant quality as well, but difficult to measure it. Methods of capturing data included: observation, questionnaires, video, and interview. The interview was requested only if there was some more information to get from the user than the information provided in the questionnaire.

Table 2. Conducting the experiment.

Tasks	Time
2.1. The Times	
2.1.1. Free use, browsing of the newspaper.	10' - 15'
2.1.2. More precise questions.	
2.1.2.1. Look at the front page, choose a story, and go to it.	1' - 2'
2.1.2.2. Look at the weather forecast.	3'
2.1.2.3. Going to the world news and choose one.	1'
2.1.2.4. Read/Browse the 4 first articles (Pr.Mugambe)	5' - 7'
2.1.2.5. Have a look at the Cinema guide.	2'
2.1.2.6. Choose an article, which interest you among all the articles.	5'
2.2. The Evening Standard	
2.2.1. Free use, browsing of the newspaper.	10' - 15'
2.2.2. More precise questions.	
2.2.2.1. Go to the article on air fares (“set to soar as oil...”)	1' - 2'
2.2.2.2. Go to the “The worst jam for 16 years”	1'
2.2.2.3. Go to the sport News (“Knight century spares the...”)	1'
2.2.2.4. Read “England lose fight for Symonds as he stays...”.	1'
2.2.2.4. Choose one page, and read all the articles of this page.	3'
2.2.2.5. Choose another article and read the other articles of the page related (to the chosen article).	3'
2.2.2.6. Choose an article, which interest you among all the articles.	2'

The experiment itself was decomposed into two parts (Table 2):

1. The first unstructured part was intended to let users freely browse the newspaper to explore it before the second structured part. During this part, behavior errors and misunderstandings were gathered along with user attitude measured by a questionnaire and an interview.
2. The second structured part consisted in definite interactive tasks for which behaviors errors and misunderstandings as well as attitude measured by questionnaire and interview were gathered.

The questionnaire used in this experiment was a SUMI questionnaire [4] since it has been proved reliable, although this reliability depends on a high number of questionnaire items (55 items in our case).

3.2 Results

Eighteen testers were asked to conduct the experiment according to the protocol depicted in Table 2. Testers were separated into four stereotypes according to their web familiarity, with browsers (intermediate experience or novice) and their reading of electronic newspapers (regular or not) as follows:

Testers	The Times		The Evening Standard		Total
	Regular	Non-regular	Regular	Non-regular	
Intermediate	1	6	1	4	12
Novice	1	2	1	2	6
Total	2	8	2	6	18

The Times (Fig. 1) uses "Tabs" to allow users to go directly from one category of news to another category. It also uses a front page, displaying the top stories of the day as well as links to the categories. For each category, the user can find the description of the category consisting of, for each article, a brief summary of the article and a link to it. The user can go directly to the previous/next article of the list shown on the first page of the category by using the previous/next arrow buttons.

The Evening Standard uses frames. On the left of the screen (Fig. 2), the user finds either the index of the articles of the newspaper, either the article itself. On the right part of the screen, an image of a page of the paper version of the newspaper is displayed. The user is invited to click on the articles shown on the image of the page. By clicking on an article, the article chosen is displayed on the left part of the screen. Another way of displaying the article is by clicking on the title of the chosen article in the index displayed at start.

The user is allowed to display again the index, to display the image of the page related the chosen article or to go to the previous/next article, previous/next page, all that using buttons at the top of the screen or text link as an alternative at the bottom of the article/screen.

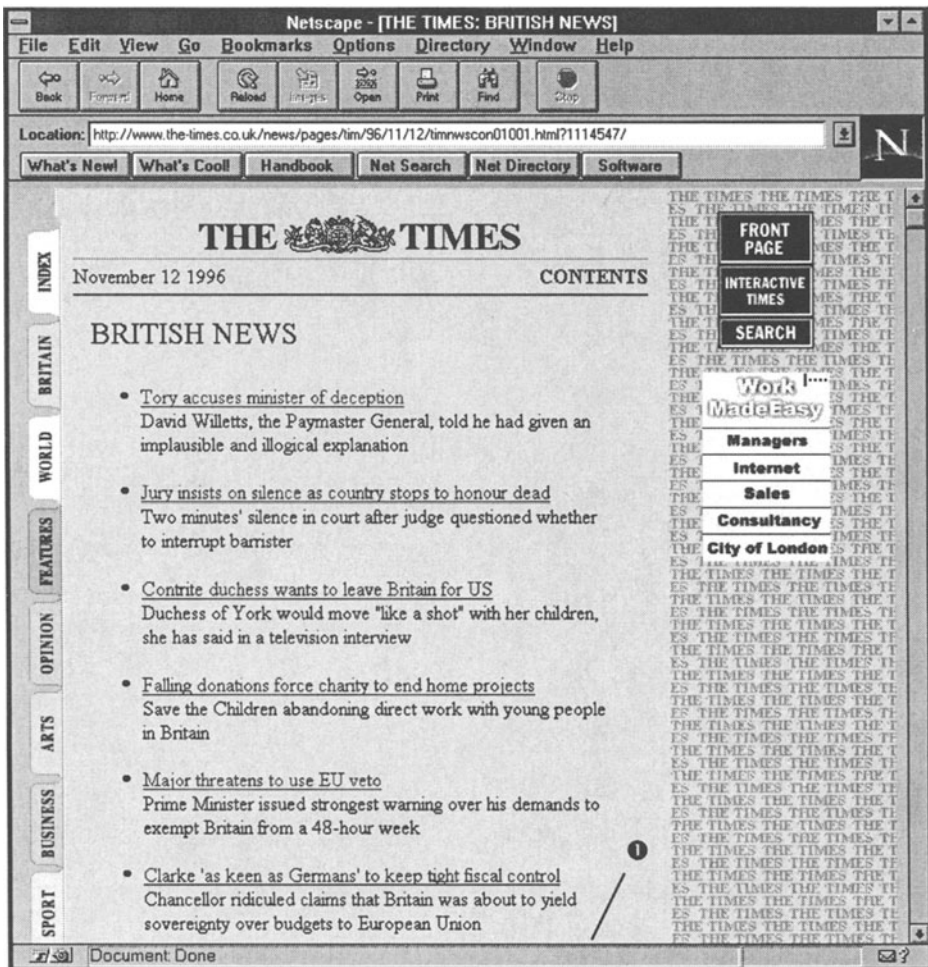


Fig. 1. The Times.

3.3 Discussion

In this section, we firstly discuss the results obtained on the experiment described in section 3.2 by summarizing the usability problems identified by the user testing and by validating or invalidating problems detected during heuristic evaluation with the results provided by the user testing. We will in the next section review usability problems which have not been detected in heuristic evaluation, but detected by user testing and some possible solution based on guidelines that could themselves serve as new heuristics for future heuristic evaluation.

The front page. Heuristic evaluation identified that the front page of both The times and The Evening Standard displayed on more than one screen could cause a problem. And because of the layout, there was no real indication showing that the front page is

longer than the window (❶). This identification is validated by user testing: for The Times, three novices did not discover the second part of the front page, and so were not aware of the fact that they can access the different categories of news from the front page. The problem was similar with the Evening Standard, but testers had less problem realizing that the front page was longer than the screen.

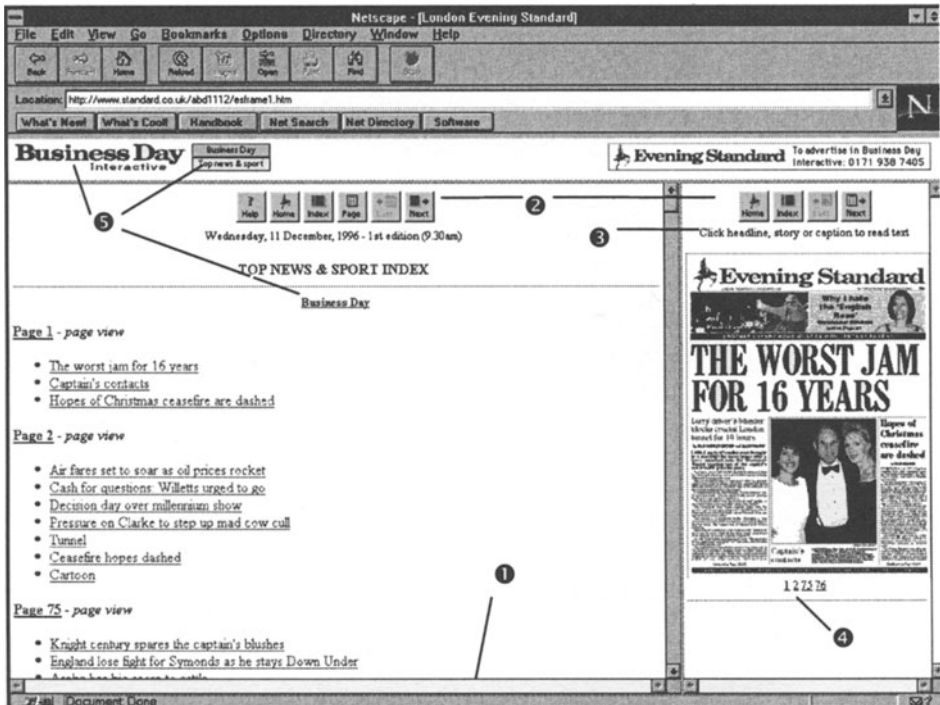


Fig. 2. The Evening Standard.

Navigation. Heuristic evaluation identified a first problem that might occur with the graphic buttons used by both The Times and The Evening Standard. The purpose, the meaning of such buttons might not be clear enough for the testers and then lead to misunderstandings and navigation problems. The solution of using redundant text labels [5] is not followed by The Times. Although we could think that the buttons of The Evening Standard used redundant text labels, they were ineffective since the buttons text would not mean anything if there were not accompanied with graphics: redundant text labels are used, but not placed just below the graphic buttons, yet at the bottom of the article (❷). So, it might not be useful to use redundant text labels at this place, because bottom text links might be considered not to have the same meaning as the top buttons of the screen. User testing revealed that two testers of The Times were not aware of Next/Previous buttons. Among the other testers aware of these buttons, only four of them really used them, even for one of the tasks where these arrows were the easiest solution to achieve it. In this task, it was ask to read four

articles of the same category in a row. Similarly, three testers were not aware of Bottom/up button; among the rest of the testers, four did not use it although it remains the fastest way to reach the navigation buttons. For one tester who was aware of the button existence (as reported in the SUMI questionnaire), it took half an hour to discover it!

A second problem identified by heuristic evaluation is related to the lack navigational buttons duplication:



for the Evening Standard, even if the text links are not useful as redundant text labels, the bottom of the articles was interpreted as the right place for duplicated navigational buttons. For The Times, there were no duplicated navigational buttons at the bottom of the articles. Instead of that, the user will find a graphic button allowing him or her to go directly from the bottom to the top of the article where the navigation buttons are positioned. This solution might cause some problems. Anyway, it would not have been hard to duplicate the Previous/Next buttons and Front page and Search buttons at the bottom. For the Evening Standard, the Page button, allowing the user to see the image of the paper version page being read, was not discovered by two testers. Among the rest of the testers, six had to try the button to discover its functionality, and the rest of them had already used that newspaper. Only one tester was not aware of the Last/Next button.

The third problem was specific to the Evening Standard: the use of an image map. It might not be clear for the user that he or she can click on the articles of the image to go to them, even if it is explained. This problem detected by heuristic evaluation was confirmed by user testing.

3.4 Uncovered Usability problems

After a validation by user testing of problems found by heuristic evaluation, we report on some uncovered problems only revealed by user testing.

Lack of clearness. Although The Evening Standard explained on the screen (just above the image) that they can click on the image map to go to the article they chose, two testers were not aware of the possibility to click on the image to go to the article they wanted to. Among the rest of the testers, one tester discovers that possibility at the end of the experience and three of them had already used the Evening Standard. The identified problem is that even if there is an explanation about using an image map (❶), this explanation was not displayed large enough to catch the reader's attention. Even when displayed on top of the image map, it does not specify that the user have to click on the image. The page number link (❷) allows the user to display the page corresponding to the number being clicked on. Three testers did not use these links at all. Among them, one was not aware of their existence; the other thought that it only displayed the current page. It has a similar use as the "Page xx", except that its location is different (just under the image of the paper version page). These numbers are perhaps too small to be seen and without enough space between them to be easily clicked on. The "Business Day/Top news and sport" buttons (❸) allow the user to go from the Business part of the newspaper to the Top news and sport part of it and the contrary, these two parts being presented as two different newspapers. Three testers

never realized that there was a business part. Again, the reason for ignoring them is perhaps the small size of the buttons and the lack of explanation. Thus, a guideline could be stated as:

- ☞ The font size must be big enough to be read by everybody, even people with small eye weakness.

Design and representation problems. The Times provides a link to the index of the newspaper's articles, but not clearly displayed and explained, it is more considered by testers as a title than a link: none of them was able to recognize it (⑥ in fig. 3).

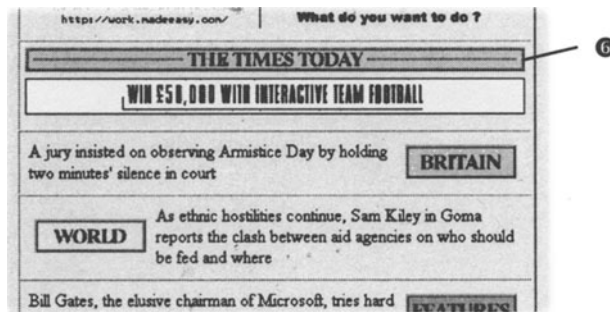


Fig. 3. The "The Times Today" button.

In The Evening Standard, the "Page xx" link allows the user to display the image of the paper version page xx (fig. 4). Three testers never used that link and when completing the SUMI questionnaire, they were not aware of the existence of such a link. The reason of this misunderstanding is perhaps because this link was in bold, positioned like a title. Thus, a guideline could be stated as:

- ☞ When you want to create a link or a button, create it in order to display it like a link or a button and not like a title, for instance

Page 1 - page view

- The worst jam for 16 years
Captain's contacts

Fig. 4. The "Page xx" link.

Wide spreading of buttons. It was previously observed in The Times that users did not use the Previous/Next arrows and the Bottom/Up arrow, although they report in the SUMI questionnaire that they knew their existence. When asked why they did not use the Previous/Next arrow or the Front page button or the Bottom/Up arrow, four testers confessed that it was because they were watching the left part of the screen where the tabs are located. Thus, a guideline could be stated as:

- ☞ Instead of wide spreading navigational buttons, try to group them so that the user can have a look at all of them in just one look.

Consistency. In The Times, the weather forecast is only accessible either from the front page or from the index, but not from the tabs (fig. 5).

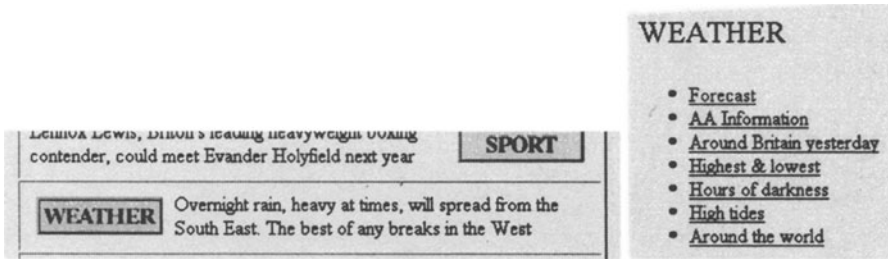


Fig. 5. The "The Times" Weather button and index.

Thus, a guideline could be stated as:

- ☞ When using different categories for structuring articles, a newspaper must always use the same categories and order in all the pages where these categories appear.

Various problems. Some other users complained about the fact that the writing on the tabs was vertical and it was not sometimes easy to read (⑦). Some testers did not understand clearly what is the difference between the front page and the index was (★). Thus, two guidelines can be stated as:

- ☞ When possible, use horizontal writing - Use expressive labels as much as possible.

One tester complained about the fact that in The Times there was no real correspondence between the categories represented by the tabs and the categories listed in the Index. Two testers complained about the small size of the letters: it was difficult for them to read the articles. Related to this comment, six testers pointed out that they would not read the newspaper on a computer screen for a long period of time, because of the poor quality of the display compared to the paper version of a newspaper.

One tester suggested that the addition of sound to the newspaper would make it more attractive. Three testers would like to have color pictures in their newspaper. Newspapers like The News & Observer use color pictures but it is not a common rule. Three testers were surprised that when they chose an article for which there was no automatic display of the paper version page relating to the chosen article. Instead of that, the user had to click on the "Page" button. Two testers found that the display of the paper version newspaper (The Evening Standard) remains useless. According to their position, a link between the paper version and the electronic version is not a must be. Two other found that it was interesting to have such a link between the two types of newspapers. Another user found it interesting too, but for him the image was too small to be used properly.

When asked what they like most about the electronic newspaper, four testers replied that it was easy to navigate and more easy to find a specific article than in the paper version of the newspaper! When asked to rate the ease of learning and using of the electronic newspaper, eleven testers found it very easy and the rest of the user found that it was fairly easy to moderate.

5 Conclusion

We would like to draw conclusion on two aspects.

On one hand, this comparative usability study stressed that heuristic evaluation can provide effective results and that these results can be further validated by a user testing. The heuristic evaluation conducted in this study also confirmed that some usability problems could not be identified by guidelines without users. However, this experiment not only validated existing guidelines related to the layout and the navigation, but it also helped to find new ones. It shows that there are always features to improve, and thus always new guidelines to find. These guidelines can become in turn new heuristics to be evaluated.

One highlighted significant difference between heuristic evaluation and user testing is the ability of the former to locate potential risks for usability problems, but its inability to detect which kind of problem it might be, whereas the latter showed ability to locate and to detail the problem. For instance, all usability problems related to misunderstanding, confusion, misleading were only partially predicted by heuristic evaluation, whereas they have all been detected and explained by user testing. Heuristic evaluation was in this case unable to predict any misunderstanding.

About the new guidelines, four of them were considered as more important than the other. The most important one is the third guideline, this guideline just invite you to group all the navigation buttons located on one page. Both the first and the second guidelines try to improve the clearness (the first one is about the font size used, the second one is about the design, representation of the buttons and links). The fourth most important guideline is aimed to improve the consistency in web newspapers.

On the other hand, this study provided some state-of-the art on electronic newspapers. Many of the current electronic newspapers in the web seem to share similar design. They basically consist in a few front pages for which layouts are actually built by hand. From the front pages, the user can reach a list of clickable topics, and from each topic, article headings list, etc. The hand-made front pages are either topic categories that remain constant over time, or are built separately for every paper (as in different newspapers examined). In each electronic newspaper, a page with a list of article headings may be automatically produced, but the results are not very impressive.

The page looks rather boring and does not encourage one to proceed to the articles themselves, because the headings are presented as a plain list and the long lines with no variation do not help the reader in selecting an interesting article. For example, when asked to rate the ease of learning and using of the electronic newspaper, six users found it very easy and the rest of the user (4) found that it was fairly easy to moderate. The dullness may be due to the fact that the available visual design tools for publishers have so far required a considerable amount of human labor, and it may not have been considered worthwhile to spend so much time on the visual design.

It would be also important to conduct some user testing with a refined version of guidelines intended to better address issues of newspapers. Guidelines that have been used here are not particular to newspapers, although their application revealed usability flaws. Some existing studies in this domain are rather old. For example, Brandt [1]

provided some empirical evidence that graphics and images are attended to in preference to text by conducting a number of eye tacking studies of newspaper pages. He concluded that “pictures and figures have an exceedingly high attentional value; reading copy is only a last resort in many cases.” More recently, Yale [11] agreed that “Editorial landmarks like titles and headers are the fundamental human interface issue in web pages”.

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