

Guidelines for Designing Electronic Books

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Abstract. This paper presents the guidelines emerging from the EBONI (Electronic Books ON-screen Interface) Project's evaluations of electronic textbooks [1], which describe how e-learning content can be made usable for the UK Higher Education community. The project's on-screen design guidelines are described, including recommendations as to which features of the paper book metaphor should be retained, and how the electronic medium can best be exploited. Advice on hardware design is also provided. Finally, accessibility issues are examined and practical considerations for the creators of digital educational content are discussed.

1 Introduction

In line with the growth of the Internet and the increasing availability of electronic resources, an abundance of literature encouraging the good design of such resources has emerged. For instance, Jakob Nielsen's *Designing Web Usability* expounds simplicity as the key to usable web site design [2]; Ben Schneiderman's *Designing the User Interface* discusses strategies for effective human-computer interaction including speech input-output and anthropomorphic design [3]; and several guides to effective hypertext design have been written [4, 5].

The EBONI (Electronic Books ON-screen Interface) Project has added to this corpus by developing a set of guidelines for the design of electronic textbooks [6]. However, by responding to the specific requirements of academics and students in Higher Education, the guidelines occupy a unique and important place within the profusion of recommendations. At a time when digital learning and teaching material is growing in availability, they describe how to design electronic resources so that they can be used most effectively as learning tools.

In the Visual Book [7] and the WEB Book experiments [8], two central themes emerged as fundamental to the usability of ebooks in terms of their on-screen design:

- The legacy of the paper book metaphor, and the wisdom of adhering to this, where appropriate, in the construction of the electronic book.
- The different set of requirements arising from when the reader interacts with the new medium; in particular, the needs that arise from an e-learning environment where bite-sized teaching or learning objects are needed to break down the learning process into manageable chunks.

These themes, as well as aspects of hardware design, were explored in detail by the EBONI Project in a series of ebook evaluations, with the findings forming a set of *Electronic Textbook Design Guidelines*.

2 Summary of Methods

The ebook evaluations which informed the *Electronic Textbook Design Guidelines* involved around 100 students, lecturers and researchers from a range of disciplines in UK Higher Education. Evaluations included:

- An evaluation of three textbooks in psychology, all of which have been published on the Internet by their authors and differ markedly in their appearance.
- A comparison of three electronic encyclopaedias: *Encyclopaedia Britannica* [9], *The Columbia Encyclopaedia* [10] and *Encarta* [11].
- A comparison of a title in geography which is available in three commercial formats: MobiPocket Reader [12], Adobe Acrobat Ebook Reader [13] and Microsoft Reader [14].
- A study into usability issues surrounding portable electronic books.

A specially developed "Ebook Evaluation Model" was implemented by each of these experiments, ensuring that all results could be compared at some level. This methodology comprised various options for selecting material and participants and described the different tasks and evaluation techniques which can be employed in an experiment. The methodology, presented in full at the European Conference on Research and Advanced Technologies for Digital Libraries in 2001 [15], comprised four stages:

1. Selection of material. Texts could be selected for evaluation according to three parameters: format/appearance, content and medium.
2. Selection of actors. Four possible actors in an experiment can be distinguished: the participants, the evaluators, the task developers and the task assessors.
3. Selection of tasks. The following task-types were proposed to gather quantitative feedback from participants about the material:
 - a. Scavenger hunts, which involved participants in hunting through the material selected for evaluation in search of specific facts.
 - b. Exams, which involved the participant reading a chapter or a chunk of text for a short period of time, learning as much as possible in preparation for a short exam.
4. Selection of evaluation techniques. The following evaluation procedures were used:
 - a. Subjective satisfaction questionnaires.
 - b. Think-aloud sessions.
 - c. Interviews.

3 Adhering to the Book Metaphor

The Visual Book study concluded that readers approach texts in electronic format with expectations inherited from their experience with paper books [16]. EBONI's studies have confirmed that the structure and appearance of paper books are at the forefront of readers' minds when negotiating electronic texts, as summed up in the words of one participant: "It didn't feel like I was reading a book. The fact that it was an electronic device rather than a traditional book with a cover and pages somehow seemed to me to take something away from the experience" [17]. Moreover, EBONI's evaluations have highlighted particular aspects of paper books that were regarded as important and should be retained in the electronic medium.

3.1 Cover your Book

Although of no practical value in an electronic environment, the inclusion of a textbook "cover" adds to the enjoyment of the reading experience, reinforcing the user's perception that he or she is reading a unique set of pages which form a cohesive unit, and providing a point of recognition on return visits to the book. If the textbook has a paper counterpart, the cover should resemble the cover of the paper book. If the textbook does not have a paper counterpart, a colour illustration should be used, together with the title and author's name. In both cases, a prominent link should be provided to the table of contents. The cover should comprise one page and fit in one screen; scrolling should not be required.

As well as providing a point of recognition for an individual book, covers may also be used to provide a unifying identity across several texts and other learning resources within the same course or subject area. By "branding" a cover with a logo, font or colour scheme belonging to a particular series of resources, students will be able to recognise a relevant text immediately.

3.2 Include a Table of Contents

Tables of contents are an essential feature in both print and electronic media, used by readers to skim the contents of an unfamiliar book to gain an idea of what can be found inside. They also provide the reader with a sense of structure, which can easily be lost in the electronic medium, and can be an important navigation tool where hypertext is used to link from the table of contents to individual chapters.

When using the table of contents as a browsing tool, the more meaningful the chapter headings and the more detail that is provided under each heading, the more informed the reader will be about the relevance of the chapter to his or her requirements.

In the evaluation of psychology texts, *The Joy of Visual Perception* had the option to view the table of contents in a frame on the left side of the screen, throughout the entire book [18]. Users liked having it always present as it performed the function of a navigation bar, enabling them to jump quickly to other sections and to view the contents and structure of the book without having to return to a "contents page".

3.3 Include an Index

An index helps readers to find information on a specific topic within a book. By including hyperlinks from each index item to the relevant section in the book, it can become an important navigation tool.

Because it is more difficult to “flick” through the pages of an electronic book when searching for information, the index may be more heavily relied upon than in the paper medium, and its availability should be made prominent and clear to the user. In printed books, readers know to look towards the back for the index. In an electronic book, it should be just as easy to find.

A dynamic index, which links index items to the relevant pages of the book automatically, no matter how the book is divided, would be a valuable tool, and further research is required to define and develop this technology.

3.4 Treat the Book in Terms of the Individual User’s Learning Style

Users’ learning styles differ and, while some prefer to focus exclusively on one book at a time, others prefer to consult several texts simultaneously. Therefore, it should be made possible to treat the book as a closed environment, containing no links to external sources unless clearly labeled as such (for example in a reference section or bibliography). This assists the user in understanding the book as a single unit, avoids confusion about which pages are part of the book, and which are part of another resource, and, in the case of texts available via the Web, prevents readers from becoming “lost” in cyberspace.

For those who would rather look at several books at once, a more open learning environment should be made possible, with links to external sources and the ability to open and view several books on a screen at any one time.

3.5 Design Typographical Aspects Carefully

The positioning of textual and other elements on screen was heavily commented on by users, particularly in the comparison of psychology texts, and has an important impact on their ability to learn.

Therefore, readers expect typographical sophistication, and pagination has to be designed carefully to enhance readability. Line lengths similar to that of the printed page (10 to 15 words) are preferred, punctuated with plenty of “white space” to give each page a clean, uncluttered appearance. Paragraphs should be left-justified, providing a uniform starting point for each line and enabling the reader to scan the text effectively. Finally, the typographical style should be consistent throughout the book.

3.6 Use Short Pages

Very long pages (for example, containing an entire chapter) are difficult to scan, and scrolling up and down to refer to different sections of text can be frustrating. Rather,

dividing chapters into several pages can increase users' intake of information. However, very short pages with little content which require the reader always to be continually "turning" pages can also be annoying and readers easily become lost. Therefore, the typical page length of a print textbook should be considered as an approximate model for the length of pages in an electronic book, and the amount of scrolling required should be minimised, especially for smaller screen sizes.

In terms of logical structure, chapters should be divided according to natural breaks in the text (for example, one sub-section per page), and hypertext should be used to provide links between the pages. Readers are able to comprehend up to two levels of sub-division (e.g. a chapter, and a section within a chapter), and such a breakdown enhances the clarity of the structure; however, three or more levels of subdivision may result in confusion about the interrelationship of the sections and hinder retrieval.

3.7 Provide Orientation Clues

Readers gain a sense of their place in a printed book via the page numbers and by comparing the thickness and weight of the pages read against the thickness and weight of the pages still to be read. It is important for this "sense of place" also to be present in the electronic medium, via page numbers, chapter and section headings, or navigation bars which highlight the current position. These indications of a reader's progress through the book should be accurate and visible.

It is also important to be able to move around the book quickly and easily, jumping several pages at a time or from one chapter to another. Adobe Acrobat Ebook Reader's navigation bar, which enables movement from any page to any other page, was praised in this respect.

3.8 Use Non-text Items with Care

Readers expect images, diagrams and formulae to be included and to look as visually sophisticated as they do on the printed page. As one participant in EBONI's evaluations said, "I like these pictures; they're just like you get in a paper book!" If possible, and where appropriate, pictures should be in colour.

The advantages of dividing long streams of text using colours and graphics are outlined in section 4.6 below, and it is suggested that diagrams therefore be included in the main body of the text to add colour and interest.

However, in scientific and mathematical disciplines, it is often necessary to study diagrams and formulae closely and to make comparisons, and this should be taken into account when positioning these items in the text. In such cases, it is advisable not only to insert images, diagrams and formulae within the main body of the text, but also to allow the user to view enlarged versions in a separate window. Images should be of a sufficient resolution to remain clear when viewed in either size.

3.9 Provide Bookmarking and Annotating Functions

Advanced functionalities such as bookmarking, highlighting and annotating were not heavily used by participants, but several commented that they liked the inclusion of these facilities and would use them on a future occasion. "I didn't think you'd be able to make notes on the computer - I think that's quite good. I'd definitely be willing to give this a try", said one user.

Such facilities, often supplied by commercial ebook reader software products, can be awkward, difficult or time-consuming to use. If they are provided, they should be as powerful, straightforward and quick to use as possible. Users would also like to perform advanced functions using these features, such as searching across annotations, or generating lists of annotations for use in other applications.

4 Adapting to the Electronic Medium

In his Alertbox for July 26, 1998 Jakob Nielsen suggested that, in order to be a success, an electronic text should not simply mimic its paper counterpart [21]. He believes that the new medium inevitably involves the reader in a different way and that much more powerful user experiences can be achieved by deviating from a linear flow of text. In particular, increasing the "scannability" of a text through use of extra headings, large type, bold text, highlighted text, bulleted lists, graphics and captions, can have a direct influence on its usability.

This theory was applied in the WEB Book experiment, and again in EBONI's evaluations. In addition to the above guidelines, which focus on maintaining features of the paper book, the following interface design considerations emerge.

4.1 Provide a Search Tool

Tables of contents and indexes both offer access points for browsing. These can be supplemented by search tools which provide another method of finding information in an electronic text, and are appreciated by readers (especially readers of reference material such as encyclopaedias, where specific information is sought). They should not replace tables of contents and indexes, and should be intelligent enough to simulate and enhance the way readers search in paper books. Frequent Internet users want to apply the same information seeking techniques they use online when searching for information in an electronic textbook. They like to use search tools, and expect them to be powerful and easy to use. A choice between simple searches (searching the whole book, a chapter or a page for a keyword), and advanced searches should be offered to suit different levels of reader, and search tips should be provided.

4.2 Use Hypertext to Enhance Navigation and Facilitate Cross-referencing

Cross-referencing between the pages of a book, between the main text and table of contents, index, footnotes, glossary or references, and between two or more books is

considered an important property of the printed medium. Readers strongly value the ability to achieve these cross-referencing tasks in an electronic environment. This can be difficult to achieve with the same simplicity and effectiveness as flicking through paper pages, but can be made more possible in an electronic book by adopting a strong structure and a clear and simple navigation system.

Separating the glossary and references from the main body of text is considered an advantage; they do not interrupt the text but are just a click away. However, a straightforward means of returning from the glossary/references to the correct place in the text is also important. An expectation inherited from the paper medium is that it will be possible to look up the meaning of a term and then return to the relevant place in the book, quickly and easily.

The functionality provided by browsers (e.g. “Back”, “Forward”) is very basic and should not be relied on. Standard link colours such as those used in Web browsers should be used where possible, and the functions of any navigation icons should be explicit.

4.3 Provide Content Clues

Section headings, keywords or abstracts under chapter headings in the main table of contents will inform the reader’s understanding of the contents of each chapter at a glance. By the same token, the inclusion of abstracts, keywords or tables of contents (linking to headings in the text) at the top of a page help readers to decide on the relevance of the contents of that page quickly.

4.4 Choose a Readable Font

Fonts should be large enough to read comfortably for long periods of time. If possible, readers would like to choose a font style and size to suit their individual preferences, thereby satisfying the needs of those with perfect vision and those with low vision or reading difficulties. Nielsen recommends sans-serif typefaces such as Verdana for small text, 9 points or less, since the low resolution of many monitors means that the detail of a serif font cannot be rendered fully [22]. Fonts which include specific special characters such as italics should be used, and a colour that contrasts sufficiently with the background should be chosen.

4.5 Use Colour to Create a Consistent Style and Aid Scannability

Careful use of a few colours throughout can create a consistent style and increase the likeability and attractiveness of the book. Use of too many colours, however, can be distracting, and plain backgrounds should be used. Pure white backgrounds can “dazzle” readers, causing eye-strain, and should be avoided. Several students commented that white page backgrounds increased glare from the computer screen, making it difficult to read the text.

Microsoft Reader, one of the commercial formats tested, has white “pages” of the book set against a black background, which was found to reduce glare.

4.6 Break Text into Short Chunks

Within each page, breaking the text into short chunks improves the scannability of the page. This can be achieved by, for example, interspersing text with images and diagrams and keeping paragraphs short, and by using meaningful sub-headings, indented, bulleted lists, and colour to break the uniformity of the text.

4.7 Use Multimedia and Interactive Elements to Engage Users

Readers perceive one of the main advantages of presenting educational material in the electronic medium as being the ability to exploit multimedia elements such as video and audio, and interactive elements in the form of experiments and quizzes, methods of communication which are not possible in the paper medium. Interaction in an e-learning environment might include:

- **Reflection** on the information being presented;
- **Action**, for example clicking on a link to another source, conducting a search or participating in an experiment;
- **Assessment**, either by the student or the tutor, of what he or she has learnt; and
- **Integration** of new information, concepts and ideas into the student’s understanding of the subject as a whole.

Facilitating interactivity can increase a reader’s sense of engagement with the book and enhance the material’s likeability. It also increases readers’ ability to remember the information being conveyed. In the study of e-encyclopaedias, for example, it was found that the encyclopaedias with greater interactivity and added value content (such as video or audio) contributed to greater memorability.

With many students disliking the experience of reading large amounts of text from a computer screen, multimedia demonstrations and interactive quizzes provide an incentive to study using a computer, and can create an effective alternative learning environment. However, multimedia and interactive elements can make it more difficult to scan material in search of specific facts; therefore, textual equivalents for all information conveyed via these means should be provided (this is also good practice in terms of accessibility) and multimedia and interactive elements should be used to supplement and enhance, rather than replace, text.

4.8 Enable Customization

Readers appreciate the ability to customise a book according to their individual preferences. Aspects such as font style, size and colour should, where possible, be manipulable by the reader (although conforming by default to best practice). It should be possible for readers to save their preferred settings for continued use. Such

functionalities are sometimes provided by commercial ebook products; for example, with Adobe Acrobat Ebook Reader, it is possible to zoom in and out of the book, thereby effectively increasing or decreasing the size of the text.

The above on-screen design guidelines are primarily intended to be applied to books published on the Web, but the principles will be relevant to ebooks of all descriptions and, in certain cases, it is possible that only commercial ebook software companies will have the resources to comply at their disposal. They simply reflect the results of EBONI's user evaluations, and it is recognised that they will be implemented at different levels by different content developers.

5 Hardware Design Guidelines

During Summer 2001, EBONI researched the second factor affecting ebook usability: the hardware surrounding the content, which enables the user to interact with the book. Five portable devices were evaluated by lecturers and researchers at the University of Strathclyde: a Hewlett-Packard Jornada [23] with Microsoft Reader, Franklin's eBookMan [24], a Palm Vx [25] with Palm Reader [26], a Rocket eBook [27] and a Softbook [28] (now superseded by the REB 1100 and the REB 1200 respectively). Feedback indicated several design elements that can enhance or detract from the experience of reading or consulting an electronic book. These are outlined in the following five guidelines:

5.1 Employ High Quality Display Technology

Display technology should be high resolution, with high contrast and minimal glare; lower resolution monitors can cause eye-strain with prolonged use. Backlighting can increase portability, in that it enables text to be read in poor lighting conditions. In EBONI's hardware evaluations, users preferred the device with a colour screen and expressed desire for a colour screen where this was not available.

5.2 Balance Lightness and Portability Against Legibility

Finding the optimum size of ebook hardware is a question of balancing weight, portability and ergonomics against legibility and quantity of text on screen. Small, slim, lightweight devices are easier to hold and more attractive than large and heavy ones; however, users dislike very small screens which restrict the amount of text displayed in any one "page", as they have to turn pages very frequently.

A host of limitations when reading a textbook from a small screen was uncovered, and this issue deserves a more dedicated, detailed study than this experiment afforded. Palm Reader on the Palm Vx, the smallest of the devices, was found to be less usable on nearly every count. All users found it difficult to discover the information they were looking for and it was reported to be more frustrating and confusing and less clearly structured than the other electronic formats. All users scored 0% in memory

tasks and, when asked what he particularly liked about reading the book, one user responded, “Nothing. It just made me frustrated”.

5.3 Design Devices for Comfort

Ebook hardware should be designed for comfort (large, heavy devices can be difficult to hold), and the ability to hold a device easily in one hand is considered an advantage. The necessity to use a stylus should be kept to a minimum; they are awkward to handle, and users worry about losing them.

5.4 Use Buttons and Dials to Improve Page Turning

Careful design of buttons or dials for turning pages can improve the page turning aspect of the paper book metaphor, leading to a smoother, faster transition from one page to the next. In EBONI's evaluations, users of the devices which employ dials commented that they felt they could read faster using this method of page turning. Simple "page forward/page back" buttons are felt to be intuitive, but buttons should be large, as opposed to small and fiddly.

All the commercial formats were praised for the ease with which pages of books can be turned (both forward and backward). In each format, this can be achieved by simply hitting a key or clicking on an icon.

5.5 Make Devices Robust

The number and diversity of situations in which ebooks can be read can be constrained when devices are delicate, fragile or costly. Most devices used in EBONI's evaluations were criticised for being too fragile and thereby restricting usage. Rubber edges and hard covers can help with this aspect of ebook design.

6 Accessibility Considerations

The above guidelines outline the findings of EBONI's studies. However, investigations into accessibility issues by the World Wide Web Consortium's Web Accessibility Initiative are also relevant to the design of electronic textbooks, and have been incorporated into EBONI's guidelines where appropriate.

The W3C's Web Content Accessibility Guidelines [29] identify the following issues to consider when designing for accessibility:

- Users may not be able to see, hear, move, or may not be able to process some types of information easily or at all.
- Users may have difficulty reading or comprehending text.
- Users may not have or be able to use a keyboard or mouse.
- Users may have a text-only screen, a small screen, or a slow Internet connection.

- Users may not speak or understand fluently the language in which the document is written.
- Users may be in a situation where their eyes, ears, or hands are busy or interfered with (e.g. driving to work, working in a loud environment, etc.).
- Users may have an early version of a browser, a different browser entirely, a voice browser, or a different operating system.

Electronic books have the potential to address all of these issues and to overcome many of the barriers to accessibility presented by paper books [30]. In the electronic medium, font sizes can be adjusted to suit the eyes of the visually impaired reader, multimedia capabilities can be exploited so that blind users can listen to text being read aloud, or to present information in a choice of media to those with cognitive disabilities, and reading devices can be designed for use by readers with limited dexterity.

However, the wealth of opportunities presented by the digital medium is accompanied by a set of potential dangers. Kerscher notes that the evolution of electronic publishing is now well underway and that there are powerful forces at work to shape future advances in IT which may not have the interests of the whole population at heart [31]. Despite the capability of technology to present information to readers of all abilities, there is a chance that, unless a proactive and coordinated approach is adopted by technologists, bodies of electronically published material may not be accessible to those with disabilities.

EBONI believes that the wants and needs of the widest possible audience should be represented, and that, in any case, good design for students and teachers with disabilities will be good design for all. As such, in addition to incorporating the results of its series of studies into various aspects of ebook usability, the guidelines also integrate recommendations from the W3C specifications and refer users to the DAISY Digital Talking Book standard, which has emerged in response to the concerns outlined above [32].

7 Practical Considerations for Content Creators

Further, in order that the guidelines would reflect the requirements of students and lecturers from different disciplines and backgrounds, a survey of the use of e-resources in Higher Education was carried out in November 2001. This was in accordance with a core objective of the project, to “identify and report on the individual requirements of academics and students in learning and teaching on the Web”. The intention was to understand any differences in needs from, use of and attitudes to technology between lecturers in different academic disciplines, as well as between those teaching undergraduate, postgraduate and evening classes. The identification of such differences would inform EBONI’s best practice guidelines for e-textbook design, in order that they reflect requirements at a more individual level.

Over 100 lecturers from Glasgow’s three universities (Strathclyde, Glasgow and Glasgow Caledonian) responded to an online questionnaire, asking about which course(s) they teach, whether any course material is delivered electronically, and

whether electronic material forms part of the list of recommended reading for their courses.

The following conclusions are of note:

- Undergraduate teachers were more likely than postgraduate or evening class tutors to deliver electronic course material and to recommend electronic material to students.
- Respondents in the Humanities were least keen to use ecourse material or to recommend electronic reading to students in the future.
- Electronic books were not used at all by respondents in Computer and Information Science, Engineering, Mathematics and Statistics, or Medicine. They were used most heavily as course material in Business, but also in English, Languages, Law and Science. They featured most heavily on recommended reading lists in the Social Sciences and the Humanities, but also in Business, Education, English, Geography, Languages, Law and Science.
- Multimedia resources were not used at all by respondents in Computer and Information Science, and very little in Business, the Humanities and Law. They were used most heavily in Medicine, English, Engineering, Geography, and Mathematics and Statistics.
- Several resource types emerged as unique or especially important to particular disciplines. For example, software was used in Computer and Information Science, electronic case reports and statutes in Law, and online theorem proofs in the Humanities.

Responses to open questions revealed teachers' views on the advantages offered by electronic learning and teaching material, as well as the obstacles to its current or future use.

A lack of resources was the most frequently cited obstacle to the use of electronic teaching material, with insufficient time and overstretched IT support services inhibiting development in all disciplines. Several lecturers extolled the use of electronic material in enabling students to access resources from anywhere at any time, and in potentially including previously excluded students. However, some feared that increasing the quantity of course material delivered electronically could actually inhibit access: students' technical skills vary, and less competent computer users could be disadvantaged. Evening class tutors were keen to incorporate electronic course material, but said that provision of equipment would have to increase so that all students have access to a PC and printer.

The quality of educational material currently available online was a concern for lecturers in some disciplines. It was acknowledged that some excellent, authentic and up-to-date material is provided on the Web, and that quality international unpublished papers and resources are freely available. However, large quantities of unreliable, incorrect and out-of-date material are also accessible, and finding resources of a suitable quality can be an onerous task.

The most enthusiastic proponents of electronic educational material felt that it increased the learning opportunities offered to students. In particular, the interactive and multimedia elements provided by the electronic medium can:

- enable a greater variety of learning experiences than those offered by text on paper;

- provide instant feedback to students; and
- offer alternative explanations, facilitating students' ability to visualise concepts.

Lecturers who expressed the least enthusiasm for electronic teaching, on the other hand, felt that the digital medium alone does not provide a pedagogically enhancing environment. They prefer face-to-face teaching and believe that this enables the most effective learning. This view was most commonly expressed by lecturers in Education and the Humanities, but also by Social Science, Geography, Engineering, and Medicine lecturers on undergraduate, postgraduate and evening courses.

8 Conclusions

Therefore, while many lecturers are keen to explore the potential of electronic teaching material and to offer new learning channels to students, in many cases a lack of time and resources remains an obstacle to the implementation of their ideas.

Although support is required from several directions in order for greater quantities of educational material to be delivered to students electronically, EBONI's guidelines provide support on developing resources of a high quality, in terms of their design. They are not intended to establish a strict uniformity of interface for all electronic textbooks, but rather to encourage use of those styles and techniques which have been shown to be successful in a Higher Education learning environment. As such, they are of use to all creators of digital educational content, including:

- Writers and publishers of scholarly digital information
- Lecturers in HE
- Information Professionals
- Agencies which invest in the creation of scholarly digital resources
- Electronic book hardware and software developers
- Projects and services involved in the digitisation of learning and teaching resources

The development of an ebook authoring package based on the guidelines would further assist authors in creating usable content, and the feasibility of this is being considered by the Project Team. Further, it will be important to obtain feedback from students and lecturers regarding their experiences with electronic resources on an ongoing basis. Over time, their familiarity with new technologies will increase and new metaphors will influence their expectations; observing and recording their interactions with ebooks will reveal such changes, and ensure that the guidelines continue to reflect current needs, demands and expectations.

References

1. EBONI (Electronic Books ON-screen Interface), <http://eboni.cdli.strath.ac.uk/>
2. Nielsen, J.: *Designing web usability*. Indiana: New Riders, 2000.
3. Schneiderman, B.: *Designing the user interface*. Massachusetts: Addison-Wesley, 1997.

4. Horton, W.: Designing and writing online documentation: hypermedia for self-supporting products. Wiley, 1994.
5. Horn, R.: Mapping hypertext : the analysis, organization, and display of knowledge for the next generation of on-line text and graphics. Lexington Institute, 1990.
6. EBONI Electronic textbook design guidelines, <http://ebooks.strath.ac.uk/eboni/guidelines/>
7. Landoni, M.: The Visual Book system: a study of the use of visual rhetoric in the design of electronic books, Glasgow: Department of Information Science, University of Strathclyde (PhD Thesis) (1997).
8. Wilson, R.: The importance of appearance in the design of WEB books, Glasgow: Department of Information Science of the University of Strathclyde (MSc Dissertation) (1999).
9. Encyclopaedia Britannica. Available: <http://www.eb.com/> (Last visited 29/04/02).
10. Columbia Encyclopaedia. Available: <http://www.bartleby.com/65/> (Last visited 29/04/02).
11. Encarta Encyclopaedia. Available: <http://encarta.msn.com/reference/> (Last visited 29/04/02).
12. MobiPocket Reader. Available: <http://www.mobipocket.com/> (Last visited 29/04/02).
13. Adobe Acrobat Ebook Reader. Available: <http://www.adobe.com/products/ebookreader/> (Last visited 29/04/02).
14. Microsoft Reader. Available: <http://www.microsoft.com/reader/> (Last visited 29/04/02).
15. Wilson, R. and Landoni, M.: Evaluating electronic textbooks: a methodology. Proceedings of the Fifth European Conference on Research and Advanced technology for Digital Libraries (ECDL 2001), Darmstadt, Germany, 4-9 September 2001.
16. Landoni, M., and Gibb, F.: The role of visual rhetoric in the design and production of electronic books: the visual book. *The Electronic Library*. 18 (3), 190-201, 2000.
17. Wilson, R.: The 'look and feel' of an ebook: considerations in interface design. Proceedings of the 17th ACM Symposium on Applied Computing (SAC 2002), Universidad Carlos III de Madrid, Spain, March 10-14, 2002.
18. Kaiser, Peter. The joy of visual perception. Available: <http://www.yorku.ca/eye/thejoy1.htm> (Last visited 29/04/02).
19. Timmons, C. and Hamilton, L. Drugs, brains and behaviour. Available: <http://www.rci.rutgers.edu/~lwh/drugs/> (Last visited 29/04/02).
20. Chudler, Eric. Neuroscience for kids. Available: <http://faculty.washington.edu/chudler/neurok.html> (Last visited 29/04/02).
21. Nielsen, J.: Electronic books – a bad idea. Alertbox, 26 July 1998. Available: URL <http://www.useit.com/alertbox/980726.html> (Last visited 8/4/02).
22. Nielsen, J. (2000). *op. cit.*
23. Hewlett-Packard Jornada. Available: <http://h30027.www3.hp.com/gatewayPages/handhelds.htm> (Last visited 29/04/02)
24. Franklin's eBookMan. Available: <http://www.franklin.com/ebookman/> (Last visited 29/04/02)
25. Palm Vx. Available: <http://www.palm.com/products/palmvx/> (Last visited 29/04/02)
26. Peanut Reader. Available: <http://www.peanutpress.com/> (Last visited 29/04/02)
27. Rocket eBook. Available: <http://www.planetebook.com/mainpage.asp?webpageid=15&TBTToolID=1115> (Last visited 29/04/02).
28. SoftBook Reader. Available: <http://www.planetebook.com/mainpage.asp?webpageid=15&TBTToolID=1116> (Last visited 29/04/02)
29. W3C Web Accessibility Initiative. Web Content Accessibility Guidelines 1.0, 5 May 1999. Available: <http://www.w3.org/TR/WCAG10/> (Last visited 29/04/02).
30. Wilson, R. "Electronic books for everyone: designing for accessibility", *Vine*. 125, December 2001.

31. George Kerscher.: A forecast of information technology. Hong Kong Society for the Blind
Keynote Address. 2 December 1996.
32. DAISY Consortium. DAISY 2.02 Specification. Recommendation, 28 February 2001.
Available: http://www.daisy.org/dtbook/spec/2/final/d202/daisy_202.html