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ENGINEERING EDUCATION SYSTEMS: E-BOOK TECHNOLOGY

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ABSTRACT
E-books are gaining wider interest since the introduction of portable electronic reading devices and software-based readers that provide users with more realistic book reading experiences. The paper discusses where to acquire e-book technology, and how to create e-books. It also reports an evaluation to test usability of different types of e-book compiler software
This paper starts with discussion of hardware and software based on e-book readers. Different types of e-books formats and standards are detailed. The publishing process and how to build e-books compilers are explained
Keywords*:* e-books, digital library, e-book technology

1. INTRODUCTION
E book Standards
Although a single standard for e-book formats does not yet exist (as at the end of May 2002), NuvoMedia and SoftBook Press co-developed and proposed the Open eBook Publication Structure (OEBPS) in 1999. OEBPS is based on HTML and XML specifications for the content, structure and presentation of e-books, and is supported by more than 200 companies including IBM, Microsoft and Adobe [7]. Although Adobe is one of the members of OEB Forum, the company is actively pushing its PDF format to be the de facto e-book standard. Microsoft, on the other hand is in favour of HTML and Word documents, and has developed LIT which supports OEBPS. The features of these formats were described and compared by [5], concluding that publishers would prefer the de facto standard to be OEBPS or PDF.

2. PUBLISHING PROCESS
Books that are produced and stored electronically rather than in print are the result of electronic publishing (e-publishing). From a financial point of view, e-publishing eliminates printing, binding, storage and transportation costs [3]. Nevertheless, it is probably just as costly (or more costly) to employ skilled editorial and technical staff (such as graphic artists, audio and video specialists, animators etc.) to prepare data for electronic publication as it is for paper based publication.
As there is still no single standard format, or indeed a universal definition, for an e-book, the process of production one can still be interpreted in many different ways depending on the type of e-book and its purpose. For example, for textual e-books, the process can involve simply digitising a printed book, or applying mark-up languages. For multimedia or hypermedia books, a different approach is often required, involving additional steps such as creating graphics, audio, animation and video.
The e-book publishing industry is currently concentrating on textual e-books with limited multimedia content. The e-publishing process closely resembles traditional print publishing and goes through similar stages:

1. Manuscripts are evaluated (for new books) or acquired (if paper versions exist);
2. If a book is marketable, contracts are signed;

3. Content editors edit the manuscript for quality;
4. Manuscripts are proof-read;
5. Final edited manuscripts are processed (i.e. e-books are created) and saved in various formats, as described earlier. This involves a further four-steps: planning, designing, creating and testing;
6. Book is stored and delivered on suitable medium.

In the e-publishing process, stage 5 entails further phases, which are adopted from the software development life cycle (see books on software engineering) to provide the e-books with an appropriate user interface and content presentation. The phases involved in stage 5 depend greatly on the type of content to be produced and their purposes. The contents can be in any of the following form:

- any one medium (for example fully textual, graphics-only content, or audio-only content);
- multimedia or hypermedia (i.e. mixing more than two media).

According to [3] each category can be used in education (e.g. textbooks), for reference (e.g. dictionaries), leisure (e.g. novels, comics), browsing (e.g. newspapers) and advertisements (e.g. brochures). If an e-book is being produced for learning purposes, its development process should also consider instructional design (a systematic approach to designing instructional materials to achieve specified learning objectives; [4] and accommodate a wide range of different learning styles.

Creating textual e-books is becoming easier with the introduction of e-book compilers. Books are created by merging the existing text files, and the compilers automatically generate the structure and the interface of the books. Designing multimedia or hypermedia books normally requires more steps as it involves more media. In textual e-books any other single medium), designers need only follow guidelines such as using appropriate fonts, making text readable and considering type styles and colours. For multimedia or hypermedia books, on the other hand, design considerations are focused on graphics, audio, animation, video, text, as well as on their combination.

There are a number of resources that give advice and guidelines for authors who are interested in publishing e-books. A typical example is Writing-World.com. Among the popular publishers and e-books stores are: OzoneBooks.com, Atlantic Bridge Publishing, Artemis Press, Bogsidebooks.com, Books Onscreen, BookZone, Crystal Star Publishing, Ebook Express and eBook Mall.

Some publishers require submissions to follow certain guidelines to ensure easy conversion to their e-book format, e.g. for e-books to be read using Microsoft Reader, some publishers ask for the following:

- files must be in plain ASCII (.txt) format;
- manuscripts must consist only of these characters A – Z, 0 – 9, " = : ? £ $ % & ( ) - + @ ! , .
- manuscripts must be divided into chapters, and saved as a separate file for each chapter;
- each chapter must be numbered in sequence, and the chapter number must be included on the first line;
- manuscripts must be unformatted;
- image size is not larger than 510×680 pixels, and of format .JPG or .GIF only.

Authors have three e-publishing choices: **commercial, subsidy** (**vanity**) and **self-publishing** [8]. Commercially published e-books are sold primarily through the publishers's Web site and online bookstores. Authors pay no publication fee, and receive royalties. Subsidy e-publishers produce and distribute books for a fee, and authors receive royalties. Unlike commercial books, manuscripts for subsidy books are usually accepted regardless of their quality, and publishers do not provide editorial services or proof-reading, and the responsibility for promoting a book rests primarily with the authors [8], [1]. In self-publishing, the authors are responsible for the entire process of publishing their books, from development to marketing. A more detailed information about these publishing choices is discussed in [8] and [14].

2.1. Building E-Books with Compiler Software

Contents which have been developed and saved as HTML, text pages or sometimes PDF formats can be turned into a single executable file. This is achieved through the use of a program called an *e-book compiler*. A compiler can be defined as software that is designed to take a number of HTML or text pages and combine them into a single file. There are numerous compilers on the market:

Ebook Edit Pro,Activ Ebook,HyperMaker HTML,HTML Compiler Pro,Illuminatus v4.51,NeoBook,Ebook Creator,WinEBook.

2.2 Book Example

To text the ease of use of some e-book compilers, the book Usability in Political Web Sites was created using three different compilers: Keebook Creator Version 2.6, Gymnast, and Microsoft ReaderWorks. The content of the book is about usability issues to be considered by designers of political Web sites, which can be defined as sites normally classified into political parties, non-profit organisations, government agencies, pressure groups, or even individuals. Such sites aim to disseminate political information and invite people to get involved in discussions about social and public issues. The book has four chapters:

1. Web Sites: Some Definitions
2. Concept of Web Usability
3. Factors Affecting Web Usability
4. Usability Issues in Political Web Sites: Users' Perspectives

The content of the book was first written in Microsoft Word in four different document files. All the compilers were downloaded from the Internet and installed in a personal computer. Each compiler was opened to test whether it was in working order. Before using the software, the instructions on how to use the software were studied. The book was then developed using all the three compilers. The development time and some screenshots were taken during each development for comparison.

In general, Gymnast is an effective and easy-to-use program that allows users to convert any text document files into PDF. When the program is launched, a form is opened where users can start the file conversion process (Figure 1).

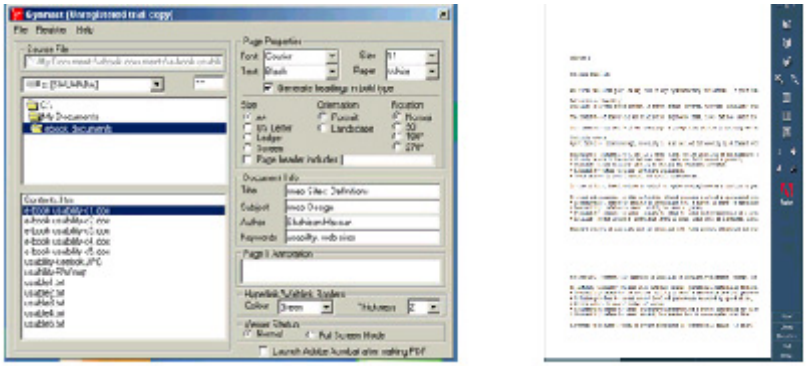

Figure 1. Book converted using Gymnast and read in Acrobat eBook Reader

The layout of the form is fairly simple and easy to understand, and it requires users to fill in some information regarding the document to be converted, which includes source files, document information, and page properties. Once finished, users can convert the file by choosing the conversion option in the "File" pull-down menu. To read the book, users have to launch the Acrobat eBook Reader. In our study, the document files used were successfully converted although some tables and figures appeared to be missing.Unlike Gymnast, Keebook Creator allows users to build books and view them within the same environment. When the program is launched, users are prompted with option to open an existing or a new project. If users opt for a new project, a dialogue wizard box is opened where users can provide information on the book title, author, and where to locate the book in the library book. Then users can start building books by creating chapters, inserting the source document files into chapters, and editing the table of contents. In our study, the book was successfully created without major problems.

The only concern was that any file imported was converted into one long page, making readers scroll down to read a particular chapter. This software is unable to convert the document file into its original page-by-page format as Gymnast does. Nonetheless, the software has a usable interface with features that are easy to use and understand. It allows users to build books in several viewing modes including library mode.Building e-books in ReaderWork is slightly easier than Gymnast and Keebook. Its interface is more professional and the menu is based on the step-by-step process of building a book as normally executed by authors (Figure 2). Using this software, users can easily add source files, define book properties, insert a table of contents, design the cover page and, most importantly, define the

navigation system within the book. Compared to the previous two compilers, users can add more information in the book properties, for example, descriptions, co-authors, publishers, date, type, and copyright statement.

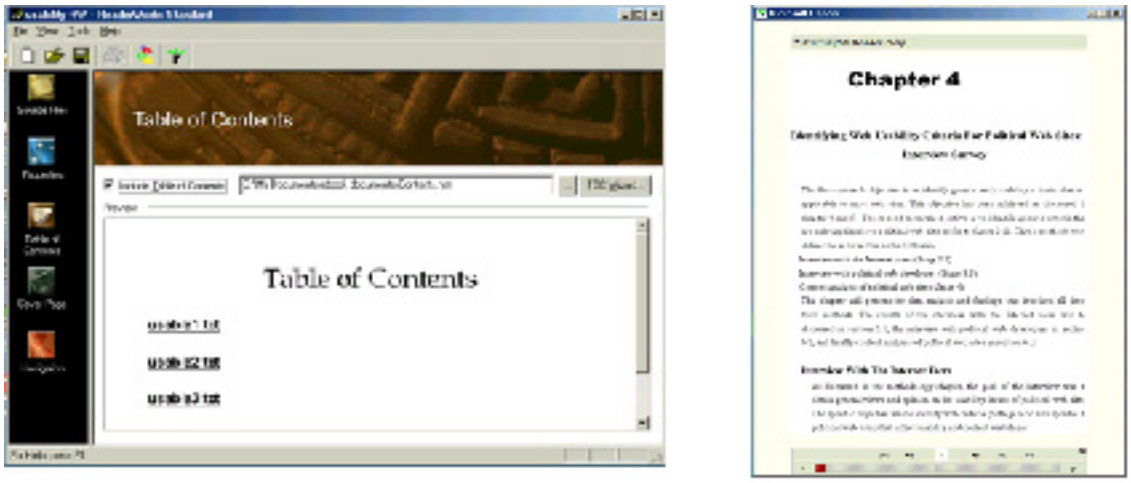

Figure 2. Book compiled in Microsoft Reader Works and read in Microsoft Reader

From this evaluation, we concluded that the best reader and compiler for inexperienced writers are Microsoft products (i.e. Microsoft ReaderWorks and Reader). This result informed an experiment to demonstrate how e-books can enhance interaction in distance education, as discussed in the next section.

3. CONCLUSION

Current developments in e-book technology will be described and the results of two experiments reported. The primary aim of the experiments is to explore the potential for using e-books in supporting distance education. It will be inappropriate to generalize the findings if only a few students participate in the experiments, but we shall try to demonstrate that e-books have potential in enhancing educator-student interaction. The findings also show that students are interested in using e-book technology. It is suggested that more studies using larger samples should be directed at exploring the potential, effect and impact of e-books in distance education.

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