

The Integrated eBook - the Convergence of eBook, Companion Web Site, and eLearning

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ABSTRACT

In recent years, universities have adopted eLearning solutions as part of their learning resources to provide students with digital and multimedia content. The effect of this strategy is that the educational materials in electronic format are replacing in part (or as a whole) the classic printed books. In this paper we present our strategy of integrating in a single resource an electronic book with a companion eLearning website. Instead of considering the textbook and the eLearning website as two distinct resources that have to be adopted by the students of the course, here we propose a unified approach that integrates both in a single resource.

Categories and Subject Descriptors

K.3.1 [Computer Uses in Education]: Computer-assisted instruction

General Terms

Documentation, Human Factors

Keywords

eLearning, eBooks, companion website

1. INTRODUCTION

Over a number of years we have witnessed important developments in the fields of eLearning, the Internet, and digital libraries. Universities around the world have experienced eLearning at different levels, from a simple web page containing links to the digital materials of the course, to whole bachelor's and master's programs entirely provided on-line using web based distance education (such as the the on-line computer engineering degree run by the Politecnico di Milano, the first totally on-line Italian Computer Engineering Degree started in September 2000 [5]). After initial criticism, eLearning has now become widely accepted in univer-

sities as well as in companies [4]. The benefits and potential of eLearning (flexibility, interactivity, accessibility, etc.) have been largely demonstrated and acknowledged by the majority of the educational community [1].

With the introduction of eLearning in universities, the role of books in education has changed slightly. Since Johannes Gutenberg's invention of the method of printing with moveable metal letters in 1436, books have been the main media for storing and spreading knowledge in every discipline of human knowledge. Books are also one of the most creative forms of art and cultural heritage of any society. Since books are the ideal instrument for the containment of human knowledge, they have been adopted in many forms and levels of education to complement the lectures given by teachers and instructors.

In the digital age, with the adoption of eLearning, the need for books in educational contexts is becoming less important. In fact, one of the main claims of eLearning is that learners may benefit from the multimedia and interactive content. Basically, with respect to the classical printed books, multimedia has the potential to be very *flexible* (different materials or levels of navigation of materials can be set out for different users), *interactive* (students can try different on-line exercises and experiments, and receive immediate feedback), and *collaborative* (students can discuss specific topics of the course or try real-life case studies, contributing new training material for their peers in future editions of the course). In this context, books do still have an important role in the educational process, however, they are very often complemented (and sometimes even replaced) by digital multimedia content specifically created for an eLearning course.

Another important resource that appeared in the digital age are electronic books, or *eBooks*. An eBook is a literary work produced and delivered in digital format. Often eBooks are bundled by publishers on the Web and need a particular software to be read (such as Adobe Acrobat Reader), or a dedicated piece of hardware, called *eBook device* or *eBook reader* (such as the new Amazon Kindle). eBooks were launched in the mid '90's, with the introduction of eBook readers (we can cite for example the SoftBook reader and the Franklin eBookMan, both specifically designed for replacing books with digital content, but now discontinued). In their original conception, eBooks were thought of as paper books converted to a digital format to be displayed on a computer, with the main purpose of economizing the cost of printing and facilitating the delivery pro-

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cess. In the beginning of the '90's eBooks were thought of as the future of publishing. However nowadays, in the era of mobile phones, PDA, iPod and Wi-fi, books and other print-based media still proliferate and contribute to the harvesting of forests and paper-wastage.

In the grey area between printed books and eBooks we may find a useful digital resource that makes use of the Web to provide additional features: the so-called "book companion websites". They are websites specifically built to provide additional information and resources for the book. In most cases they are maintained by the authors, and the reader can find useful materials such as the "errata corrige", examples or source code (for instance in the case of a book on a programming language), and, for teachers, presentation slides that can be used in the classroom.

Although eLearning and digital books are two similar fields, people in these two disciplines work quite separately to (or only marginally related to) each other. The reason could be that eBooks have always been considered as a mere transposition of a printed book into digital format, without considering that the text, when converted into a digital format, has some advantages that cannot be found in the printed format. In particular, an eBook can be printed in parts, searched, distributed instantly at no cost, annotated with personal notes, readable with lightweight devices (such as PDA), and finally may contain links to internal and external resources. The potential application of eBooks in eLearning has been studied in some circumstances and some interesting results have been proposed [3].

In this paper we report our experience of producing an integrated solution: an eBook with a coupled website to run eLearning in a university course. Instead of considering the adopted book and the eLearning website as two distinct resources that have to be employed by the students of the course, we suggest a unified approach that integrates these two resources into a single product. The remaining part of this paper will show our adopted approach that allowed the integration of the content materials and the interactive activities in a unified resource of the course.

2. THE INTEGRATION OF THE EBOOK WITH THE ELEARNING WEBSITE

The project is aimed at giving the students of a course on Information Visualization, taught at the Faculty of Communication Sciences of the University of Lugano, the texts, multimedia material and the interactive activities of the course. A number of books on this topic already exist. However, our experience with previous editions of this course show us that the printed book isn't the ideal support for the content of this domain. In fact, the most interesting techniques and tools of Information Visualization consist of dynamic and interactive applications. Students can learn (and appreciate) these techniques better when they try them themselves under practical, real-world conditions, or when these concepts are illustrated with a video or an animation. The printed books don't work well in this case.

For this reason, we decided to explore the opportunities provided by eBooks to create a textbook for the course. With respect to the paper version, eBooks offer interesting advantages. An eBook doesn't need to be printed (lowering the cost of the book), can perform searches in the text, can be read by special software (useful for visually impaired

people), and may contain hyperlinks to internal and external resources. Hyperlinks may transform an eBook into a very versatile and powerful text for a course. In particular, hyperlinks can be used to bring the student, while reading the text, to a number of educational resources that cannot be included in the text of the course, such as multimedia materials, interactive exercises, quizzes, discussions, etc.

We decided to integrate the eBook with an eLearning website, and the eBook contains hyperlinks to the contents and activities provided by the eLearning website. This website gives the students a twofold advantage. It can be used as the usual eLearning platform of the course, which includes, among other things, the schedule of the course, the syllabus, the discussions, the assignment, and the exercises. In addition, it offers a platform to extend the eBook with additional materials that, by their nature, don't fit well in a text, such as multimedia and interactive materials.

The eBook was prepared using the \LaTeX typesetting system, a family of tools based on Donald E. Knuth's TeX typesetting language that creates professional, high-quality documents. \LaTeX has become the standard method of communicating and publishing documents in many academic disciplines. The hyperref package has been used to handle cross-referencing commands in \LaTeX and to produce links to external documents and URLs. The final result of the \LaTeX document preparation system is a PDF file that can be distributed to the users without any further processing. Moreover, \LaTeX is released as Free Software and is available on Linux/Unix operating systems. This means that we can prepare eBooks using \LaTeX without software license costs.

The eLearning website was implemented using the Moodle Learning Management System¹. Moodle is a free, Open Source software package with a large community of users designed to help educators create on-line courses with opportunities for rich interaction. Moodle has been selected for its peculiarity of being adaptable to our needs.

An important aspect we had to solve was the issue of hyperlinks from the eBook to the website, and the links to the external websites that are not maintained by the author of the eBook. We wanted to create links to specific resource pages of the Moodle platform. The main issue to solve was finding a way to guarantee that the links will still continue to work in future releases of the software or even in case of changes to the software platform. In fact, the developers of the eLearning software may decide to change the URLs of web pages in a future release of the program. A way to overcome this problem is by adopting a mapping of URLs from the eBook to the eLearning website. A mapping of URLs allows for an easy transition to new releases of the software, or even to different software systems, without re-editing the eBook. To this end, we implemented a basic script that maps the links from the eBook to the specific Moodle resources. The script is implemented in PHP on the server side, and uses a conversion table that the author can edit easily, through a text configuration file (see Figure 1).

The other problem is the links to generic websites that are not managed by the author of the eBook. Putting links to external URLs in the eBook could be a problem, as the frequent changing of the URL address of a page is a well known problem of the Web. We have no guarantee that a particular URL address will be still valid in the future. To overcome

¹<http://moodle.org>

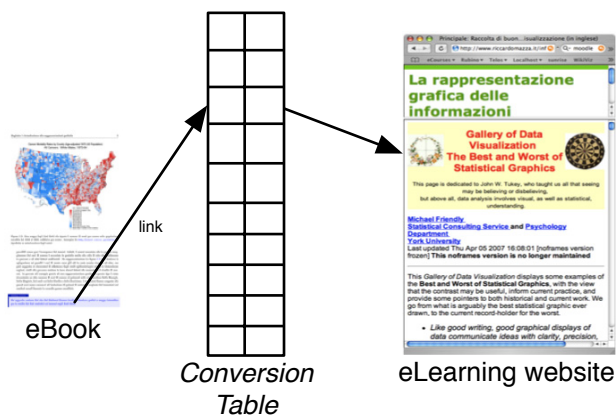


Figure 1: Mapping of links from the eBook to the eLearning website.

this problem, we decided to put links to external URLs as a specific resource of the eLearning website, and to direct the eBook links only to the eLearning website. In this way, if the URL address of a Web resource changes, the author has only to update the URL in the eLearning website without changing the content of the eBook (the new production and new delivery of which would be more problematic than just updating a link in a website).

3. AN EBOOK FOR THE UNIVERSITY COURSE

The basic reference text of the course on Information Visualization is an eBook delivered in PDF, written by the author of this paper and published by Apogeo, Milan [2]. Apogeo is a young publishing house, which has always been interested in the latest advances in publishing technologies. The eBook is structured like any other university level textbook. In fact, it can be printed and read like any other text book.

However, this eBook possesses more than a typical university book: a high number of hyperlinks that point to external resources that, by their nature, cannot be included in a text book. Three types of links are included:

- **Reference links** – these links take the reader to a page of the eLearning website that gives further materials which aid a deeper understanding and learning of a specific topic of the course. Reference links are usually placed at the end of every section or subsection of the text. Reference links are particularly useful with dynamic and interactive applications and techniques. For example, the Hyperbolic Browser is an Information Visualization technique that allows the exploration of a large tree data structure. This technique is described in the eBook with images and text. However, the students have a full understanding of this technique only when they try to use an Hyperbolic Browser application. For this reason the eBook contains a hyperlink to a Web page that contains a working demo (with an applet) of this application. Students (but also readers of the book, that are not enrolled in the course) can read the description of this technique and see some images

(like in any other book) and, when they are reading the eBook on-line, can also use the application in a active way.

- **Activity links** – are placed at the end of each chapter, and lead the reader to specific activities related to the chapter. Among the activities, readers may find a dedicated discussion forum and a set of quiz tests, consisting of multiple choice, true-false, and short answer questions. Students and readers of the eBook can discuss specific topics of the domain and evaluate their understanding with quizzes.
- **Generic links** – are not related to a specific topic or part of the domain. These are links to the page with the *errata corrige* of the book, a video of the author introducing the eBook and the eLearning website to the reader, links to other useful resources for the domain, etc.

With respect to the classical university printed book, the eBook gives the students the possibility to have a reference book of the course, the possibility to have a deeper understanding of the domain with several on-line resources existing on the web (that are not covered in the usual classroom sessions due to time restrictions), and a number of eLearning activities that are tightly coupled with the text of the book.

Moreover, the eLearning website can support both the students of the course and the occasional reader who is not enrolled in any university course, who can take part in the discussions and try to solve the quizzes.

The author (and instructor of the course), thanks to the monitoring and tracking facilities provided by the eLearning platform, is able to track the activities performed by the students (and by the readers of the eBook). He can know exactly how many people have accessed the website, which materials of the website are most and least read, the history of pages visited by a specific reader and the grade he received in the quizzes.

4. CONCLUSIONS

In this paper we have presented our effort of setting up a complete, interactive, on-line, interconnected number of resources for a university course. The basic teaching materials are represented by an eBook, which exploits the opportunity of hyperlinks to connect the concepts of the course with multimedia materials, websites, discussions, quizzes, and so on. With respect to the classic printed book, or to the courses in which learning materials are only provided in an eLearning website, the integrated eBook represents a flexible resource with some interesting advantages:

- Can be printed and used like any other textbook of the course. It's known that a large population of students find reading long texts from a screen an unpleasant experience and, therefore, they prefer to select and print selected chapters instead of reading these from a computer screen.
- Can be used as a basic reference for eLearning activities supported by the materials provided by the Moodle eLearning Course Management System. The eLearning website can store those on-line resources

that cannot be included in the eBook. An efficient web linking mechanism with a specific page of the website puts the on-line activities in relation to the appropriate sections of the eBook.

The eBook has been published by Apogeo Editore and the website can be reached at this URL:

<http://www.riccardomazza.it/infovis/ebook>.

As the next step, we will be adopting the eBook and the eLearning website in the next edition of the course, in September 2008, and we plan to evaluate its acceptance with the students of the class as well as collecting some feedback from them.

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