Free Books; Why all my Students Buy, Read and Keep the Textbook

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1. Introduction

Books command a special reverence within the academic world, and I am not exempt from their power. In my case, I have approximately 29 cubic feet of shelf space allocated to books that I own and need regularly. At one time or another I have actually read many of them, but now 'regular' usage means a few pages are needed for reference once every few months, or years. There are another 15 cubic feet of books stored in boxes because they are only needed for irregular usage. Before the advent of the Internet, paper was the best medium for transferring information in forms such as books. At this point it still offers some tactile stimulation, but it lacks the convenience and power of an electronic form. In practical terms each book only needs a few megabytes of disk space. I could fit my entire collection of books on a few CDs or easily lose the entire collection on my hard drive. The best reason for books to be in paper form it to control how they are distributed. Given the benefits, it is inevitable that people will prefer to adopt books that are freed from paper.

Our students have grown up in an environment where most information can be found with a few well chosen mouse clicks. Many no longer (or ever did) see the library as the best place to find answers. From their perspective, most of the information they have ever 'needed' could be found on the Internet, and was free! This is illustrated by the increasing number of students who don't buy required books, or students who sell back books at the end of a course [4]. This has prompted some creative responses from publishers, such as consumable textbooks and frequently renumbering homework problems. But, the root of the problem is in a mismatch between the widening gap between the cost of textbooks and the economic value perceived by the students. The solution is to free the books from the financial costs.

2. Books; Past, Present and Future

Books have become so ubiquitous that we rarely think about what they are. Some of the common features of a modern textbook are listed below.

- a book addresses a clearly focused topic addressing a market need
- textbooks are organized into chapters to be read sequentially
- books are often limited to a few hundred pages in length for economic reasons
- the writing level is focused on readers with specific knowledge and interests
- books are printed in editions that are released in static forms that don't change
- textbooks are relatively expensive and require marketing and distribution
- there is a delay of months or years to release a new edition

By necessity a publisher must develop a book that addresses an identifiable need while controlling costs. In pragmatic terms a book must not try to be all things to all readers.

2.1 Past

From my own experiences textbooks are very important. In my days as a student I could extract most of the required information from the textbook, and the course notes. In the instances where the textbook proved insufficient I would use other sources in the library, or as a last resort the teaching assistants or professors. Unfortunately, going to other sources often required waiting until the next day, or spending time going to the library, finding books, and then browsing for what I needed. As a result I would focus on the course textbook for answers. Even a poorly written textbook would often provide needed answers with careful reading. The careful reading probably occurred because there was no choice. After a while it became a natural skill.

2.2 Present

We are currently in a period of change, driven by the Internet, or more specifically the World Wide Web. Most students have had some form of Internet access since the mid-90s, and many currently have a high speed connection where they live. My campus has wireless access, allowing students to travel freely with their computers. In practice, students have easy access to the Internet most places they go.

Being a communication tool, the Internet makes it possible for students to access information from multiple sources very quickly. Using search engines, students can often access information on any topic within a few mouse clicks. This is not to say they are accessing information that is factual, or if it is the information they need. Regardless of the results, there is a very quick 'pay-

off' for very little effort. The result is a feeling that the right is information is only a few clicks away [6]. Unlike the information in a textbook, very little of the information targeted to the student learning a subject. Students will often spend much longer on the Internet going between sales brochures in electronic form to research papers looking for the information they need. In my experience, students will spend more time looking for the answer than it would take to just work through the book. Many students have also adopted a learning style that can best be described as 'random access', that focuses on getting the information at the right time, as opposed to learning and then applying. In other words they focus on the index (the analog of a 'search' function) instead of a table of contents.

Again, ignoring the quality of the content on the Internet, students have had many years of experience on the Internet. In that time they have seen vast quantities of information available at no cost. The subtle lesson they have learned is that *information is abundant and is available at no cost*. For many this has spilled over to many other aspects of their lives, and is evident through things such as,

- peer-to-peer music and movie sharing

- pirated software

- free software such as browsers, operating systems and game demos

- free books and information [7][8]

It is becoming more common that students don't buy textbooks, and often sell the books at the end of the course. When I was a student a used book was hard to find, now they are common. A casual line of logic would conclude that they are not avoiding the content of the books, but the cost.

The content of the information on the Internet is highly variable. It ranges from the worst with 'junk' that promotes perpetual motion and urban legends. In the middle of the spectrum is information presented with a bias. Most notably commercial sites often present information selectively towards commercial gains. The better information tends to result from experts and professional societies with interests in sharing knowledge and educating. The key element for good information for students is an unbiased approach that focuses on learning and integrity. Most higher education website combine these practices with the desire to share information, tending to result in useful information for students.

2.3 The Future

It is easy to conclude that as the Internet grows, so will the quantity of information available. This will create more competition for the 'for pay' information on the Internet and in book form. There is no question that the business model of many publishers will have to change fundamentally. The music industry is already facing this issue. A minute of music consumes approximately 1MB of

disk space. As a result music has been easy to store and trade. The music and publishing industries are similar in that they are maintaining the printed/recorded media as a method of protecting their markets. At present a textbook produced in electronic form can fit in a few MB of disk space. A scanned textbook would require a few hundred MB of disk space. In practical terms we can expect file-sharing to occur for scanned copies of textbooks.

The cost of computers and Internet connections are continually dropping, and have become common requirements for students [9]. In particular, the number of students using laptops every year is increasing. Eventually laptops, or a successor, will be carried by every student, as calculators are now. This will not only eliminate the need for paper copies, but create a demand for digital formats for compactness. The fluidity of electronic file formats will also create a demand for the right to edit the files to add notations. The portability of electronic formats will continue to reduce the barriers to reproduction and multiple users.

These changes will not necessarily mean the end of books, but the embodiment of a monolithic volume printed on paper will not continue as the method of choice [5].

3. The Solution

I have started developing a set of books [1], [2], [3] that are available on the Internet in electronic form. The books are each between 500 and 1,000 pages, but the average PDF file size is about 5MB. These books began as sets of supplements for course textbooks. Over time they were refined and expanded to course notes and eventually textbooks. In most cases the books are for senior level courses and would not have enough market demand to justify publication without removing significant amounts of material. In other words, only a very foolish publisher would approach a costly book for a very small market, regardless of the usefulness. The alternative was to make them available on the Internet. At this point in time I have kept a 'license' that permits individual usage, but prohibits commercialization. To date there have been many people downloading and using the books [10]. It is also easy to distribute supplemental materials with the books, such as source code and lecture slides.

For the most part, the books have not been through a formal peer review process. But, they have been undergoing continuous updates based upon comments and problems exposed by the students, and people who have read it on the Internet. In my experience, the feedback I have been using is much stronger than that I would expect from a formal peer reviewer. The books are updated frequently, at least once a year as courses are offered. To accommodate this I have begun to use version numbers instead of edition numbers to help clarify the magnitude of changes. In addition the older versions are all available for download. This is important for faculty who have developed courses using a certain version of the book, and don't want to use a new version.

4. Conclusion

My experiences to date with electronic publishing have been very gratifying. In practical terms I have spent a relatively small amount of time to develop teaching materials that I have desperately needed for years. And, while they serve my needs well, I can also share them with others who also benefit. At this point in time the work is not finished, there are a number of issues which I am still investigating.

Intellectual Property Issues - there are a variety of models from completely free, including the right to change the material to fully restrictive. For reasons stated before, the free alternatives are very desirable.

Distribution - At present there are few centralized distribution points for free electronic books [7]. Most of these are not well known, or don't focus on textbooks.

Electronic Formats - A non-commercial format is needed that is compact but can be edited. This needs to include graphics, hypertext and other modern elements.

Paper - Many people still want paper copies. There are some services that will store electronic books and produce paper copies, but more are needed.

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Biography

Hugh Jack earned his bachelors degree in electrical engineering, and masters and Ph.D. degrees in mechanical engineering at the University of Western Ontario. He is currently an associate professor at Grand Valley State University and chairs the graduate and manufacturing programs. His research interests include using open source software for industrial control. You can get more information at his server (http://claymore.engineer.gvsu.edu).