A Comprehensive Strategy Framework for e-Textbook in the Coming Digital Society for Learning

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Abstract—**The Princeton University held a pilot experiment on the current e-reader using in the classroom. The classroom experience was worsened by using e-reader, unsurprisingly. Meanwhile her final report in 2010 shows some valuable suggestion for future e-book manufacturers. However, the success of a product locates not only on its advanced technique but also on its stakeholders and business model. Take the e-book reader Kindle for example. Its success is largely owing to a specific position of "Reading" and online book sales. While during its marching to campus, it is obviously not valid any more. In this paper, we go through the research and practice of e-books recently as well as reflect the e-reader pilot at Princeton. We then propose a comprehensive strategy framework for e-Textbook that is composed of three dimensions: information goods, technology, and stakeholders. Tracing on the path of e-book reader, we march to e-Textbook. During this journey, we not only highlight solutions to the problems e-Textbooks will encounter, but also propose valuable business models for future e-Textbook.**

Keywords- e-book; e-Textbook; business mode; e-Reader

I. INTRODUCTION

There has been already 42 years for the development of e-books since Alan Kay originally proposed the concept of Dynabook in 1968. Meanwhile, the researchers, enterprises, and governments have developed and promoted the applications of e-books in various concepts, ways, and techniques. Such situation presented the e-books fruitful definitions and facets [4, 8, 10].

There are several different facets for the e-books. For the content side, the e-books may be digitalized books, online database, CD-ROM. For the device side, the e-books may be portable device for storage contents or browsing information. Even simpler, e-books maybe the digital contents as usually recognized. In this way, the development approaches are various as follows: content, composer, container, channel, and consultant [1]. Under different supports of projects,

various technique development approaches come across their versatile requirements and user groups.

Same as the above situations, scholars have different definitions in the context and popularity for the e-books. That is the reason why the research issues presented versatile facets and results. In this paper, we adopt a broader definition: the e-books are not only digital contents, but also the portable devices/ carriers, access interfaces, and system for information browsing and integrating.

In 2007, the e-book reader, Kindle promoted by Amazon popularized the global e-books development and digital reading trend. The success is owing to the mechanism of online sale, digital reading techniques and hardware. The trend forced the other big electronic company, SONY, resumed its e-book development project. SONY promoted a new style e-book reader, and transformed its proprietary specification of e-book content into a general specification, e-PUB (short for electronic publication). In 2009, Barnes and Noble promoted e-book reader of its own brand, even she has already given up the sales of digital books long before in 2003. Insta, a market research institute, predicts the global e-book device shipments will raise from nearly one million in 2008 to thirty million, that will be a market scale of eleven billion. The next target for digitalized will be the great population of textbooks. Forrester predicts the textbooks will be the greatest e-book reader market five years later. A recent published report "E-Textbooks in Higher Education" [16], it examines the lessons learned from the various implementations of e-textbooks on college campuses in the 2009-2010 academic year and portends for the coming years. It also notes that the e-textbook is now in its important stage of learning curve.

In 2009, the Princeton University held a pilot experiment on the current e-reader using in the classroom. The classroom experience was worsened by using e-reader, unsurprisingly. Meanwhile her final report in 2010 shows some valuable suggestion for future e-book manufacturers such as annotation tools, pagination, content organization, and in achieving a more natural "paper-like" user experience

[18, 19]. We emphasize here that all the required techniques will be achieved by the manufactures soon. What left unsolved are the habits of stakeholders, especially the teachers and students.

Reading is an important part of learning; however, it is not vice versa. Reading is not equal to learning. The textbook has its specific usage for learning. The textbook has its own characteristic use habits and application environments. Thus the development of e-textbook definitely needs a different position of e-book. Under current basis of e-book, we should develop learning related technique functions and usage process, provide suitable online platform as well. In this way, the learners and instructors may enjoy reading the e-book. Moreover, under the enabling of e-textbook, they may construct an environment for digital learning interaction, and reach the goal of e-learning.

Contrary to the prosperity of e-book, let us take a look at the textbook market. Currently, in the United States, the publishers find great obstacles selling the online components of the textbook, due to the maturity of environment as well as the technology resistance of instructors. In addition, there should be a better pricing mechanism in balancing the huge cost of developing online components and the great burden of students. The vibrant second-hand textbook market may portray part of facets of the ecology.

The remainder of this paper is organized as follows. Section 2 details the major problems in marching from e-book to e-Textbook, nature of e-Textbook, the benefits of users and markets, and the requirements for its innovations.

Section 3 proposes our comprehensive strategy framework from the perspective of information goods, technology, and stakeholders. Section 4 states the possible business models under this framework. Finally, conclusions and future applications are given in Section 5.

II. MARCHING FROM E-BOOK TO E-TEXTBOOK

The success of e-book cannot guarantee the success of e-Textbook according to the characteristics of e-books stated above. In the developing of e-Textbook, we will face several major problems. We analysis with a systematic approach composed of three dimensions: information goods, technology, and students' habits. Followed this, we detail the nature of e-Textbook and the requirements for its innovations.

A. The Problems Faced When Moving from E-book toward e-Textbook

From the development process of e-book and the background of digitalized text textbook, we figure out six major problems for e-textbook from current studies [9, 12, 15, 17]. (1) learning vs. Reading, (2) E-ink or i-Pad, (3) service vs. product, (4) proprietary vs. Open, (5) interface function, and (6) cash flow mechanism. We detail them with a systematic approach that is composed of three dimensions: information goods, technology, and students' habits. They are depicted in Table 1.

TABLE 1 THE PROBLEMS FACED WHEN MOVING FROM E-BOOK TOWARD E-TEXTBOOK

Perspective	Option A	Option B	Considerations
Information Goods			
	product	service	Single product or bundled services
	pricing	costs	Reasonable, acceptable, comprises, sales, costs, services, for teachers. cash flow, stakeholders, needs
Technology			
	E-ink	i-Pad	usability, reading habits, interaction
	proprietary	open	Market, communication, benefit to all
	simple	flexibility	Interface, Behaviour, learning processes, flows, flexibility
			Software, hardware
Students' Habits			
	reading	learning	Interaction
			Chapter or whole book, e-Publisher industry

1) Problems Faced in the e-Textbook
a) The Perspective of Information Goods
(1) Service or Product?

We have to keep in mind that the big success of Kindle is not just because it is only a product. Besides the portable E-ink display interface, it is also composed of Amazon's online book ordering services. Through the use of network, it is empowered with the marketing, digitalized book, delivery of

magazine and books, browser interface, connectivity to information, the online shelf of the platform enables every user have his own central storage spaces, the extensions of application and function enable every Kindle have its own e-mail account to communicate the digital contents. Thus, when we face the promotion from e-book reader to e-Textbook. We strongly posit that e-Textbook is just equivalent to the simple thinking of combining e-book and textbook digitalization [12].

We have to plan the function specification of e-Textbook properly. Moreover, we get to have an integration of product, service, and platform. Then we will have a way to success in promoting e-Textbook.

(2) Pricing

The iPod and iTunes of Apple have changed not only the pricing thinking but the market of digital music. The related stakeholders of digital music have now acknowledged that USD$ 0.99 each song is a reasonable price for consumers to get. Amazon has gradually leading the price strategy, too. She sets the price level of USD$ 9.9 each digital book because of her leading place in online book sales and success of Kindle. However, there are still many comprises among teaching and learning, limitation of sales, high costs, and the services for teachers.

Therefore, in the e-Textbook industry, the suitable cash flow mechanism must be well established. The stakeholders including authors, publisher, teachers, and students. They have to deal with the common pricing strategy to satisfy their needs. Through the clearing and cash flow mechanism, the reasonable price to get the digital textbook must be recognized by the stakeholders in getting not only the digital contents but also the paper version.

b) The Perspective of Technology

(1) E-ink or i-Pad

We have to face the problem of use after the digitalization of books. Many researches show that it is the usability, which hinder reader to use the e-book [3, 6, 7, 12]. For the reading habits, [1] stated the readers prefer paper books because it is difficult in reading on the screen. The e-book readers which use the reflective-like technique of E-ink electronic paper make themselves to be near to paper books. While the technique characteristic of low response of E-ink electronic paper also limit, e.g. it cannot scroll the digital contents or paging the contents. Besides, the better ability of interaction and information retrieval are what digitalized books should specially possess [14]. However, the iPad sales hit two million in April 2010 shows the opposite strength.

(2) Proprietary or open system

The development of e-book shows a trend from proprietary to open system both on the software and hardware. In early development, the system specification goes proprietarily for reaching each own objective. However, it limited the development of whole e-book industry. On the contrary, facing the trend of open system, Amazon develops Kindle DX for popular file specifications as pdf of Adobe and Office of Microsoft. The same situation occurred in the pioneer electronic company, SONY. She abandoned her own

e-book specification and engaged the common standard of e-book content specification named e-PUB. Therefore, we should remember the lesson [9]. Open minds create more better developments for the industry.

(3) Interface Functions

Current interface functions of e-book reader are positioned to reading. These may not be completely matched all the necessary functions in promoting e-book reader to textbooks. Instead of directly fitting the learning behaviour of paper textbook to the e-Textbook [9, 12], it is necessary to research and confirm the learning processes needed in the e-Textbook. Such processes consist of interface, functions, and the flows.

c) The Perspective of Students' Habits

There are distinct human factors between the process of learning and reading. The study of campus e-book by [13] noted few people read the entire book. Most of the readers read only several chapters but not the whole book. The average time they spend on e-book is less than 20 minutes. From the teaching practice in the university, most of the teachers will choose some chapters as specified materials, and add some supplementary materials. Thus, the mechanism of e-Textbook should provide chapter by chapter instead of whole book.

Reading is much about personal activity. However, besides the above activity, learning effects are much owing to the interactions among teacher, student, and peers. Hereby, the current e-book readers have to make great progress on the interaction functions in order to apply to domain of learning.

In learning or textbook, the needs of chapter or whole book are diverse. This situation is quite different from in reading. The e-Publisher industry has begun to think a new pricing mechanism for chapter by chapter and a whole book.

2) Requirements for Consumers and Market

Many studies reveal the requirements for consumers and market for current e-books. The largest survey in the use of e-book so far is the survey of MyiLibrary of JISC in England. After a survey of 22,437 users from more than 120 universities, it showed that nearly 62 percent of students have already used e-books in their researches or instructions [13]. Reference [11] surveyed on Denver University showed that 51 percent of students do use the e-books, 56.6 percent of them read more than one chapter online but not printing out. More and more people use e-books because of saving printing fare and convenience [17]. The students use e-books three times of paper books [7]. The trend of e-book entering into campus for learning is obvious. As stated above, Forrester predicts the textbooks will be the greatest e-book reader market five years later.

Although the trend is emerging, there is still great inconvenience in using e-books, which hinders the popularity and promotion. The major inconveniences encountered are subsequently "not used to reading on the screen for a long time", "special devices needed or technical problems", "inferior quality", "hard to read and browse", and "lack of ability in searching local contents" [5, 6, 11, 15].

The above inconveniences show the requirements for users in the development of e-books. In moving to e-Textbook, despite the digital contents, there must be convenient terminal reading devices, convenient operation, humanistic action flows, speed for information searching and interaction. To meet the needs of textbooks, there are some important requirements as follows: the total mechanism must be convenient and complete to support instruction, strategy of sales and Profit sharing to support whole book and chapter-by-chapter, function of printing on demand (POD), sales and service chain for click and mortar, an integrated platform for learning and logistics.

B. Nature of e-Textbook

The e-Textbook is kind of technology–mediated learning by nature. The technology here is as mediation and communication for learning. For the mediation, as stated above, we have to fit the e-Textbook to the characteristics of learning. For the communication, learning is not independent activity but a community of practice.

Learning also happens in the interaction among the teachers, students, and textbooks or auxiliary materials. Such situation is both un-substitute and un- duplicate.

C. Requirements for Innovations

Currently the e-Textbook is on its way to innovations. We begin with the lessons learned from some company with vision. We then draw the future requirements for e-Textbooks and finally explore the innovations for e-Textbooks. We depict there is a spectrum moving from e-book, e-book for learning, to e-Textbook.

1) Lesson Learned from e-books

O'Reilly Media Group put her feet in the e-book market early in 1987. At that time, she boldly held the opinion of throwaway DRM (digital rights management) and multi channels simultaneously. The benefit today shows the value of such strategy. In O'Reilly's opinion, publication being invisible is far terrible than being pirated. It can do more harm to the authors using the DRM to avoid pirates.

Owing to the strategy of open to digital contents and value-added services, O'Reilly Media enables her e-book users to own various versions for different kinds of terminal readers, to do multiple downloads, to enjoy the latest version all their life. Instead of limiting, she shows the strategy of open, multiple channels, and sharing. This strategy makes the publication ubiquitously.

The lesson learned from O'Reilly Media Group is valuable to the development of e-Textbooks. In the age of information explosion, publishers have to change their roles from information providers to services providers. The consumers do not pay for the contents but for the value. The value for the publishers is the knowledge rectification, arrangements, and mediation. Moreover, the information communication technologies (ICTs) provide the new value of ubiquitous and integrated services. This is the key to success for e-Textbook mechanism.

Owing to the quick changing of time and knowledge, traditional time-wasting publishing cannot meet the quick updating for today. On the other side, this is just the niche for electronic publishing (e-Publishing) companies. They have to be a suitable mediator of knowledge communication. The textbooks are oriented for knowledge creation and learning. The need for knowledge communication is specially suitable and urgent for e-Publishing. The system for e-Textbook has to provide open shelf system, combination of current sales model, click and mortar in campus, continuous updating and supplements, service mechanism of Wiki and Web 2.0, and corresponding payment system.

2) Future Requirements for e-Textbooks

We can derive future requirements for e-Textbooks from the imagination of future benefits for users. They are stated as follows.

a) The implementation of the concept of electronic bags

Past experience of the electronic bags shows insufficient value-added application software, poverty of contents, unclear position of users, lack of team coordination, late for content rights, neglect of user habits, and lack of market education. Without regarding the electronic bags as a whole system can account for the failure. In this case, it is hard to integrate each component as well as comprehensive planning.

The technique of e-Textbook plays an important part in the future implementation of the concept of electronic bags.

b) e-learning community of practice

A well-planned system of e-Textbooks may fully utilize the connectivity of ICTs. Hence, such e-Textbook may connect people and information as well as integrate into the e-learning community of practice

c) New styles of e-Publishing industry

The publishing industry may employ ICTs for transformation. Such transformation may add the value needed in the age of information explosion. The e-Publishing system enables a new style of flexibility of publishing, quick mediation ability, and instant communication speed.

III. OUR PROPOSED FRAMEWORK

Following the backgrounds and requirements for innovations described in former two sections, we propose a comprehensive strategy framework for e-Textbook based on the concept of information goods, and stakeholders. The stages we concerned covers pre-class, in-class, and after class. In this way, we make the learning happen ubiquitously. They are depicted in Figure 1 and elaborated as follows.

Levels	Items			
Information Goods	Non open (e.g. DRM)/ open materials			
Technology	OSPH (e.g. MID)	OSOH (anyone)	PSPH (eg. Kindle)	PSOH (e.g. NoteBook)
Stakeholders	Authors, Publishers, Teachers, Students			

Figure 1. The comprehensive strategy framework for e-Textbook

A. The Level of Information Goods (open/ non-open)

As depicted in 1), in this level, we should consider not only the service or product, but the pricing mechanism. Through the lesson at Princeton, we may plan the function specification of e-Textbook properly. Moreover, we get to have an integration of product, service, and platform. Then we will have a way to success in promoting e-Textbook. Amazon has gradually leading the price strategy. She sets the price level of USD$ 9.9 each digital book because of her leading place in online book sales and success of Kindle. How can the related stakeholders of e-Textbook acknowledge a reasonable price for producers to take and for consumers to get. There are still many comprises among teaching and learning, limitation of sales, high costs, and the services for teachers. Through the clearing and cash flow mechanism, the reasonable price to get the digital textbook must be recognized by the stakeholders in getting not only the digital contents but also the paper version

B. The System for e-Textbook: Proprietary or Open System for Software (PS/OS)

Except running on a proprietary system, the e-Textbook reader may be developed in the open operating system, e. g. Android platform. Reference [2] argued that e-learning should promote from application level to function level. The application level contains sharing, presentation and media of materials and quizzes with ICTs. However, the function level consists of recording of learning process, statistics, reservation, and evaluation in passive function; analysing learning status, detecting learning myth, guiding learning, implementing planned instructions, and test/ evaluation in active functions.

Current e-book Readers do not emphasize the application and function level for e-learning. Even the Amazon Kindle has already provided a similar and basic Whispersync function for synchronization among multiple Kindles, it still lacks the learning records function, neither records learning status in order to analysis, no to mention the function of quiz or evaluation.

On the other hand, the Living Lab is a user centered innovation in real life scenarios. William J. Mitchell from MIT developed it[20]. It is user-centric research methods in real life environments to identify and build prototypes, and to evaluate multiple solutions. By means of the concept of Living Lab, we will put key stakeholders to co-develop in this experiment; we may evaluate and verify whether the functions of e-Textbook readers in Android platform can satisfy the learning needs.

For the platform and business mechanism, we also design an experiment of two classes in different schools. The consumer information and behaviour will be accumulated in the experiment. The results will validate the pricing strategy and institution.

C. The stakeholders in the e-Textbook industry

The stakeholders including authors, publisher, teachers, and students. For the authors, a well developed environment encourages their fruitful contributions. Since e-Publishing is unavoidable, the publishers have to embrace and try to create even more opportunities than ever. The most hardest part will be the habits of teachers and students. The habits of learning and teaching are not easily changed in a short period of time. In this case, they may suffer before they befit from the e-Textbook. The learning community of practice may be one of the possible solutions. As stated above, learning is not only personal activity but also a group one. The e-Textbook we design should meet the needs for learning community of practice. There are group installing and monitoring for the group learning, sharing and collaborating supports of various kinds of instruction approaches and learning style.

As the e-Textbook network platform, [14] stated that e-book should possess the following functions: interaction, hyperlink, browsing, searching, and link to online services, moreover, continuous updating. Several functions are expected in the e-Textbook network platform. There are Sharing, Web 2.0 knowledge spread, accumulate, and creation as stated above. Just think about it, even there is a great success at Princeton this time, the e-Textbook may not be available in other campuses on account of the different situation. That means only when we can grasp the characteristics of the students, the e-Textbook can be successful.

IV. THE BUSINESS MODEL

Based on the above framework for e-Textbook, there are several business models. The business model stated here focuses the trend of e-books, considers most of the backgrounds and requirements depicted in Section 2. It aims to create an open and integrated e-Textbook system. We stated the technical components and management issues in the business model respectively in this section.

As depicted in Figure 2, all the relations of the products and services are noted, the bones between them are the management issues to be handled. The technical components in the business model is four-fold: A. open, and sharing; B. personal services for authors, teachers, and learners; C. multiple channels of sales and cash flow; and D. the technologically ubiquitous learning environment.

A. Open and sharing

For the open and sharing part, there are (1) format transformation for e-book, (2) services across book sales platform, (3) shelving system, (4) service of sales chain with click and mortar, (5) supplementary materials of digitalized textbooks, and (6) mechanism of Web 2.0 like Wiki.
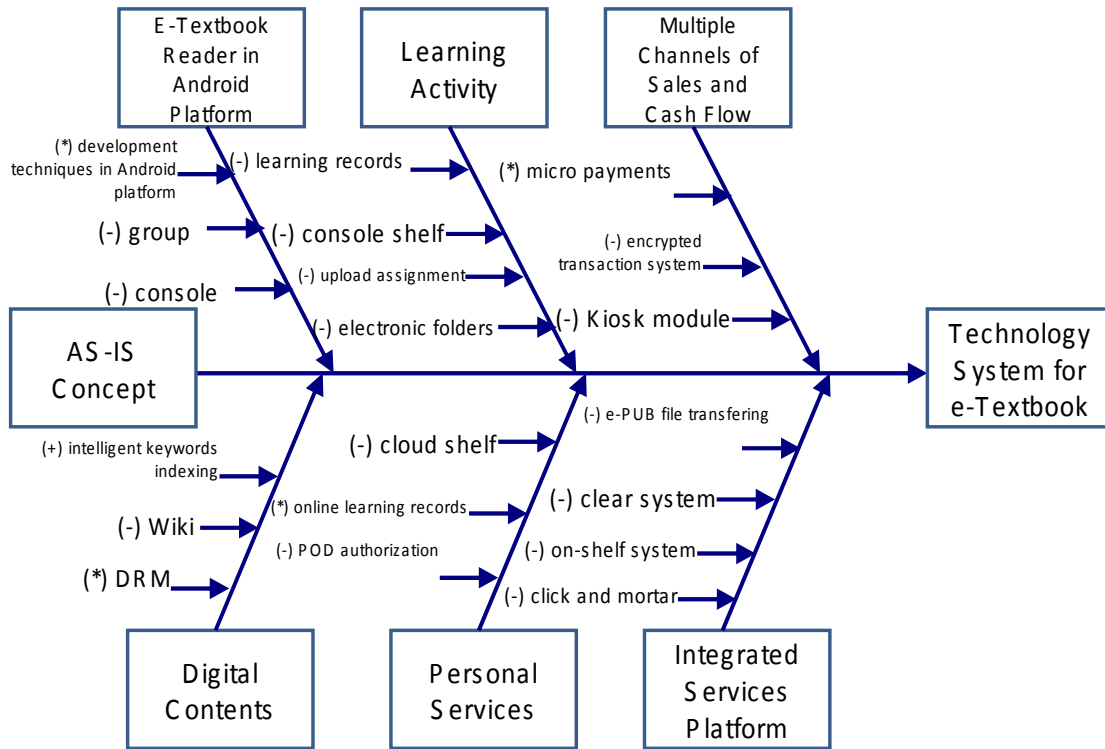
Figure 2. The relations of the products and services for the e-Textbooks (the signs denote the developments of product, technology, or service are * for developed, + for under developing, and - for will be developed in this project)

B. Personal services for authors, teachers, and learners

In this part of personal services for authors, teachers, and learners, there are (1) service of personal book store, (2) clearing and authorization chapter by chapter, (3) service of POD authorization, (4)   push service, and (5)   personal service.

C. Multiple channels of sales and cash flow

The multiple channels of sales and cash flow include: (1) sales of deposited encryption letter, (2)   sales interface of Easy card depositing, and (3) module of cash flow.

D. The technologically ubiquitous learning environment

As a technologically ubiquitous learning environment, there are (1) records for learning activities, (2) console shelf, (3) assignment uploading and quizzes, (4) electronic folders, (5) group, and (6) console.

V.   CONCLUSION AND FUTURE WORK

We have stated the efforts need to be elaborated when moving from e-books to e-Textbook. We highlight open problems regarding the technology as well as the way of distribution. Again, we emphasize that the lesson learned from the pilot at Princeton is not enough. Simplified speaking, advanced in technology only is not enough. The comprehensive strategy framework may cover the requisite needs. The stages covered in our proposed architecture covers pre-class, in-class, and after class. In this way, the learning will happen ubiquitously. The contributions of this paper to the approach and practice in e-Textbook industry are three-fold: (1) We go through the research and practice of e-books through a systematic survey framework, (2) We not only highlight solutions to the problems e-Textbooks will encounter, but also propose a framework for e-Textbook. (3) We also illustrate with possible business models for e-Textbook industry. At the end of this Section, we also give suggestions for the future study in e-Textbook.

A.   Conclusions

(1)   We go over the research and practice of e-books through a systematic survey framework of three dimensions: technology, stakeholders, and information goods. The results are noted in Table 1. Thus, we may have a complete comprehension starting from the e-books.

(2)   Tracing on the path of e-book, we march to e-Textbook. With a project of the real case of Publisher Lisa, the journey is now on its way. We highlight solutions to the problems e-Textbooks will encounter in Table 1. Through the holistic point of view, we regard e-Textbook not just a product but a system. Such system aims the learning activities and relates together all stakeholders in social, economics, institution.

(3) Besides the comprehensive strategy framework for e-textbook depicted in Figure 1, we also illustrate with possible business models for e-Textbook as depicted in Figure 2. Figure 2 demonstrates all the related products and services with management issues through the proposed approach.

B. Future work

There are still some further issues worthy to study. The framework we proposed may try to apply to diverse ways of technology-mediated learning. Other salient issues are the evaluation criteria for the technical system, the possible sources of technology/ services and patents, the searching and management of intellectual property.

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