E-textbook—The Real Student-Centered Learning Management System

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For Learning Management Systems (LMSs), most publications deal with the technical and economical issues of proprietary versus open source solutions. Depending on evaluation outcomes, institutions of higher education install or migrate from commercial LMSs, like blackboard to open source, like Modular Object-Oriented Dynamic Learning Environment (Moodle), or vice versa. This is because the leading LMSs are very similar and there is no compelling reason to choose one over the others apart from the total cost of ownership. One important issue that LMS providers ignore is the fact that learning outcomes are not bound to a specific LMS but depend on process factors, like the tutors' timely feedback, interactivity, adaptation of content, and students' motivation. A real game changer could be the e-textbook, because it engages students and tutors. Although lacking the traditional administrative backend of a LMS, an e-textbook can offer a wider variety of interactive features and choice of devices. Publishers have been offering e-textbooks in the form of course content integration, but not as LMS in its own right. Especially in the context of blended learning, where a physical infrastructure and administration system already exists, the drawback of a missing backend can easily be overcome. Both LMS providers and publishing houses commit to "doing the things right" by adding more and more technical features to the LMSs and publishing more and more textbooks in prevailing e-book formats. The real mantra, however, should be "doing the right things" by delighting customers—the students. Students love their mobile phones that enable them to access all sorts of information, from friends to lectures. This is a major advantage of m-learning. Since publishing houses, universities, and LMS providers are not necessarily known for delighting customers or embracing disruptive innovations, it may be self-publishing e-textbook authors who will be the first to provide engaging m-learning.

Keywords: Learning Management System (LMS), blended learning, e-learning, m-learning, e-textbook, e-book, collaborative learning, self-publishing

Introduction

The Australasian Council on Open, Distance and E-Learning (ACODE) Educational Technology Survey found that 60% of Australasian institutions were investigating moving to Modular Object-Oriented Dynamic Learning Environment (Moodle) (Lambert, 2011). However, the fundamental question is no longer whether to move from a commercial system, such as blackboard to an open source one, like Moodle, but whether the traditional Learning Management System (LMS) has reached the end of its life-cycle. Gartner Group (2012) saw that the LMS market is in a fundamental state of change. LMS providers have focused on adding more and

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more functionality to their platforms and forgot that the LMS does not directly contribute to learning outcomes; instead, tutors' feedback, interactivity, and adaptation of content, and students' personality are the determining factors of success (Kember, McNaught, Chong, Lam, & Cheng, 2010). One example of adding an unnecessary feature is e-mail. Most students have their private e-mail accounts on Google or Microsoft and an university email account. An additional LMS e-mail account seems overkill. One reason for adding more and more features is that most studies compare technical and administrative capabilities of LMS, because they are easy to evaluate (Bechter & Stepping, 2005). The more the technical features, the higher the ranking. Little research has been dealing with LMSs and learning outcomes.

A new kind on the educational block is the e-textbook enabling personal learning experiences in the form of digital products and services that engage students through interactivity and are platform independent. While most available e-textbooks are direct copies of print versions to the digital environment, partly in order to mimic the reading experience of a printed book (layout, switching pages, etc.), some additional functions have been incorporated (Bravo, 2011):

1. Adding/sharing/seeing other students' notes;
2. E-textbook recommendation by email, Facebook, Twitter, etc.;
3. Online rating;
4. Text highlighting/copying;
5. Adding bookmarks;
6. Choice of fonts, font sizes, and background colours;
7. Text searching;
8. Integration of the audio file (audiobook);
9. Usage on multiple devices.

The first three points refer to social reading programs, for example, Kobo's "Reading Life" and "Pulse", where, while reading, users can post quotes to social networks, track their reading, and earn awards/badges based on their reading amount (Mulhivill & Schiller, 2011). Another example, "Public Notes" from Amazon, enables students to make openly available their notes and highlights (Mulhivill & Schiller, 2011).

Increasingly, e-textbooks exploit the digital nature and include audio and video contents, as well as Internet links and interactive features. However, in most cases, these additional functionalities are often not yet compatible with the bare-bone approach of e-readers, and can only be accessed on tablet computers.

Unfortunately, e-textbooks have their disadvantages too:

1. Lack of universal publishing standard (Williams, 2012);
2. Sharing/lending books becomes difficult for students (Fister, 2010)—However, this is currently being addressed by publishers;
3. Privacy might be impacted when personal text markings (shared on some reading platforms) are utilized by others (Jia, 2012);
4. No bookshop support (Fister, 2010);
5. Issues pertaining to Digital Rights Management (Fister, 2010);
6. Loss of income for authors because of rampant piracy (Williams, 2012);
7. Difficulty of selling "old" textbooks to junior batches (Stommel & Bechter, 2013).

Because e-textbook is a relatively young medium, predictions and impact assessments differ:

1. Filloux (2010) predicted that instead of buying ownership of an e-textbook, users will buy the rights to content for a number of devices and time frame;
2. Instead of storing files on devices, the content is stored in the cloud and is available from any Internet-based device. This concept is building on the concept of buying rights instead of ownership;
3. Instead of buying e-textbooks, a subscription fee is paid for access to an e-textbook library, predicted by Atkinson (2012);
4. Shatzkin (2012) had a contrasting opinion and expected subscription models not to move past libraries of single publishers, because the book industry is fragmented which complicates the establishment of a joint platform;
5. Content is generated on-the-go. Instead of publishing finished e-textbooks, daily instalments or even multiple instalments per day are necessary to keep insatiable readers hooked (Beech, C. Jiang, & J. Jiang, 2012);
6. Instead of publishing a finished e-textbook, Websites, like <http://www.bookiejar.com>, allow publishing chapters of work-in-progress textbooks and feedback from test readers;

Besides large publishing houses, there is an increasing number of self-published e-textbooks. The success of a self-published e-textbook can result in a book contract with an established publisher; some are increasingly screening sales of self-published books and offer contracts (Kowalczyk, 2012; Jia, 2012). In China, bookstores now feature areas with printed textbooks—after their online success (Beech et al., 2012).

Accessing all sorts of content via their mobile devices is popular amongst students. All LMSs, although most are offering mobile access, do not enjoy such acceptance, because they are more or less administrative tools with some basic interactive features, such as discussion board (Sun, Tsai, Finger, Chen, & Yeh, 2008). Sclater (2008) found that learners using LMSs are less engaged than those using their mobile devices. The features that LMSs lack can be compensated by other solutions, e.g., Elgg, a social network engine, but there is no smooth integration. Students may want to send pictures to their peers or make use of Global Position System (GPS); both not being part of any mobile enabled LMSs. Location awareness is an important feature. Students can locate peers and networks. Being in reach of a fast network, a video download can be done whereas slow bandwidth would imply reading a text according to a location aware recommender system.

In an e-textbook, discussion on a topic can be embedded easily in the form of an integrated discussion board and serve as an integrated tutor-student tool by containing assignments and grades. The whole course can be integrated in the e-textbook.

Attempts to develop a similar LMS for m-learning that focuses more on interactive aspects, such as sharing all sorts of content with other students, have not been successful and are at the conceptual stage at best (Casany, Alier, Mayol, Piguillem, & Galanis, 2012; Martin et al., 2010).

Research Objectives and Framework

The objectives of this study are as follows:

1. Analyse the perceived needs and wants of e-textbook authors and students;
3. Evaluate the advantages and disadvantages of e-textbooks over LMSs;
4. Define the key success factors of acceptance of e-textbooks as LMS;
5. Define the steps towards implementation and personalization.

Data for this study were collected over a three-month period at the end of 2012. The framework of this study is shown in Figure 1.

Figure 1. Research framework.

Any learning/teaching tool needs input from content providers and must be accepted by users. Whereas the e-textbook is just seen as a part of the LMS in academia, we hypothesize that it may substitute it one day. LMS has its merits when it comes to administration (backend), but the perception on the frontend is determined by the customers—students. Our research therefore focuses on perceptions, not on technical features, e.g., which LMS has the most and best features. Instead, we focus on perceived value.

Findings

A total of 138 respondents completed the e-textbook reader survey. Most respondents came from the US (41%), Germany (20%), and the UK (8%), and the rest from around the world. Most respondents used a Kindle (54%), Sony e-Reader (17%), Kobo (7%), or an Apple Portable Device (7%).

The main reason why people read e-textbooks is convenience (see Table 1). Surprisingly, the interactive as well as audio/video features were not ranked highly (on a Likert Scale 1-10). One reason could be that students are not aware of what is technically possible and they never experienced a state-of-the-art e-textbook. Additionally, most e-readers do not support functions that, for example, a tablet computer can provide.

Table 1

Reasons for Reading E-textbooks

Reason	<i>M</i>	<i>SD</i>
Convenience	8.8	1.62
Ease of storage	8.6	1.97
Size of library	7.8	2.18
Interactive components	3.2	2.51
Video/audio content	2.2	1.95
Adjustable font (size)	7.7	2.19

Unfortunately, we could not ask why readers are using e-textbooks instead of a LMS, because it has never been implemented.

Peers and student colleagues are the most trusted source when looking for an e-textbook (see Table 2). This finding indicates a certain degree of uncertainty avoidance. Word-of-mouth is considered as a more trustworthy source than, for example, a bookseller's recommendation.

Besides e-textbook readers, we analyzed 90 responses from authors, 68 respondents said that they interact

with other authors through online media, such as forums, which indicates a sense of belonging to a community to share experiences. Sixty percent of the authors came from the US, the remaining from other English-speaking countries, such as Australia and the UK. One third were self-employed, which indicates that only a minority can live solely on publishing e-textbooks. Almost all of the respondents used the Kindle format (99%), followed by EPub (74%), Portable Document Format (PDF) (56%), and Mobi Pocket (44%). Eighty-one percent of the respondents that self-published utilized at least two different formats.

Income and self-actualization seem to be the main motivational factors when publishing an e-textbook (see Table 3).

Table 2

Trusted Information Sources for E-textbooks

Information source	<i>M</i>	<i>SD</i>
Online advertisement	3.9	2.65
Information in news article	5.3	2.42
Online posting by author	4.1	2.74
Recommendations from peers	7.9	2.23
Booksellers' recommendations	5.4	2.76
Booksellers' homepage	4.3	2.61
Browsing the Web	5.5	2.81
Browsing bookseller	3.9	2.72

Table 3

Author's Motivation in Publishing E-books

Author's motivation	<i>M</i>	<i>SD</i>
Income	7.3	2.73
Peers' pressure	1.3	1.24
Self-esteem	5.1	3.28
Recognition	4.3	2.98
Status	3.4	2.46
Self-development	7.1	3.05

Asked why they consider e-textbooks as the future trend, they prioritize the worldwide market potential (see Table 4).

Table 4

Why E-textbooks Will Succeed

Reason	<i>M</i>	<i>SD</i>
Are the future of reading	8.0	2.23
Are cheaper to produce than print books	8.9	1.82
Allow easy worldwide distribution	9.1	1.65
Allow interactive components	5.2	3.30
Allow video/audio content	4.6	3.40
Give indie authors better chances of success	8.5	2.29

Comparing the perceptions of readers and authors, both groups rate video/audio content relatively low. This is surprising because that it is one of the major selling points of e-textbooks. The reason could be that we are still living in a world where bandwidth limitation discourages students from downloading videos or it is a

simple chicken and egg situation. Authors think that readers do not want it and readers do not ask for it because they do not know what is technically possible.

So far, we assumed that e-textbooks are published by reputable publishing houses. This does not have to be the case. Any e-book lends itself for self-publishing. The trade-off is between the marketing power of a large commercial publisher versus freedom in every aspect.

When comparing the expected price difference for published *vs.* self-published e-books, all the respondents expect the same or a lower price for a self-published e-textbook, with the median at 45%, i.e., 45% price deduction for a self-published book (see Figure 2).

Figure 2. Expected discount for self-published e-books.

The main reason for the expected discount is the perceived risk of poor quality when buying a self-published e-book. To check for interdependence between the discount and other reasons than risk for the expected discount (e.g., lower production cost, lower overhead, and less marketing expenses), a cross tabulation was carried out, followed by a calculation of Lambda coefficient and Goodman and Kruskal's Tau in order to test the strength of the associations. Both statistics showed no association between expected discount and other justifications.

In addition to asking for an expected discount, the perceived fair sale prices for a self-published and a published e-textbook chapter were determined. The median for each chapter of a self-published and a published book is US\$4 and US\$6 respectively.

Given a standard market rate of US\$8.50 per chapter that leading educational publishing houses charge these days, the difference amounts to US\$2.50 per chapter and sums up to US\$50 for a standard 20 chapter e-textbook. In a nutshell, readers think that publishing houses overcharge on e-textbooks—not to mention printed textbooks.

In order to reduce the number of answers/variables, a factor analysis of the questions with numerical scale was conducted. Table 5 shows that 10 variables can be condensed into four factors (also known as components or dimensions). Factor one can explain the most (22%) and factor four the least (12%) of variance.

The four factors can be described as follows:

1. The first factor has four high loading variables (cut-off: 0.6) and can be described as valuing the “easy

to use” characteristic of e-textbooks;

2. The second factor has two high loading variables and can be described as valuing the “interactive” characteristic of e-textbooks;

3. The third factor has two high loading variables. The dimension can be described as “sale price” dimension;

4. The fourth factor reflects the “discount” that a self-published e-textbook comes with.

Convenience in the broadest sense is the main reason to use e-textbooks. The second reason reflects the additional interactive features that e-textbooks offer. As shown in Figure 2, readers expect a substantial 45% price difference between e-textbooks from a publishing house and self-published ones (see factors 3 & 4).

Table 5

Major Factors of Using E-textbooks

	Factor loadings			
	1 (22%)	2 (16%)	3 (15%)	4 (12%)
Ease of storage	0.779	0.000	-0.100	0.014
Size of library/modules/chapters	0.730	0.017	-0.210	0.172
Convenience	0.666	0.035	0.158	-0.200
Adjustable font	0.636	-0.060	0.148	-0.090
Reading time	0.478	-0.310	0.031	0.202
Interactive components	0.069	0.892	-0.010	0.001
Video/audio content	-0.140	0.852	0.148	0.126
Price of published e-textbooks	0.057	0.009	0.896	-0.250
Price of self-published e-textbooks	-0.030	0.170	0.806	0.464
Discount of self-published e-textbooks	-0.010	0.069	-0.020	0.932

Conclusions and Implications

There is no market for e-textbooks as substitute for LMS yet, because no stakeholder (educational institutions and LMS providers) sees a market need. They may reconsider if students demand it. In marketing terms, the market can be described as a “blue ocean” and need a corresponding strategy (Kim & Mauborgne, 2004). The first mover can reap the benefits but bears the risk of outright failure. Table 6 answers the four basic Blue Ocean questions.

Table 6

Blue Ocean Strategy Applied to E-textbooks

Questions	Possible answers
Does the industry work with some factors that can be eliminated?	Remove the mediating companies (publishers, LMS providers, etc.), so the suppliers (authors, designers, etc.) obtain a direct access to the educational market, preferably with the possibility to cooperate with other authors/designers to create an engaging environment.
Are there factors that could be lowered below the current standard?	No longer need for high volume sales (main stream) or LMS, and hence, opening up the market place to self-published e-textbooks.
Are there factors that should be heightened above the current standard?	Access to suitable suppliers of all e-textbook building blocks; Assembly of a full e-textbook product (including all the necessary building blocks) without upfront payments, instead royalty basis.
Are there new factors that should be introduced?	Crowd sourcing of layouts, edited versions, internal graphics, comic versions, etc. as a starting point for creative content; Thinking outside the box.

Note. Source: Kim and Mauborgne, 2004.

The benefit of the crowd sourcing community is that the own artistic input can be complemented by the creative output from others.

For example, the reported cost for a freelance editor and a cover artist in the US amounted to US\$1,800 (Rice, 2012, p. 40), with the editing generally being the more expensive service (from US\$1-2 per page up to tens of US dollars per page). As translation costs can run into thousands of US dollars, some authors have started to work with royalties instead of upfront payment (Nicholson, 2011). Understandably, for a translator, to invest a significant amount of time, she/he must be sufficiently confident of an e-textbook's success.

Looking beyond collaborative and crowd-sourced designed e-textbooks, it should also be customized to cater for different cultures and individual learning styles (Speece, 2012). It may turn out to be too expensive to fully personalize e-textbooks, e.g., one cover or individual animation for one particular student. The recommended alternative is customerization—the combination of operational mass production and marketing customization. There may be a group that wants, for example, a red-yellow cover, whereas the other group wants a black-white one or specific language or animation.

In a more formal approach, this can be done in two ways. The first technique is content-based filtering (Pazzani, 1999). This filtering technique could suggest book covers, layout formats, interactive components, etc. to readers based on a set of e-textbooks in which readers have expressed interest or bought in the past. Collaborative filtering (Konstan et al., 1997), the second method, is making automatic predictions (filtering) about interests/preferences of a reader by collecting information from many other readers (neighbors).

Collaborative filtering systems usually take two steps:

1. Looking for readers who share the same patterns with the user;
2. Using the ratings from those like-minded readers found in step one to calculate a customization prediction for the user:

$$P_{a,i} = \rho_a + \frac{\sum_{u=1}^n (r_{u,i} - \rho_u) * w_{a,u}}{\sum_{u=1}^n w_{a,u}}$$

$P_{a,i}$: Prediction for reader a for personalization i ;

n : Number of neighbors u ;

$w_{a,u}$: Similarity weight between reader a and u ;

$r_{u,i}$: Rating neighbor u for personalization i ;

ρ_a : Average rating reader a ;

ρ_u : Average rating reader/neighbor u .

The likelihood that a reader is willing to pay for a certain personalization feature can be calculated according to the above formula. It depends on the reader's general disposition, i.e., some readers want to have everything customized and others are easy-going. The prediction whether reader a likes personalization i is based on his/her neighbors. The similarity index $w_{a,u}$ is a simple correlation. If two readers always want the same feature to be personalization, they would be perfect (correlation of + 1) neighbors. If they show complete opposite behavior, they would still be perfect neighbors (correlation of -1), because reader a 's behavior can be predicted by doing the opposite of what reader u is doing. Taking into account a number of neighbors (50

seems enough), a prediction for a reader can be made.

In the era of digitalization, personalization can easily be done as demonstrated. Surprisingly, no publisher has done it yet.

In summary, e-textbook has the potential to be a disruptive innovation and replace the LMS. Its main weakness is the missing backend (student admin features), which is not an issue if an institution has an admin system in place already, like in blended learning. Interfaces can easily be developed. Our research has shown that an e-textbook is a better repository for content and engages students more. Unfortunately, we could not rely on field data because nobody has ever tried it. We therefore recommend a Blue Ocean Strategy in economic terms and a crowd sourcing approach for content developers. Apart from the student admin side, e-textbooks can do everything the best LMS has ever been designed for and will engage students beyond that. In future, people may ask why LMS reached the end of its life cycle and the answer may be: It was never designed to be learner-centered in the first place.

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