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Towards Developing a Cost-Benefit Model for Learning Management Systems

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Abstract

Although Learning Management Systems (LMS) have become a common place in higher education many stakeholders invest in this technology once the expected benefits align with the strategic goals of the institution and the technology falls within a given budget. However, it is not immediately apparent how stakeholders can determine whether the level of investment associated with implementing the LMS is justified by the benefits obtained. In this paper, a case study will be used to identify the costs and benefits associated with the implementation of a web-based LMS. In the instances where these costs and benefits and indirect, measures will be proposed that can be used to quantify them. The goal is to produce information that stakeholders can use to understand the value of their investments and at the same time, practitioners can use the information to maximize the value of the investment in a LMS.

Keywords

Learning Management System, Cost-Benefit Analysis, Blended Learning.

1. Introduction

Learning Management Systems (LMS) have been defined as web-based systems that include both synchronous and asynchronous tools that are used to support both learning and administrative functions (Black et al., 2007). These systems have become common place in higher education (Coates et al., 2005). Stakeholders in higher education often invest in new technology once the expected benefits align with the strategic goals of the institution and the technology falls within a given budget. The benefits of using these systems have been discussed quite extensively in the existing literature (Coates et al., 2005) and to a lesser extent, the indirect and direct costs have also been discussed (Nicol & Coen, 2003). However, as there is little existing research in combining the two it is not immediately apparent how stakeholders can determine whether the level of investment, or costs, associated with implementing a LMS are justified by the benefits obtained. Closer examination of the benefits and the costs provides insight into the potential reasons for this void.

The costs can be broadly categorized into indirect and direct costs. Direct costs may include site license, site administration, technical support, computer hardware, technology infrastructure, course development, faculty development and student training. A greater challenge lies in the identification of the indirect cost. A cost can be associated with the negative impacts that users experience as a result of the use of a LMS. Faculty may feel less control over their course assets, as they upload them for distribution while adhering to guidelines set by the LMS administrators (Harrington, 2004). There are also costs related to change management. The time and effort required to overcome resistance to the introduction of new technology and procedures is also a cost factor. One of the most discussed indirect costs is the time commitment required of the faculty and administrative staff to learn and use the features of a new LMS as they set-up and maintain their courses in the web-based environment. All these costs, both direct and indirect, must be considered when assessing the value of the LMS.

A number of the benefits derived from the use of these systems have been noted in existing literature (Coates et al., 2005), these include improved efficiency, improved conveniences for students (Harrington, 2004) and more diverse learning experiences. Like costs, the benefits can also be categorized into direct and indirect benefits. LMSs are often utilized by higher education institutions which only offer face-to-face courses. For these institutions, the investment in an LMS lays the technological foundation for the possibility of the online delivery of courses, in part or in full. The benefits associated with offering online courses should be considered as indirect benefits of implementing the LMS. On the other hand the ease with which course material can be distributed provides an example of a direct benefit. Another issue is the difficulty of equating costs and benefits (Nicol & Coen, 2003). Costs are predominantly captured as quantitative data while the benefits are predominantly recorded using a qualitative approach. There is also the dimension of time that impacts how the costs and benefits are identified. There are costs and benefits that occur once, those that are recurring and others that are ongoing.

In this paper, a case study will be used to identify the costs and benefits (both long and short term) associated with the implementation of a web-based LMS AT a leading business school in the Caribbean. The most common costs and benefits reported in literature along with those that surface from the case study will be examined. In the instances where there are indirect costs and benefits, indicators will be proposed that can be used to quantify them. The goal is to produce information that stakeholders can use to understand the value of their investments and at the same time, practitioners can use the information to maximize the value of the investment in a LMS.

Ultimately, this case-based analysis of the costs and benefits and recommendations will lay the foundation for the development of a model for other higher education institutions to assess the costs and benefits they may encounter when implementing a LMS. The use of the model will provide information which can be used to support requests for future and continued investments in such systems.

2. Literature review

An estimated 95% of colleges and universities use Learning Management Systems (LMS), which are thought to be one of the most used technologies in higher education (Coates et al., 2005; Pollack, 2003; West et al., 2007), LMS technologies are widely used and are used to support the core business of universities, which is teaching and learning, but research into the adoption process and implications of these systems is still in its early stages (Al-Busaidi, 2012; Coates et al., 2005; Perrin et al., 2009; Ryan et al., 2012). Some studies include Al-Busaidi (2012) that examined the critical factors that influence the

success of the LMS in blended learning from the learners' perspective. Ryan et al. (2012) described the perceptions of stakeholders when adopting a LMS and made some suggestions to make the process more manageable. Perrin et al. (2009) considered the issue of consistency of delivery across multiple course sections and found that the LMS was useful in ensuring consistency of learning, teaching, curriculum and materials.

Further, a number of researchers have highlighted some important recommendations when adopting the LMS for blended learning (Garrison & Kanuka, 2004; Mitchell & Honore, 2007; Ooms et al., 2008). These were found to be very useful in the case described in this paper. Mitchell et al. (2007) highlight the need for a balance in terms of face to face and online delivery, and recommended that for a 12-module course, no more than two modules should be delivered online. Moreover, care must be taken to ensure that the adoption is not seen as a cost cutting initiative. Garrison et al. (2004) stress the need for a redesigning and rethinking of the teaching and learning relationship when adopting the LMS and expertise in this area is required. Ooms et al. (2008) stress the importance of the role of the e-developer to support academic staff (e.g. in both the pedagogic and technical aspects) in converting modules that were traditionally delivered face to face to blended learning modules and advising on how the LMS can support teaching and learning.

Essentially, there are both direct and indirect costs and benefits associated with the adoption and subsequent implementation of LMS. While the difficulty of comparative analysis of cost and benefits regarding investments in technology in Higher Education has been acknowledged (Laurillard, 2007; Nicol & Coen, 2003), a number of parameters exist in the literature (Cohen & Nachmias, 2006; Steinberg, 2004; Twigg, 2003). Steinberg (2004) identified change management, staff development and support as cost parameters. Additionally, Twigg (2003) included instructional preparation and delivery. Cohen et al. (2006) proposed a cost effectiveness model that included infrastructure and instruction costs as the cost components while the benefit components included improvement in (i) instructional quality (ii) affective aspects (iii) the efficiency of the teaching and learning process and (iv) knowledge management.

3. Case study

3.1. Overview of case

The case study focuses on the implementation of an LMS at a Caribbean business school. The goals of implementing the system were to improve operational efficiency and to provide the school with a number of opportunities to strengthen its brand, as a leader in the graduate management education space, by improving and broadening the learning experiences of its students. The specific case proved interesting due to the size and structure of the school. Firstly, the corporate governance structure of the school imposes two priorities that are equally important. On the one hand there is quality assurance in its academic programmes for which the business school must adhere to the wider universities statutes and ordinances and on the other hand there is a board of directors that oversees the commercial and financial proprietary and viability of the school. The school operates under the profit motive as it is a self-financed school, thus, there is a real need to justify the investment in a LMS. Secondly, there is a high reliance of adjunct or part-time faculty and therefore quality assurance is a critical concern of the school. Thirdly, there are support staff members (programme coordinators) who not only ensure the administration of the programmes but act as liaisons between lecturers and students and therefore play a key role in the implementation and adoption of the learning management system.

A decision was made to adopt a blended learning approach to the delivery of courses in the MBA programme, the largest program offered at the school offer. The MBA is currently offered either full time or part time and there are a number of part time offerings and therefore there are a number of deliveries of a given course within an academic year. These courses are primarily delivered by a pool of part-time lecturers. Therefore, a given course can be delivered multiple times by different Lecturers within an academic year. This scenario presents a challenge which makes ensuring the quality and consistency of course delivery an essential consideration (Perrin et al., 2009). One of the techniques the school uses to ensure the consistency and the quality of course delivery is the assignment of a full time faculty member, known as a cluster coordinator, to oversee the adjunct Lecturers delivering courses within a particular discipline within the MBA programme.

The fact that the school is self-financed required that there was a real need for a cost-benefit analysis so that the board would support this adoption. During this process it was realized that there was limited literature both in terms of the adoption approach that best suits the organization (as there are alternatives that vary in cost) and how best to justify the investment in these systems.

3.2. Approach to Adoption

One of the school's goals was to provide a web presence for all the courses offered in the MBA programme and to redesign core courses to optimize the benefits that the LMS can provide. However, the school has built a reputation on face-to-face delivery, therefore, a strategic decision was made to limit the number (40%) of face-to-face sessions that were replaced with the online delivery of content for a given course. This is consistent with the findings of Mitchell et al. (2007). This move to blended learning using a LMS was in line with the strategic plan of the university.

In adopting this LMS all the courses delivered in the MBA programme were classified as Web-supported or Web-enhanced (hybrid/blended) and the content for all courses were uploaded to the LMS. The primary differences between web-supported and web-enhanced courses are the number of face-to-face contact hours student will have with Lecturers, the degree to which the LMS is used to deliver content and resources and the LMS's utility in course administration.

To be successful, the conversion of a traditional face-to-face course to a web-enhanced course requires careful pedagogical redesign (Garrison & Kanuka, 2004). One widely used model requires Lecturers to conduct the conversion of their face-to-face courses. In that model, instructional design support is made available to Lecturers on request. This requires Lecturers to spend a significant amount of time to redesign and upload their courses, prior to the scheduled course delivery. Given that Lecturers are not compensated for the additional time required to redesign their courses, they may not have the required competencies with respect to eLearning and pedagogy, and have varying degrees in technology skill sets; the resulting web-enhanced or web-supported courses, within an institution, are often found to vary significantly in quality (Al-Busaidi, 2012). The school realized that this approach would not be suitable because of the school's reliance on part-time faculty who are unlikely to be willing to invest the time required. To address this issue of an instructional designer (ID) was assigned to perform the initial conversion of the courses (Ooms et al., 2008). The ID collaborated with the Lecturer throughout the conversion process with technical support provided by the information systems unit and administrative support from Program Coordinators. Program Coordinators are full time employees that provide administrative support for Lecturers and students.

During the adoption of the LMS and the implementation of a blended learning approach, a number of important issues surfaced and were subsequently addressed all of which had costs and benefits associated with them. These issues included:

3.2.1. Change management and training

To ensure that students, Lecturers and support staff were aware of the planned changes, a short change management program was implemented. To raise awareness among all faculty, meetings were held to present and discuss how the implementation of the LMS aligned with the strategic plan of the school. During new student orientation, students were informed about the function of the LMS and were provided with an explanation of the blended learning approach for the delivery of core courses. The programme coordinators were told how the use of the LMS would impact their roles and it was emphasized how it could be used to make their current tasks more efficient.

Technical training on the use of the LMS was provided for all stakeholders. The training program included the development of online tutorials, job performance aids, reference sheets, the delivery of workshops and one-on-one consultation as requested.

3.2.2. Technology

On reviewing a number of technology solutions, two primary solutions were selected for further analysis. One solution would require the business school to pay for the use of an existing LMS implemented at its parent university. The second solution would require the business school to implement and manage a LMS independently. The second approach was taken, the details of which are described below:

- Learning Management System / Delivery Platform - the Moodle Open Source LMS was the preferred choice for the business school's eLearning environment. Moodle is one of the most popular LMS in use across the world (Al-Ajlan & Zedan, 2008) and is a "mature" Open Source product that provides an extensive range of learning activities and resources required to enable the school's planned course delivery modes (Lakhan & Jhunjhunwala, 2008; Machado & Tao, 2007). The Open Source nature of the product provided opportunities for a customizable low cost solution.
- Technology Deployment Model - the school made the decision to use Cloud-Computing as the deployment model. The benefits of Cloud Computing are primarily due to the economies of scale derived from shared large-scale computing and storage infrastructure managed by popular service providers (e.g. Amazon) (Armbrust et al., 2010).

In order to understand the effects of the adoption a questionnaire was circulated to the students and a series of interviews were done with students, academics and administrators. This was included as input to understand the benefits and costs that are incurred in the adoption of a LMS.

4. Findings

Based on the findings from the literature, the experiences and insights that were gained from implementing the LMS and extensive interviews and questionnaires conducted with students, faculty, technical support and administrators a set of costs and benefits were identified that must be considered when needing to justify the investment in a LMS. One of the difficulties is that while the costs are mostly direct the benefits are mostly indirect and if not identified will make it difficult to rationalize the investment in the LMS.

Table 1 summarizes the findings from this study including the benefits of adopting the LMS, what used to obtain pre and post adoption (to demonstrate how these benefits were obtained), the costs incurred, and a measure that can be used to quantify the cost or benefit. As discussed previously some of these are indirect (many of the benefits) and so these proposed measures can be used by organizations when carrying out a thorough cost-benefit analysis before the adoption of the LMS.

	Criteria	Pre-Implementation	Post-Implementation	Measure
Benefits	Quality assurance	A given course is delivered a number of times by different lecturers. The cluster coordinator is responsible for ensuring the consistency of delivery across offerings. This consistency of delivery was previously done by meeting with the lecturers to discuss the expectations of the course and examination.	In the interviews the cluster coordinators expressed that the LMS has assisted in ensuring the consistency of deliveries. A container was created for each course delivery; the template was copied across containers so that they have the same look and feel, (yet allowing the lecturer the freedom to personalize it). The cluster coordinator was added to each course container which allowed them to monitor what each lecturer is disseminating to their students and the online discussions taking place.	The difference between the time the cluster coordinator spent on quality assurance across deliveries before and after adoption.
	Increased support for diversity of learning styles	Deliveries were primarily face to face lecture style.	The courses were converted to a blended style of delivery. The instructional designer was used to do this pedagogical redesign. The LMS serves as a repository for additional resources that the lecturer may want to make available to students.	A questionnaire and interviews were held with the students. While the majority expressed that the materials that were converted to online were done effectively, there was some differences as to their preferences of face to face versus online delivery. This seems to support the notion that that the different learning styles view the options differently. The students agreed that the blended approach does support diverse learning styles. The measure would be the increased number of learning styles supported using the blended approach.
	Increased awareness of available instructional material	Lecturers typically used a set of power point lecture notes and supplemental readings to deliver a course.	One very interesting finding from the interviews was that a number of lecturers expressed that they did not realize the extent to which diverse, relevant content was available online and how it could be used as a teaching resource (e.g. videos, tutorials). This was realized through interaction with the instructional designer. Students also pointed out that they found this variety in content delivery beneficial.	The increase in the number of types of content/styles that are now being used for course delivery and the number of courses using these various styles.
	Improved quality of the course	Typically the lecturers had not been updating their course significantly for each new course delivery.	The course conversion process required the lecturer to review the course content and material with the ID. In many cases this has led to an improvement and realignment of course content and activities and an overall improvement in course quality.	This benefit was identified from the interviews with lecturers and by comparing the newly developed course to prior offerings of the course. This can be measured by the increase in updates in course content since the move to blended.
	Improvement in programme coordinator	The programme coordinator used to spend a great deal of disseminating information to students (e.g. coursework	The LMS is now being used to disseminate this information. This was identified as one of the most significant benefits to the	This reduction of time was significant given the high number of part time lecturers and students. This can be

	efficiency	grades, changes to schedules, examination details, course material). This used to be done by email or telephone.	programme coordinator.	measures by the difference in the proportion of time that used to be spent on these activities versus what is currently spent on them.
	Improvement in student satisfaction	The students previously would contact coordinators (phone or email) or come to the school to get information (e.g. grades, schedule).	The LMS is used to disseminate this information and students can access information (e.g. coursework grades) remotely and securely. This was one of the most cited benefits in the interviews with the students. The students interviewed included those that were in the system at the time the LMS was adopted and therefore they knew what obtained before and after the implementation.	The difference between the response time to a query before and after the adoption.
	Decrease in cost spent on photocopying	The course materials were photocopied by the programme coordinators and a package given to each student.	All course material is distributed through LMS.	The reduction in the cost of the toner cartridge for the printer. This is already reflected by a reduction in the budget allocation for printing expenses.
	Increased job satisfaction	The programme coordinators, all of who are required to have post graduate degrees, spent considerable time doing the menial tasks described above (e.g. overseeing photocopying of course material, disseminating information).	The role of the programme coordinators was redefined. Their time was used for more meaningful functions. It also allowed the school to train and use some of these persons for other roles that the school had identified as important but did not have the resources to support (e.g. Student and Alumni Services Officer, Academic Counselor). These tasks are more high-level and job satisfaction was higher. This was an important finding as the literature often focuses on the satisfaction of lecturers and not the support staff.	As all the coordinators that were at the school prior to the adoption are still there the difference between job satisfaction before and after the adoption can be measured through a questionnaire using the likert scale.
Costs	ICT Investment	Previously the school had no ICT to support course delivery.	1. The school personalized the Open Source LMS solution Moodle.	The cost of employing expertise to carry out the personalization is direct and readily available.
			2. Amazon cloud was used to store the data.	This is a readily available recurring direct cost.
			3. IT Support for the LMS. The IT support at the school was increased to ensure deal with LMS issues quickly.	This is a readily available recurring direct cost.
	Change Management	There was concern that the students would be resistant to getting the soft copy of the course materials rather than physical copies.	Meetings were held with the students that were in the programme at the time the adoption took place (and would be most affected by the changes) to explain the benefits of the LMS. These concerns were short lived and did not last past the first year of adoption. The LMS quickly became the norm.	The time for the administrators to meet with the students to rationalize the need for the adoption of the LMS. It was actually a one-time cost because after the first year the LMS became the norm and no further cost were incurred in this area.
	There was concern lecturers would not be willing to invest the time in converting the courses to a blended mode of delivery. These concerns were raised in the initial discussions with	A breakfast meeting was held with the management of the school and all lecturers (including part time) to discuss the adoption of the LMS and the benefits it would provide. It was mandated that this would be	The cost of the breakfast meeting was a direct cost.	

		lecturers. This was particularly true for the part time lecturers.	used for all courses.	
	Increase in time lecturer spent on preparation		The lecturers had to meet with the instructional designer to discuss the course conversion.	The difference between the time that used to be spent on class preparation vs. what is currently spent. It is likely that this time difference will only be significant when the course is first converted to blended
	Training	Many of the lecturers and some of the existing students had not used a LMS previously.	Training for the LMS was held for all lecturers, coordinators and students. After the first year there was no special training session for new students as it was integrated into one of their foundation courses. All lecturers at the school were required to attend the training so the first time there were a number of these sessions after the first year only new lecturers needed this training and one of the coordinators was trained to train these new lecturers.	The cost of the training sessions was a direct cost.

Table 1: Benefit and Cost Criteria and Measures for the Adoption of a LMS

5. Conclusions

Experience, extensive interviews and questionnaires were used to identify the costs and benefits that are associated with the adoption of a LMS. This work provides a first step in developing a cost-benefit model for the adoption of a LMS. The development of the model not only requires the criteria that need to be considered in the model but also some measure for these criteria. This model will provide the much needed solution for those institutions that need to justify their investment in the LMS. The model chosen (i.e. open source solution with the use of the cloud) also affects the cost and given that there are a number of available models that could have been used. In the future a technique will be developed that will allow institutions to use multi-criteria decision making techniques to identify the model that best suits their needs.

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