USE OF NON-FINANCIAL MEASURES IN INFORMATION TECHNOLOGY DECISION MAKING: A DESIGN RESEARCH STUDY OF LEARNING MANAGEMENT SYSTEM (LMS) DECISION MAKING IN UNIVERSITIES.

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Abstract

Implementing Learning Management Systems (LMS) in universities is becoming one of the most critical decisions in higher education environment as they could yield long term benefit particularly in terms of enhancing the quality of teaching and learning processes and gaining competitive positions. Like IT and IS investment in other sectors generally, there is a need to develop a more comprehensive and effective model that really articulates the value from IT investment, to assist better decision making processes. Researchers have suggested that IT investment decision making models that are based primarily on monetary evaluation are inadequate because the value of IT investment is mostly indirect and intangible in nature. This study investigates the decision making models that are used to decide on the technology to invest, focusing on the importance of non-financial value to be incorporated in the IT investment decision making models. It proposes a model for LMS decision making, which integrates the Information Technology Balanced Scorecard (ITBSC) framework and Murphy’s (2002) “five pillars of benefit realization”. Six perspectives are derived from this integration, which are direct payback, business process, users, learning and growth, IT architecture and infrastructure, and risk and uncertainty perspectives.

Keyword: Learning Management System, IT/IS investments, IT value, non-financial measure.
1 INTRODUCTION

Many universities are investing in e-learning technologies for more flexible learning options (Chua & Dyson, 2004) and improved teaching and learning effectiveness (Mott & Granata, 2006). Apart from these, universities have also seen the potential of cost reduction as the desired return from investments in such sophisticated technologies. According to Laurillard (2007, p. 24), adopting e-learning technologies helps to reduce costs in several ways, such as “re-use and sharing of resources” and “more standardized production of materials”. Leveraging the technology in education has also been claimed to establish and sustain students’ engagement in learning (Coates, 2006). Universities are also investing in e-learning technology for their competitive advantage and their institutions’ reputation (Kinkle, 2010; Naveh, Tubin, & Pliskin, 2010). According to Bates (2005), the value of technology in education is the ability to “fulfil the needs in an information society and to improve the quality of learning”, and the value of distance education which is supported by the enhancement of the technology, is even greater when applied to “more mature students” with commitments such as jobs and families (p. 16).

To date, there has been a tremendous growth in e-learning technologies, including the development of open source learning management systems (LMS) such as Moodle, which has gained its popularity in recent years, as well as systems like Sakai and ATutor. Universities are also investing in proprietary models such as WebCT, Blackboard, GradePoint and Desire2Learn. Many universities in the world have taken advantage of these platforms to provide new experiences in learning for their students (Ruth, 2010).

As technology emerges, there is also an emerging need for the institutions to “reorganize to lever the benefits of new technology” (Bates, 2005, p. 17). However, given the large amount spent on these technologies, the expected benefit from the implemented systems is not always easily realized. For example, in China, 29.94 billion Yuan were invested on e-learning in 2006, but the level of application of IT in education in the country was lower than expected (Yang & Zhang, 2008). In Malaysia, Alias (2005) reported that students of e-learning programs in a local university had not adopted the technology (e.g., forums, online collaboration) extensively. From her observations, Alias (2005) stated that, students did not see technological advantage as an essential factor for them to succeed in an online learning environment, instead, communication and interaction with instructors remained essential as in the traditional face to face teaching and learning method.

Recognizing the increasingly important role of information technology in education to support the strategic missions of the institutions, IT leaders are struggling to demonstrate the value of the investment, despite facing difficulties in justifying the investments (Mott & Granata, 2006; Wier, 2004). In addition, Weir (2004, p. 11) stated that it is difficult to demonstrate the value in IT investments, as there is “no coin of realm” in terms of articulating value assigned to IT investments. In response to this, researchers therefore emphasized understanding the value of IT in education, particularly in LMS implementation. These include the study about the ability to cope with the complexity of the educational change process (Laurillard, 2007), the impact of LMS on students’ learning outcomes (Klobas & McGill, 2009), continued usage as an important measure in determining the success of LMS (Ramayah, Ahmad, & Lo, 2010), the importance of students’ and instructors’ involvement in LMS which contributes highly to the success of LMS (Klobas & McGill, 2010) and the extent of features of LMS explored and used by instructors as an important success factor of LMS implementation (Renzi & Klobas, 2010). While these studies focus on the realization of LMS success at the post-implementation phase, few studies have been done to examine the important elements that should be included in LMS decision making processes (at the pre-implementation phase). Murphy (2002, p. 107) suggested that there is a need to understand both investment decision exercises (pre-implementation) and benefit realization (post-implementation) as both “before and after measures are vital requirements to set meaningful targets for improvements”. More understanding of the decision
makers’ practices in deciding on the technology to invest, and the methods used to justify their decisions, which enable them to assess and communicate the value of IT to stakeholders, would therefore be valuable. A model to assist the decision makers in evaluating investments in technology in universities, which uses a more balanced approach that incorporates non-financial measures as important elements of justifications, therefore is needed.

2 RESEARCH QUESTION

From the extensive review of the problems pertaining to the justification for implementations of new technology, particularly, LMS in universities, I believe that, to assist better decision making, there is a need to develop a more comprehensive and effective model that really articulates the value from investments in these technologies. This is important because better decisions made in deploying technologies in universities will move the institutions closer to realizing the expected value from these technologies, and achieving their strategic goals. In this study, a more balanced approach that incorporates non-financial measures will be used to develop a new LMS decision making model. To be able to effectively achieve this, there is a need to obtain a better understanding on how and will the non-financial measures, if included in decision making models, be able to improve value realization from LMS implementation in specific, and in IT investment in general. Therefore the research question that guides this study is:

Will non-financial measures, if included in decision making models, be able to improve value realization from IT investments?

3 RESEARCH CONTRIBUTION

This research will contribute to the body of knowledge in five ways:

- The study will increase knowledge about the practices of IT decision making in universities, thus providing insights for stakeholders in the education sector. Previous studies have focused on the post-implementation phase while few have been done on the pre-implementation phase of IT investments in universities. Therefore, this study is hoped to shed some light on the approaches that universities use in IT decision making.
- The outcomes of this study are expected to improve decision making and policy making about the implementation of LMS in universities. In this study, a model is developed to help improve the decision making and policy making about LMS implementation, taking into account the importance of the non-financial perspectives in the decision making model.
- The study will contribute to the literature on IT decision making practices in the education sector in general and may have implications for IT decision making more broadly. Though this study focuses on LMS implementation in universities, the model may also be adopted in other industries which invest significantly in technology to create their business value.
- This study is hoped to reduce the perceived lack of relevance between IS research and practice. There has been criticism about the lack of relevance between IS research and the level of integration by practitioners (Baskerville & Myers, 2004; Benbasat & Zmud, 1999), and researchers have suggested that this problem could be reduced by adopting Design Research (DR) approach in IS research (Benbasat & Zmud, 1999).
- This study will also contribute theoretically to the literature of Design Research (DR) approach, by adopting the approach in the development and the evaluation of the new LMS decision making model.
4 THEORETICAL BACKGROUND

The issue of IT investment evaluation has been discussed by many researchers who suggested that the low returns and financial losses from such investment are resulted by the lack of having a good appraisal technique for such investments (Kettinger & Lee, 1994). Researchers also claimed that IT investment justification using the traditional appraisal techniques such as Return on Investment (ROI), Internal Rate of Return (IRR) and Net Present Value (NPV) are not sufficient for strategic decision making due to the lack of preciseness in definition and results that management expect (Lefley & Sarkis, 1997), and these methods are suggested to cause management being unable to take into account the strategic or indirect costs surrounding IT, and therefore unable to capture the full strategic benefit from such investments. (Abdel-Kader & Dugdale, 2001; Hochstrasser, 1992; Irani & Love, 2001).

Researchers concluded that a more sophisticated approach to the appraisal of IT investments, which includes both financial and non-financial perspectives such as quality, organizational learning, training and process improvement and innovation, would improve the management’s understanding of the key advantages of the innovation and its process, as complement to the traditional management accounting techniques (Abdel-Kader & Dugdale, 2001; Ivantysynova, Klafft, Ziekow, Günther, & Kara, 2009). Several researchers have proposed techniques as alternatives to the traditional appraisal techniques to evaluate IT-related projects. These techniques include the Value Analysis Method (Strassmann, 1988), which applied the use of a prototype system to quickly determine what is important to the users, Critical Success Factor (CSF) (Crescenzi & Reck, 1985) which is an approach that is used as a benefit seeking process, and methods that recognize the involvement of managers in realizing the value of IT investments, such as benefit management approach (Ward & Daniel, 2006).

4.1 Information Technology Balanced Scorecards (ITBSC)

Kaplan and Norton’s balanced scorecards (BSC) introduce more balanced and inclusive approaches that integrate multi-dimensional measures in the evaluation techniques (Kaplan & Norton, 2007; Van Grembergen, 2000). Researchers have suggested concepts of the BSC to be implemented in evaluating IT projects performance and the BSC has been extended to Information Technology Balanced Scorecards (ITBSC), to enable management to apply the BSC in the process of evaluating the performance of IT related projects and IT functions in organizations (Martinsons, Davison, & Tse, 1999; Van Grembergen, Saull, & Haes, 2003). Van Grembergen (2000) proposed an ITBSC framework which contains the four perspectives of the BSC approach, modified in order to adapt to the measures in the IT environment. Van Grembergen provided a conceptual mapping from the traditional BSC to the ITBSC is depicted in Table 1 below:

<table>
<thead>
<tr>
<th>BSC</th>
<th>ITBSC</th>
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<tr>
<td>Financial</td>
<td>Business Contribution (for evaluating the contribution of the IT department to the organization)</td>
</tr>
<tr>
<td>Customer</td>
<td>Customer (User) Orientation (for evaluating the customers’ perspective, which in the information system environment usually would be the user of the system)</td>
</tr>
<tr>
<td>Internal Business Process</td>
<td>Operational Excellence (for evaluating how effective and efficient are the IT processes)</td>
</tr>
<tr>
<td>Learning and Growth</td>
<td>Future Orientation (for evaluating how well are the technologies would meet the future needs of the organization)</td>
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Table 1. Conceptual mapping from the traditional BSC to the ITBSC
The ITBSC approach is more comprehensive than strictly financial approaches to IT decision making in its strategic perspectives. It puts more emphasis on the business strategic impacts as an effect of the IT investments. In an LMS decision making model, users’ perspectives, the effectiveness and efficiency of LMS process, cost reduction initiatives and future prospects of the system are important perspectives that should be taken into consideration in the decision making process. The ITBSC facilitates a good understanding of these perspectives, however, ITBSC is less focused on the aspects of managing the IT investment’s technical criteria and the aspects of the realization of IT value from the investments. While it is more focused on the expected derived outcome in the four dimensions mentioned above, the ITBSC model is unable provide a linkage between the IT investment and the benefit to be derived from the investment (Watrus, 2009). This is because the ITBSC model of Grembergen (2000) emphasized evaluation of IT functions within an organization using the four perspectives created by Kaplan and Norton in the BSC rather than evaluation of the effect of the IT investment on the organization.

4.2 Murphy’s “five pillars of benefit realization”

Murphy’s (2002) “five pillars of benefit realization” framework has been specifically designed for IT value realization from IT projects, where the model really articulates the multi-dimensional approach by incorporating the non-financial measures in the evaluation process. The “five pillars of benefit realization” defines the relationship between the business context and IT investment management, in which, in this approach, the business context is seen as the starting point that drives all IT investments decisions. Each of the pillars is explained as follows:

- **Strategic alignment** – Answers questions about how well the objectives of the IT/IS strategic objectives aligns with the business/organizational strategic objectives
- **Business process impact** – Answers questions about how well the IT/IS support or improve the business process
- **IT architecture and infrastructure**– Answers questions about the compatibility of IT infrastructure, whether upgrading has to be considered in realizing the new project
- **Direct payback** – Considers the financial returns from the IT/IS project, and the evaluation methods that quantify the financial impacts from the investments.
- **Risks** – Estimation of risks in terms of the project itself and the risks towards the organizational as a whole

4.3 Six perspectives of LMS decision making

In developing a new model for LMS decision making, the four perspectives in ITBSC, and the perspectives of IT architecture and infrastructure, and the IT risks and uncertainty emphasized in Murphy’s “five pillars of benefit realization” are integrated. Six perspectives are derived from the integration of Murphy’s “five pillars of benefit realization” with the ITBSC framework, which are discussed in detail as follows:

4.3.1 Direct payback perspective

This perspective describes the financial impact of LMS implementation on the organization. A favourable impact would usually be required in terms of cost reduction and budget management (Mott & Granata, 2006; Wier, 2004). However, there are also other financial impacts that should be taken into account, for example, the costs shifting to students such as printing costs, as a result of the elimination of paper based materials and the need for additional costs in training for the non-skilled instructors and to maintain a high level of skill and competency among the instructors (Renzi, 2008).

4.3.2 Business process perspective

This perspective describes how LMS implementation impacts the business process. LMS implementation may have different impacts in terms of process for instructors, students and for the
administration of a university. For the instructors, the implementation of LMS may have impact in terms of efficiency “as measured by the effectiveness of meeting the demands of students” (Lawrence & Sharma, 2002). For the students, LMS implementation may have positive impact on student engagement in learning activities (Coates, 2006), providing a more flexible way of learning and in turn, may “improve the time-to completion and graduation rates” (Mott & Granata, 2006). LMS could also improve the administrative processes in terms of course scheduling and exam scheduling and other administrative support such as handling students’ and faculty staff’s data, and evaluating students’ performances (Reigeluth et al., 2008).

4.3.3 User perspective

This perspective describes how LMS implementation impacts the users of the system. The user’s needs have to be crucially understood and the implementation of the new system should have the capability to fulfil the needs. According to Alias (2005) it is important to understand the users’ “personal factors and social factors” in an online learning environment as different culture are claimed to have different social interaction with the system. LMS may also improve student engagement (Coates, 2006); however the factor may have impact on the students psychologically, but not cognitively, thus it is difficult to explicitly measure the result in terms of the students’ academic achievement. LMS implementation may also have impact on instructors’ time, where instructors may need to sacrifice their time on training and learning a new system, in order to create value in the quality of their teaching with the enhanced technology (Klobas & McGill, 2010), affecting their valuable time on research and consultancies. This could also affect the institutions’ income as a result of the decrease in research and consultancies, consequently, affecting the institution’s reputation.

4.3.4 Learning and growth perspective

This perspective describes how the sustainability and growth of the system could be maintained. In this perspective, empowerment and innovation are important in order to attain continuous improvement (Kaplan & Norton, 1993). Human capability in terms of skills and confidence with technology are also important measure for this perspective. According to Renzi (2008) who studied the differences in university teaching after LMS adoption, the demographic factors that influence the LMS adoption by instructors are the skills and confidence with technology. This perspective will also describe the measures in gaining competitive advantages and building the university’s good reputation through LMS implementation.

4.3.5 IT architecture and infrastructure perspective

This perspective describes the ability to realize the value from LMS implementation through effective management of IT architecture and infrastructure. According to Pearlson and Saunders (2010), IT architecture provides the blueprint that defines the business strategy which is translated into an IS business plan. In IT architecture, the detailed business requirements which derived from each business goal, is defined. From IT architecture, the detailed plan is translated into the design of an IT infrastructure, which consists of components “including the actual hardware, software, network and data descriptions” (p. 165), which are “best to suit the plan and overall business strategy” (p. 164). In the process of implementing LMS in universities, it is important to take into account the aspects of integration of the existing system such as student information/administration system and library system, and the ability of the LMS to be integrated with future developments of add-on systems for extended or more enhanced features of the system.

4.3.6 Risk and uncertainty perspective

According to Murphy (2002, pg. 66), few organizations consider a comprehensive and structured approach to assess risks in their IT investments planning. As a result, many face failures and disappointments and this force the need for a better way in assessing risks in IT investments appraisal. Murphy emphasized that the risk of projects running behind time and the risk of complexity are among the crucial risks that must be looked into for a successful system implementation. Murphy
suggested that a formal, structured risk assessment is included as an important perspective for evaluating IT investments to take consideration of these intangible risks. The potential risks of an IT investment vary between organizations, as well as within the organization and over time. One of the potential risks of LMS implementation is the incompatibility of additional proprietary third party software, which usually is high in costs (Hotrum, 2005).

4.4 The Three Dimensional IS decision making model (3DISDEMM)

The six perspectives discussed in the earlier section are grouped into three different dimensions to develop a new IS decision making model for LMS implementation in universities, which are business dimension, technology dimension and human dimension (see Figure 1).

- **Business dimension** – consists of direct payback perspective and business process perspective, where both perspectives, if managed effectively, would result in positive impact towards achieving business strategies and objectives.

- **Technology dimension** – consists of IT architecture and infrastructure perspective and IT risk uncertainty perspectives. These perspectives are important to be managed effectively in order to ensure that IT value could be realized and delivered as anticipated by the organization.

- **Human dimension** – consists of user perspective and learning and growth perspective, where both perspectives deal with human perspective, particularly the human needs in determining the features of the system and human capability for future growth and sustainability of the system.

5 METHODOLOGY

This study adopts the Design Research (DR) method to support the design of a decision making model and to evaluate the effectiveness and the feasibility of the model. DR is a method which consists of development activities and evaluation activities to refine the developed design, based on principals derived from past research (Brown, 1992; Collins, Joseph, & Bielaczyc, 2004). In this research, mixed-methods are used, where data collection involves both interviews and questionnaire distribution. The five phases involved in the development of the IS decision making model is depicted in Figure 2.
5.1 Current stage of the research and plans for completion

The first and second phases of this study have been completed. In the first phase, an overview of the current practices in decision making in the implementation of LMS was obtained. A small exploration was conducted at an Australian university where two IT managers from different administrative units were interviewed. The results show that both respondents agreed that meeting the financial objectives alone is not sufficient to realize the value of the implemented system. Results also show that all the six perspectives included in the model proposed in the initial stage of the study, were discussed and pointed out to be important to be taken into account in the process of LMS implementation. In addition, a new criterion, which is benchmarking with other institutions and recognizing their best practices in the LMS decision making processes, is also found as important to be taken into account.

In the second phase, interviews were conducted with IT decision makers from eleven universities in Malaysia, with the objective to explore all non-financial criteria which are important to be taken into account in the LMS decision making process. At this stage, these criteria are being identified from the interviews and a conceptual design of the LMS decision making model is being developed.

The coming two years of the research will be devoted to the development of the LMS decision making model, in the phases recommended in the DR approach. Throughout the third, fourth and fifth phases, evaluation by the users of the decision making model developed through the initial design phase, detailed design phase and evaluation phase will be performed with the goal of improving the design in the next iteration and hoping to give maximum impact on practice on the naturalistic settings.

To ensure originality of the research, the literature review will be continuously updated from the references made through inputs from journal, articles, books and other academic resources to acknowledge the previous work done in the areas of IS research, design research approach, IT investment, the realization of IT business value, Learning Management System and e-Learning evaluation. Studies that examine the evaluation of LMS in the post-implementation were found in the literature; however, to the best of my knowledge, no study has been done which examines the pre-implementation of LMS in universities, particularly in Malaysia. The limited amount of research conducted on non-financial pre-implementation evaluation of IT-investments in general, also confirmed the importance of this study.

6 CONCLUSION

This paper addressed the importance of realizing IT value from the implemented system and the problems in identifying and realizing IT value, particularly in the implementation of new technology in universities. It also discussed the different techniques and approaches developed by researchers and consultants to assist in resolving the problems in realizing IT value in organizations and the use of these approaches, particularly the use of non-financial perspective in assisting decision makers to evaluate systems in the pre-investment phase. It proposed that a more comprehensive and effective model that really articulates the value from IT investments, to assist better decision making processes in universities, is needed. To be able to effectively achieve this, a comprehensive model for IT investment decision making involving both financial and non-financial measures has been proposed.
References


