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DOI: <https://doi.org/10.1108/03055721111134781>

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Citation

MENKHOFF, Thomas; THANG, Tze Yian; CHAY, Yue Wah; and WONG, Yue Kee. Engaging knowledge management learners through web-based ICT: An empirical study. (2011). *VINE*. 41, (2), 132-151. Research Collection Lee Kong Chian School Of Business.

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Engaging knowledge management learners through web-based ICT: An empirical study

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Published in VINE, Volume 41, Issue 2, May 2011, Pages 132-151

<https://doi.org/10.1108/03055721111134781>

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The authors gratefully acknowledge that this research was funded by the Office of Research (OR Ref No. 08-C207-SMU-014; Fund No. C207/MSS6B017), Singapore Management University.

Abstract:

Purpose – The purpose of this paper is to examine how to successfully blend an e-learning module into a knowledge management (KM) course aimed at getting KM students interested in the respective subject matter (= KM) in a web-based learning environment.

Design/methodology/approach – Based on data obtained from 138 undergraduate business management students at a university in Singapore, practical aspects of effectively implementing an e-learning system with a focus on KM are analyzed and the importance determined of three conceptual variables in the context of successful blended learning approaches: online faculty to student interaction, social presence and personal e-learning experiences.

Findings – The study shows some positive correlations between online faculty to student interaction, the degree of presence in a web-based learning environment, as well as personal e-learning experiences as potential drivers of students' desire to learn more about the subject matter KM.

Research limitations/implications – There has been reliance on self-reported data in both the strengths, weaknesses, opportunities and threats study and the student survey. The causal effects of students' perceptions on actual learning need to be explored in a future study with a larger sample size.

Practical implications – To increase students' acceptance of a web-based KM course, instructors must ensure quality interaction between them and their students, strong social presence via intrinsically rewarding group interactions and enriching, personal e-learning experiences on the basis of real-life KM problems. Games, systematic performance monitoring and graded knowledge tests are critical, too.

Originality/value - This study highlights several good design features of an effective student interface vis-à-vis the development of an effective online learning environment from the perspective of KM student learners. Implications for e-learning designers and instructors, as well as issues for further research, are outlined.

Keywords: E-learning, Knowledge management, Virtual learning environments, Web site design

1 Introduction

The knowledge management (KM) course featured in this essay is an elective for undergraduate students aimed at exploring the on-going shift towards a knowledge society/economy, the theoretical and empirical origins, definitions and domains of KM as well as its use and practical implications in terms of knowledge-centric business processes (Alavi and Leidner, 2001). The KM course attempts to provide learners with answers to the following core question: which forms of creating and utilizing knowledge can enable both individuals and organisations to transform learning and innovative capabilities into key competencies? The course focuses on both the theoretical and applied literature on knowledge-based society/economy, knowledge work(ers) and KM. To achieve the various learning objectives, students are requested to analyse several case studies aimed at appreciating the challenges managers experienced who tried to find answers to the issues raised above as well as to outline the benefits and consequences of “good” KM. Students also have to conduct their own empirical research on KM applications in local or foreign organizations. To realize the goal of a shared learning experience between students and instructor, the course is aimed at integrating actual KM problems, practical KM experiences, problem-based interaction with practicing KM consultants (if available), individual/group projects, and critical reflection on the various course materials.

In 2005, the KM course was converted from a traditional face-to-face class to a blended learning format with support from the University's Centre for Teaching and Learning (CTL). About one-third of the course is delivered in an e-learning format (Eisenstadt and Vincent, 2000; Garrison and Kanuka, 2004). Two-thirds of the course contact hours are spent in the classroom face to face.

The e-learning module (ELM) for the KM course featured in this paper was designed to be a mix of self-learning followed by assignments (e.g. case analyses) to be submitted. The module contains a total of six e-learning units to be delivered over five weeks during the semester. The final product is the result of team effort that consists of seven persons: one CTL staff as the project manager, the instructor as the subject matter expert, one student research assistant and four external consultants and developers.

The core objective of this paper is to provide a self-critical and evaluative case study of the roll out of a new ELM blended into a “KM” course. We share the rationale behind the design features of the module and the implementation platform, describe the effort to blend the module into the teaching of the KM course and explore potential antecedents of students' desire to learn more about the respective subject matter in an online environment based on qualitative feedback by undergraduate students and empirical evaluation results. Various data sources are integrated to provide a wholistic picture of how the new e-learning environment was implemented and what its strengths and weaknesses are. Besides analyzing some of the practical aspects of developing, implementing and utilizing an e-learning system, we are interested in determining the importance of three key variables in the Singapore context which have been identified in the literature as important drivers of successful blended learning approaches in a web-based learning environment, namely online faculty to student interaction (Picciano, 2001) the degree of presence (Picciano, 2002; Richardson and Swan, 2001, 2003; Rourke *et al.*, 2001) as well as personal e-learning experiences (Swan, 2001) which need to be similar to real face-to-face classroom instructions to enable positive learning outcomes (Lombard and Ditton, 1997; Shea *et al.*, 2001). As such, the essay makes a contribution to the dearth of Asian research literature on blended KM learning at institutions of higher education (Ramsden, 1992).

2 Conceptualization and hypotheses

As the growing literature on e-learning and blended learning suggest, both scholars and educators are increasingly recognizing the importance of asynchronous and synchronous learning (Nipper, 1989; Alavi and Gallupe, 2003; Bourne and Moore, 2005; Coppola *et al.*, 2002; Garrison, 2000). Garrison and Kanuka (2004) define blended learning as the thoughtful integration of classroom face-to-face learning with online learning experiences. Blended learning experts have pointed out that selecting the right pedagogy is more important than choosing the respective technology (Webster and Hackley, 1997). In practice, however, instructors are often dependent on the expertise of software designers and design houses due to insufficient knowledge about theory and practice of effective blended learning as well as the art of e-moderating (Albrecht, 2006; Picciano, 2002; Picciano and Dziuban, 2006; Shneiderman, 1998; Salmon, 2000; Swan, 2001; Sloan Consortium, 2005).

Successful blended learning requires both effective pedagogical approaches as well as the stimulating use of the computer as didactical tool. Designers and instructors have to ensure that learning components such as digital materials storage and distribution (presentation), synchronous and asynchronous communication, simulative interactivity, multimedia, and access tracking processes do indeed stimulate learners.

What else does it take to stimulate learners to get interested in the respective learning content in web-based learning environments? E-learning experts (Bolliger and Wasilik, 2009; Lombard and Ditton, 1997; Picciano, 1998, 2001, 2002; Shea *et al.*, 2001) have stressed the importance of student to faculty and student-to-student interactions and presence in online courses as social phenomenon which require specific teaching approaches. A key enabler is the quality and quantity of interaction between students and instructor (Hill *et al.*, 2003). To avoid that students feel that they are “drifting” in the online space, it is important that there is sufficient interaction between them, the instructor and their peers (Baker *et al.*, 2003, p. 8). E-learning students often self-advise. Therefore, it is easy for them to misunderstand instructions and to become less committed. Regular communication and quality interaction (e.g. during online professor office hours and/or on the basis of online food for thought which leverages on students' interests and experiences) can help to avoid such issues. Students will find topical online interactions more relevant and enjoyable when they correspond to their career aspirations or major field of study (Arbaugh, 2005). Therefore, we hypothesized the following:

H1. The degree to which the e-learning experience stimulates students' desire to learn more about KM is positively related to the frequency of online interaction.

Social presence (Lombard and Ditton, 1997; Picciano, 2002; Swan and Shih, 2005) refers to the communitarian embeddedness of virtual learners in web-based learning environments and their dependence upon instructors and other students sharing ideas and knowledge. Picciano (2002) refers to it as a student's sense of being and belonging in a course. According to Rourke *et al.* (2001, p. 3), social presence supports affective objectives by making the group interactions appealing, engaging, and thus intrinsically rewarding, leading to an increase in academic, social, and institutional integration and resulting in increased persistence and course completion. Richardson and Swan (2001, 2003) explored the role of social presence in online learning environments and its relationship to students' perceptions of online learning and satisfaction with the instructor. They found that students with high overall perceptions of social presence also scored high in terms of perceived learning and satisfaction with the instructor. Insufficient presence may lead to estrangement, learning problems and negative performance outcomes. Thus, we hypothesized the following:

H2. Social presence is positively related to the degree to which the e-learning experience stimulates students' desire to learn more about KM.

In terms of learning effectiveness, an ELM must offer personal experiences similar to the enjoyment and performance benefits of traditional face-to-face classroom settings (Arbaugh, 2005; Bolliger and Wasilik, 2009;

Picciano and Dziuban, 2006; Swan, 2001). IBM's so-called "Basic Blue" training program for new managers might help to illustrate this point. The company conducts 48 percent of its training online. It trains more than 5,000 new managers each year to enable them to appreciate IBM's culture, strategy and management practices. A couple of months before all new managers actually come to together face to face in a week-long training session, they engage in self-paced web learning modules with a focus on basic management skills, simulations and video based real-life business scenarios featuring a fictional colleague or client. By the time the new managers meet in person, they have sufficient practical experiences to share actual lessons learnt on-the-job:

After forging those face-to-face relationships with other managers, they continue to do online group simulations and mentor one another for seven months. Studies conducted by Harvard Business School and other organizations determined that the program enables managers to learn five times as much material at one-third the cost of a classroom-only approach (www.workforce.com/section/11/feature/23/62/89/index.html (accessed June 2009)).

Such an approach implies an affective alignment of meaningful and relevant online (based on real-life business scenarios) and face-to-face learning experiences which is of benefit for the learner.

As in face-to-face classroom settings, positive or negative personal online learning experiences are shaped by several factors such as how the e-content is presented (e.g. in terms of engaging animations), communication richness, the extent to which learners have the opportunity to share and collaborate with instructor and peers or the teaching strategy aimed at promoting self-directed learning and critical thinking. In our case, the teaching and blended learning approach focused upon problem-based learning so as to enable students to analyse case-related KM scenarios professionals are facing in their daily practice such as insufficient leadership support for KM initiatives which was done both online and during normal classroom sessions. Altogether, face-to-face classroom sessions represented 70 percent of the total course contact hours while self-paced e-learning totalled 30 percent of course, contact hours. We believe that such a mixed menu does in fact enhance students' desire to learn more about KM. Thus, we hypothesized the following:

H3. An ELM that offers personal experiences similar to face-to-face classroom settings/instructions is positively related to the e-learning experience that stimulates the desire to learn more about KM.

Other problem-based learning activities integrated into the blended ELM featured in this article include exposure to mini-lectures by instructor and guest speakers (practitioners) as well as students' case and project presentations. Learners enrolled in the course are required to prepare themselves for face-to-face classroom sessions by reading selected references as specified in the course outline and to access the six topical e-learning units (see below) anytime and anywhere before they are actually dealt with by the instructor as stipulated in the course outline. As outlined in Section four, effective courseware design is essential to motivate learners to make use of online resources such as photo-realistic images or end of topic summaries. Thus, we hypothesized the following:

H4. Quality online materials improve the motivation to learn.

3 Methodology

Methodologically, the paper is based on routine evaluations (Patton, 1997) of the university's CTL with particular reference to the qualitative analysis of evaluative strengths, weaknesses, opportunities and threats (SWOT) reports written by 45 undergraduate business management students who enrolled in the KM (elective) course in academic year 2005-2006. Students were tasked to assess the effectiveness of the ELM in form of an 1,800 words essay, outlining the SWOT of the new module. SWOT analysis is widely used as a managerial tool in strategic management. Its scholarly origin is unclear but it has been featured in management textbooks since the early

1970s (Weihrich, 1982). While SWOT is arguably a simple tool to assess educational experiences, there is evidence that it is useful to explore and structure educational research, e.g. to get ideas for improvements. Jackson *et al.* (2003), for example, used SWOT analysis as a tool to analyse recent research on team and organisational diversity in the context of organizational, group and individual dynamics as well as training. One of the advantages is that SWOT is easily understandable by users (Sherman *et al.*, 2006). The essays were analyzed using processes such as data organization and reduction, conclusion drawing, and verification (Miles and Huberman, 1994). In terms of data reduction, the data material was simplified and categorized in order of importance as reflected in the various sub-headings in the section “evaluation and analysis of student feedback” below. SWOT perception commonalities of students and emerging patterns/concerns provided inputs for the subsequent verification and conclusion drawing phase of the research. As the SWOT concept was used as basis for the students' reflective essays, it provided an initial structure for identifying critical passages in the text material. After having read through the various students' essays, certain themes or topics were used for coding the text material by selecting appropriate labels (names) such as flexibility under the category “Strengths” or fun and competition under the category “Weaknesses”. The plausibility of these codes was ascertained by a second rater. Quantitative inter-rater reliabilities were not obtained due to the exploratory nature of this initial research.

Two other samples of undergraduate business management students who enrolled in the KM (elective) course were obtained via an online evaluation questionnaire addressed to altogether 93 students who took the ELM in academic year 2007-2008 and 2008-2009. These data allowed us to run some exploratory correlation analyses and to test three hypotheses about some of the potential drivers of students' desire to learn more about the subject matter (KM) in an online environment of a tertiary educational institution in Asia (Singapore). To further enhance the credibility of our analysis, the paper was reviewed by the teaching assistant of the ELM and an expert specialized in e-learning.

4 Design considerations

Content structure

As most of the content comprises text and static images, the project team had to find a way to find the correct blend of text, graphics, animation, sound, and video (Jonassen *et al.*, 1997; Martins and Kellermanns, 2004; Laurillard, 2002; Oliver, 1999). The e-learning package comprises eight modules (six learning modules and two assessment modules altogether). Each assessment module covers the content of three modules. The total e-learning content duration is estimated to be about 360 minutes (six hours), which includes interactive activities like short review questions within each sub-topic. The target learners are undergraduate students in the 20 to 25 age group, a generation raised in the internet milieu which expects visual cues and online communications to be the norm. In order to meet the target learners' profile and needs, the courseware makes use of relevant photo-realistic images to describe concepts and present factual data. Information is being organized into smaller and manageable “chunks” to make it easier for the learners to digest.

The courseware design requires the learner to complete all the sub-topics within each topic, but not necessarily in any specific sequence. Learners with no prior knowledge are strongly encouraged to follow the recommended sequence. However, to provide focus, the topics are released linearly, one at a time, so that everyone is in synch with each other. This is done through the selective release feature of the learning management system (LMS). Features include:

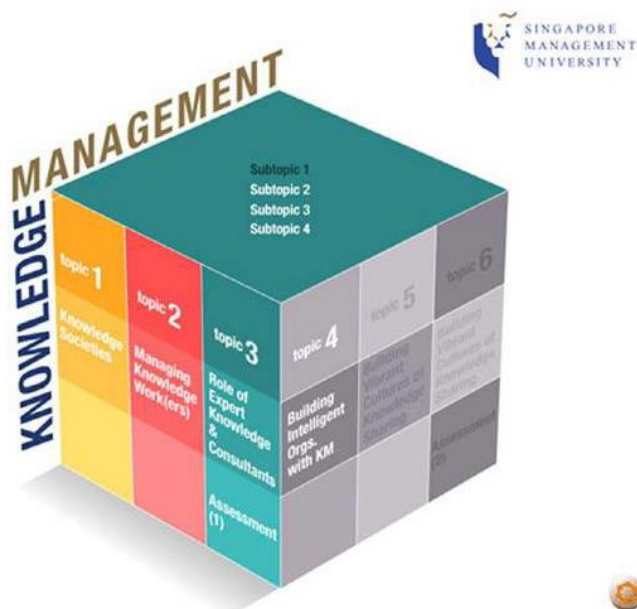
- *Review questions at the end of each sub-topic.* These objective-based quizzes are designed to reinforce learning and not to test the learners. Thus, there are plenty of hints and feedback given. Although quiz results can be tracked in an external database, this feature is not a requirement for this courseware.

- *Assessment.* There are two assessment modules to help students self-assessed if they have accomplished the objectives of the course. Assessment 1 covers the content from topics 1 to 3, and Assessment 2 covers the content from topics 4 to 6. Assessments are controlled and released individually by the faculty. However, there is no requirement for these assessment results to be tracked even though it is possible to capture them in an external database.
- *Online resources.* End of topic summaries, case studies, case study links in each topic and additional online articles are supplementary materials that students can use for their assignments.

Interface design

One of the challenges that the project team faced was how to design and present the menu and navigation to the students in a fresh and engaging way without overwhelming them. The project team decided that the main menu should be as dynamic and visually enticing as possible to catch the students' attention but not overly animated to prevent distraction (Shneiderman, 1998). After pondering about various different menu designs, the project team finally adopted a cube menu (Figure 1) as it offers a clean interface with minimal user action to view all the topics at one go.

Figure 1. Interface design with cube menu



When a new learner first enters the main menu, all available topic titles are shown in white against a grey background. Grey background indicates unvisited state. If a topic is not yet been released to the learner, the topic title text will be dimmed. When learners mouse over each topic, the sub-topics will be shown on the top face of the cube. Clicking on any of the sub-topic will result in its launch. When a sub-topic is fully completed, the sub-topic title will change from white to the respective colour scheme of the topic (e.g. topic 3, sub-topic 1).

Instructional design

A sample page in the ELM is shown (Figure 2). Standard features of a traditional courseware have been incorporated, including the back and forward navigation control, page indicator, help, glossary, site map, audio

on/off control, narrative replay and anytime exit. However, the following are some features that have greatly enhanced the user experience:

- *Degree of importance.* The three cubes beside a piece of article or information can highlight to the learners the degree of its importance relative to the topic being studied. The number of cubes coloured ranges from none to three and signifies the progressive importance of that piece of article or information (Table I).
- *Printing of contents.* By clicking on the “lesson outline” button, which is located in the last page of each sub-topic, the learner is allowed to print the entire text content of a sub-topic via PDF file upon completion. This facilitates note taking and the review of contents without having to go online.
- *Single sign-on via LMS (WebCT Vista).* The courseware can be uploaded into Vista. So all students enrolled for the KM course will have access to this courseware without the need for additional login information.
- *Standard compliance.* The KM courseware is SCORM 1.2 RTE 1 standard compliant. This means that tracking can be achieved if implemented in a SCORM compliant LMS like WebCT Vista. Unfortunately, implementation within the platform has not been straightforward. Nevertheless, after much study, we are able to use Vista's student data and values from the SCORM table to construct a progress map for individual learners. This map keeps each learner motivated as they can keep track of their learning progress down to sub-topic levels.
- *Bookmark.* Similarly, by drawing information from a SCORM variable, a learner taking the course will automatically be prompted to resume from the first page of the last visited sub-topic upon revisiting the courseware. The learner, however, is free to resume or restart from any sub-topic available.

Figure 2. Details of user interface – sample page in ELM



Table I. Details of user interface

Topic title	Displays the title of the current topic (e.g. The rise of the knowledge society as illustrated above)
Sub-topic title	Displays the title of the current sub-topic (e.g. Knowledge explained)
Page title	Displays the title of the page (e.g. Summary)
Menu (cube icon)	Activated to return to the main menu
Audio (speaker icon)	Toggle audio on/off
Site map (hierarchy icon)	Displays all sub-topic and page titles, and allows direct entry to a desired page
Help (question mark icon)	Provides instructions to the user interface
Glossary (a-b-c icon)	Displays a list of commonly used abbreviations, technical terms or concepts with definitions or explanations
Exit (door icon)	Exits the courseware
Navigation control (back and next)	To page backward and forward

5 Results: evaluation and analysis of students' qualitative feedback

Both qualitative and quantitative studies were conducted to evaluate the ELM. Below, we have categorized summaries of the students' qualitative SWOT feedback which provide useful insights into the SWOT of the university's first ELM on KM. The findings give us opportunities to further improve on the design of e-learning packages put together by the university. While there are good suggestions to improve the module, the benefits have to be weighed against the costs and efforts required. We will clarify any technical limitations as well as highlight the tools that are already available within Vista for learners to use. Some of the results of students' quantitative feedback are summarized at the end of this section.

Strengths of the ELM

- *Flexibility.* Since students can access the module any time anywhere, they relish this flexibility and are independent in structuring their learning activities instead of being bounded by a rigid classroom schedule. Students also reported that they felt more responsible for their own learning.
- *E-content.* Students pointed out that with electronic content, definitions of unfamiliar terms are easily available due to the inbuilt glossary enabling them to find out the meanings very quickly. Students reported that the use of multimedia elements like narration, videos, animations and pictures in addition to the text made learning and recall of content easier, implying a more engaging learning experience. The interface and graphical design of ELM was described as “beautiful” and “unexpectedly interesting”.
- *Structure.* The organisation and structural elements of the ELM were perceived as conducive for learning especially the user-friendly sitemap. It has helped them in their revisions as they could go to any part of the ELM that contained the information they wanted. Students appreciated the review mechanism that has helped them to monitor their own learning progress. Students also assessed case studies, case study links in each topic and the additional online articles positively. ELM-related videos were also seen as value-added features.
- *Tracking of progress.* The system “remembers” where learners leave off, and helps them to return to that particular slide when they have re-logged in. Students felt that this reduced the inconvenience of remembering and then navigating to where they had last left the ELM.

Weaknesses of the ELM: tracking of progress

Qualitative evaluation data suggest that without appropriate guidelines or tracking of progress some students might lack the self-discipline to go online while some learners just click through the pages so as to get to the end of each topic quickly. It was suggested that the module should track the scores for review and quiz questions, and the rate at which the users are going through the topics. Respective reports should be sent to the instructor automatically on a weekly basis to enable him/her to monitor learners' progress, identify potential issues and questions that might need class discussion. As a follow-up measure, CTL developed a tracking application that can be added onto SCORM compliant ELMs to satisfy this requirement.

Since the progress of each student is tracked, they should not be expected to answer the review questions after the first time they cover the topic, which would waste their time. This will facilitate the students in reviewing the topic quickly the subsequent times they revisit a topic. Together with data captured in an external database, the tracking application can offer learners an option of whether they want to redo the review quizzes.

Weaknesses of the ELM: e-content

The key e-content issue was the need to ensure two-way interaction to enhance learning. In some case, students were unable to clarify doubts immediately if they did not fully understand the given online explanations. Other issues concern the coverage of main content and supplementary resources as well as the ingestion of some fun elements:

- *Communication and collaboration.* Students stressed the need to integrate communication facilities into the ELM itself so that users can interact with each other conveniently and in real time if they are online. They would also like to upload their assignments onto the system to be shared with their peers. CTL has assessed that both existing commercial tools like MSN messenger and SKYPE as well as the chat tool, discussion forum and assignment submission tool in Vista are sufficient and readily accessible to meet this requirement. Moreover, the development effort is costly and not easy to maintain.
- *Glossary.* Students would like the glossary to be as comprehensive as possible so that key terms and abbreviations are fully explained within the ELM itself. It was also criticized that there were too many abbreviations which were not immediately explained. It has been suggested that the ELM provides links directly for the explanation/definition of each term as they appear. Providing such links has been done before by CTL in other ELMs and can be an invaluable feature in addition to a more comprehensive glossary.
- *Content coverage.* Students felt that the coverage of some topics was not in-depth enough. We felt that the sufficiency of the contents really depends on whether the materials are supposed to be supplemental or replacement. If it is designed for the former, then it is important for the instructor to follow up the ELM with extra contents and learning activities in class to complete the learning.
- *Fun and competition in learning.* There were also suggestions to make the quizzes more competitive and motivating by employing a “game style” in which students get gems or points whenever they answer the questions correctly, and giving a prize to the person with the highest score at the end of the course. Some users stressed that quizzes should be graded so that more thought and effort are put into answering quiz questions. Finally, sounds of applause or other multimedia applications could be activated every time a correct answer is given to motivate students. CTL can certainly consider the creation of small games to inject some fun in their learning. However, tracking will be required to store their scores and grades. With complex games that require online competition, a lot more resources would be required and may not offer a lot of learning value in return.

Weaknesses of the ELM: structure

The manner with which content is chunked, sequenced and accessed by the users plays an important part in their online learning experience:

- *Faster page access.* While the sitemap was perceived as accessible and easy to use, some users reported that actual navigation to the pages that they wanted to access was “cumbersome”, requiring (too) many clicks before reaching them. So, students suggested that the ELM could use a bookmark style of navigation so that they can access (with one click) any page immediately instead of going through the main page. For now, CTL relied on the SCORM variable to capture where the user last left the courseware so that he could resume whenever he comes back. The progress map also has useful “bookmarks” to let the user know how much he has covered for each sub-topic. A bookmark feature as proposed by the students will require additional programming effort.
- *Feedback.* While the review questions and case study questions were seen as useful, many users highlighted that more detailed explanations could have been given in cases where questions had been answered wrongly since no one is around to clarify their queries.
- *Too many clicks.* Comments with regard to the ELM case studies and links suggest that there needs to be a refinement on how these items are presented. Users highlighted that pop-ups showing certain instructions and links were at times pointing to blank assignments. The fact that links and case studies opened in another window was also perceived as problematic. Several students felt that they find the hassle of clicking on many different icons discouraging. CTL acknowledge that improvements can be made in this area.
- *Technical problems.* Technical problems encountered were largely related to Vista as the ELM is launched through the platform. However, they can be resolved mostly through the proper installation of the necessary environment variables for the ELM to operate.

The system made use of a SCORM variable to remember where the user had logged off and to return the user to the same page on the next login. However, if users accidentally closed the main LMS window, this would result in the whole session not being recorded at all. Consequently, the user had to start all over again when he returned. To prevent this from happening, users were prompted with a message to confirm if they really wanted to leave without the session being recorded. Although this was seen as “very inconvenient”, this is the next best measure.

Students pointed out that the login procedure into Vista was very difficult to follow. To improve the user experience, an installation wizard was perceived as necessary with clear instructions so that users do not need to fret about login problems at all. CTL noticed that the problem prevailed mostly with first time users of Vista. Hence, user training, user guide and installation demos are all helpful suggestions.

Opportunities of the ELM

Our evaluation findings underline the generally positive feedback of students who enjoyed the e-learning experience. They felt that it had stimulated their desire to learn more about KM, and they regarded the ELM as innovative and value added. About 94 percent of all respondents of the online survey conducted in 2008 said that they would like to see more of such online content for other courses. Asked why, students pointed out:

The module was a very good tool of outside-classroom learning. The voice over was strong, and helped in understanding the content better. The animations, pictures, videos and graphics were excellent! They really help in understanding the concepts. The short assessments make it easier to recap what we have learnt. If possible, the module should be made available for use even after the class is over, as it would be a good reference point any time in the future.

It's innovative and convenient. We can access it at our own time and own pace.

I think it provides an interesting platform to learn and I find it very useful in revising what I had learnt. It is impossible to take down everything that the professor says in class, so the ELM was effective and helpful in helping me remember what he went through.

Threats of the ELM

One danger of the ELM is that it might create the impression that classroom teaching is redundant. This might cause some students to miss classes. Since the KM ELM is only a supplement to classroom teaching and discussions, there should be a thorough integration between what is learnt online and what is discussed in class. It is important that there is sufficient time for the discussion of (online) case studies and clarification of ELM issues in class to ensure effective knowledge transfer between instructor, students and peers (Ravenscroft, 2001; Reeves, 2002; Swan, 2001).

ELMs can be weak when it comes to social interaction between users and instructor. Some courses are unsuitable to be taught via the ELM since they require hands-on work, while some other courses require a face-to-face environment where individuals can share their opinions and experiences on certain issues. Hence, even with the introduction of fora, chatting facilities, and other online collaborative technologies, ELMs cannot always provide sufficient interaction unless both instructors and students are trained in mastering online communication.

There is also the danger that some media might not be sufficiently comprehensive or relevant to illustrate the desired knowledge; in other instances, they might contain too much detail and consume too much time. Hence, e-content has to be carefully chosen and processed for maximum learning impact.

6 Results: evaluation and analysis of students' quantitative feedback

What drives KM students' desire to learn in an online environment? Besides the design of the student interface, the quantitative surveys helped to confirm potential drivers of effective e-learning environments related to the instructional design such as social presence, online interaction and the actual e-learning experience which need to be carefully managed and nurtured by the instructor who has to create a sense of (online) ELM group belonging besides providing access to relevant discussion fora, blogs, wikis, etc.

The results of the correlation analysis showed significant positive associations among the major survey variables, frequency of online interaction, ELM as stimulus to learn more about KM, the actual ELM experience *vis-à-vis* face-to-face learning, and quality of online materials.

As shown in Table II, there was a positive relationship between the e-learning experience and the frequency of online interaction (Pearson coefficient 0.21 $p \leq 0.01$). The higher the frequency of online interaction, the greater the students' stimulated interest in the ELM module. An interesting question in this context is which kinds of stimulation can lead to improved interactions between students and instructors. Examples of effective stimuli include a user-friendly content management system that enables users to post and follow up on course-related assignments or easy-to-use communication channels enabling even slow learners (who may need more response time to participate) to effectively enhance their elearning curve. Another example would be a learner-centric online discussion forum with stimulating, problem-oriented questions (posed by an instructor with a strong personal "presence") which appeal to the students' context and experiences so that they initialize in-depth and value-added discussions. Instructors and classmates who are not easily contactable through the web clearly put elearners off (Tu and McIsaac, 2002; Chai and Poh, 2009).

Table II. Correlations of major variables in the study

	Mean	SD	1	2	3	4	5	6	7	8
1. Age	23.26	2.40	(-)							
2. Gender ^a	0.47	0.51	0.34**	(-)						
3. Frequency of online interaction	2.60	1.70	-0.17	0.05	(-)					
4. I am part of ELM group	3.13	1.53	-0.12	-0.04	0.10	(-)				
5. ELM stimulated my desire to learn KM	4.43	1.39	-0.19	0.18	0.21*	0.36**	(-)			
6. ELM offers similar experience as face-to-face learning	3.18	1.56	-0.02	0.05	0.09	0.52**	0.41*	(-)		
7. ELM allows for social interaction	2.47	1.22	-0.04	0.02	-0.08	0.59**	0.31*	0.51**	(-)	
8. Online material made e-learning interesting	3.62	1.48	0.08	-0.05	-0.05	0.27*	0.46**	0.36*	0.20	(-)

Notes: $n = 93$; correlation is significance at: *0.05 and **0.01 levels (two-tailed); ^agender coded male - 1, female - 0

Communitarian embeddedness *vis-à-vis* the web-based learning course was positively associated with the extent to which the e-learning experience stimulates students' desire to learn more about KM, providing support for *H2* (Pearson coefficient 0.36 $p \leq 0.01$).

To enable students to perceive their peers as being “there” and “real”, instructors need to ensure quality interactions between instructor and learner, and among learners. Their responsibility is to create a secure space for social interaction through effective course design strategies, frequent feedback (via a chat forum, instant messaging or video conferencing), sharing of personal stories or emotions, i.e. graphical representations such as an image or ASCII characters of a particular feeling he or she has.

The survey findings do also support *H3*, providing some evidence that to be effective in terms of learning stimulation, an ELM must offer personal experiences similar to effective face-to-face classroom settings/instructions (Pearson coefficient 0.41 $p \leq 0.01$). Both students and instructors must feel comfortable with elearning approaches *vis-à-vis* the traditional on-campus mode they are used to so as to bolster this new type of learning. Besides factors such as instructor competency or student buy-in (Selim, 2007), it is important that the e-learning program contents are meaningful and needs-based in terms of students' career goals, study subjects/areas of specialization and expected learning outcomes.

We also found support for *H4* in form of a highly significant correlation between the quality of online materials and improved motivation to learn (Pearson coefficient 0.46 $p \leq 0.01$), i.e. the content, tools and instructions required for teaching and learning. Like any learning material, online learning materials must be relevant for the target group, didactically effective, applicable and allow for some useful generalizations. Further quality criteria include updatability, interactiveness and communality (in conjunction with usability with regard to technical structure and interface design, ease of use and accessibility of online learning materials).

Overall, the findings confirm that the success of web-based learning depends on the nature of online interaction which is critical in terms of satisfaction and learning effectiveness (Picciano, 2002, p. 22). If asynchronous discussions via an electronic discussion board form the basis for the instructional model used, then it is essential

that interesting and meaningful discussion questions are posted online and that the discussion facilitator provides a value-added debriefing at the end of the respective learning unit. If the quality of student to faculty or student-to-student interactions via relevant online channels is poor, we can expect issues with regard to web-based learning effectiveness. The data suggest that fostering a sense of social presence (Swan and Shih, 2005), is essential to motivate learners to internalize online learning content and to stimulate them to learn more. This insight is supported by a recent survey by Reupert *et al.* (2009) where most respondents highlighted the need for engaging, passionate, and understanding instructors who are expected to show these attributes through self disclosure, relationship building, humor, and individualized feedback. Online professor office hours, empathy and warmth, sporadic reminders that participating e-learners belong to an exclusive club of technology-savvy students or even small threats of punishment in case of non-compliance may increase perceptions of social presence and a sense of group commitment (Rourke *et al.*, 2001) as potential driver of students' desire to expand their course-related competencies. If the sense of belonging in an online course environment is poor, we can also expect issues with regard to web-based learning effectiveness.

E-instructors interested in stimulating learners' interest in the respective subject matter must ensure that ELMs offer personal experiences similar to face-to-face classroom settings/instructions which can be achieved by leveraging on problem-based learning approaches and real-life online material which corresponds to students' career objectives and major field of study. If instructors fail to do so, we can expect issues with regard to web-based learning effectiveness. In summary, while the correlation coefficients in the present study do indicate support for the hypotheses tested, the results do not imply any causal underlying relationships whatsoever. Much more needs to be done in terms of sample size and complex statistical analyses to further understand how ELM influences and contributes to students' desire to master both theory and practice of KM.

7 Discussion and conclusion

The evaluation results suggest that the ELM adds value to learning and the internalisation of KM related concepts and applications. In the quantitative ELM surveys, 73.5 percent of the all students enrolled stated that they enjoyed the e-learning experience, and 93.9 percent replied that they would like to see more of such online content for other university courses. However, there is also room for improvement with regard to some of the design features of the ELM as well as the pedagogical approach used to impart KM-related skills and competencies online. As course participants stressed in their course evaluation papers, course-related online games, graded knowledge tests and systematic progress tracking (in terms of monitoring and assessing online participation and performance) by the instructor represent critical features of enjoyable and sustainable ELMs in the specific context of Singapore (something which the instructor did not really anticipate during the development stage of the module). Our findings echo results of studies conducted by other e-learning researchers who found out that students are strongly influenced by perceived performance consequences when it comes to assessing the benefits of online learning tools (Hedberg and Lim, 2004; Peters, 2000; Tam, 2000). To what extent the emphasis on grades for online coursework is a uniquely Singaporean phenomenon given the emphasis on formal knowledge tests and exams in Asian educational systems (Welch, 2007) needs to be addressed by future studies.

The ELM taught in academic year 2008-2009 featured a new tracking application (in response to students' feedback during the earlier SWOT exercise) to enable closer performance monitoring. In academic year 2005-2006, students had requested for an application that enables the instructor to track their completion status (including percentage of materials covered), number of visits and time duration. Since the LMS, Vista, is SCORM 1.2 compliant, this application made use of the SCORM data residing in Vista's database. Upon implementing the application in academic year 2008-2009, we found that we were not able to achieve 100 percent accuracy in tracking the completion status. However, the amount of time spent has been accurately captured for all students. We were able to identify some client installations that have interfered with the transmission of the SCORM data.

The fact that the instructor highlighted the existence of the new tracking device and his intention to use it as additional input during the grading phase contributed to greater utilization of the ELM and hence more learning.

Adequacy of technical support, prior experience in using computers and the web as well as instructors' knowledge of students and their viewpoints towards new learning technologies such as e-learning represent important factors influencing students' perceptions as far as the qualitative data are concerned. Other quantitative studies lend support to these findings (Lim, 2001; Selim, 2007). Rich and effective online interaction in terms of collaborative, learning enhancing dialogues between instructor and students as well as the students' sense of belonging in the ELM course together with enriching personal e-learning experiences similar to real face-to-face classroom settings are critical to stimulate learners' appetite for KM-related learning contents as far as our quantitative data are concerned.

To enable students to more effectively collaborate with each other online, learners were encouraged to experiment with commercial social media tools such as MSN Messenger and SKYPE as well as the chat tool, discussion forum and Assignment Submission tool in Vista which are readily accessible. They also explored the usefulness of blogs to supplement the blended learning format and to reflect about the implications of the course contents with regard to their own career development (in terms of personal KM) as exemplified by the following (somewhat philosophical) extract from a participating ELM student blogger:

[...] at the end of the day the question is what incentives do I have to make use of online learning tools besides scoring well and gaining new knowledge? One of the challenges [...] is the sustainability of attracting active contributors and maintaining social life within chat rooms and forums. The basis of online participation is to be engaged via a shared platform with a shared goal as it provides a valuable opportunity to learn from each other.

The quotation reminds us that e-learning is simply a means to an end which is to enable learners to appreciate learning contents and to apply them in line with curricular premises. As Nichols (2003) has argued, the teaching tools have changed but the job of an educator in an online environment has not. In assessing students' competencies, for example, the expected learning outcomes need to be evaluated rather than proficiency and frequency in/of utilizing online tools such as bulletin boards, online discussion groups, blogs or wikis. If educational needs warrant it, e-learning can add substantial value to learning processes but technology alone will not do the job.

Besides more research on the uniqueness of effective e-learning approaches in Asia and potential barriers such as the conservativeness of both instructors and teachers (Welch, 2007; Yeung, 2009; Currie *et al.*, 2008; Menkhoff *et al.*, 2010), greater emphasis has to be put on equipping instructors who are interested in utilizing e-learning frameworks with respective up-to-date online teaching, learning and moderation skills.

The results of this study suggest that online learning effectiveness can be further fostered through user-friendly designs as well as development and training measures for both instructors and students with a focus on effective instructional design cum media features, blending, problem-based learning, online communication and collaboration channels, social presence and enjoyable e-learning experiences.

Blended learning approaches such as the ELM featured in this article which utilizes both face-to-face and e-learning experiences must be infused with relevant content and enjoyable online social collaboration to achieve greater effectiveness (Nemanich *et al.*, 2009, p. 142). As Dziuban *et al.* (2005) and Lorenzo *et al.* (2006) have stressed, another pedagogical challenge is to develop teaching and learning strategies for blended learning environments that will leverage on the strengths of Generation X students such as their technological proficiency while accommodating their immaturity in terms of information literacy and critical thinking ability.

One limitation of the research study reported here is its reliance on self-reported data in both the SWOT study and the student survey. The causal effects of students' perceptions on actual learning were not explored due to limited data. This should be the focus of future studies.

While not representative, the results of this case study have helped to identify several, potentially important antecedents of effectively utilizing blended e-learning content for courses such as the KM program featured in this essay aimed at increasing students' desire to learn more about the respective subject matter as dependent variable. Potential predictors include student motivation and computer self-efficacy, how and how often the ELM is actually used, the relevance of topics featured, including content, the effectiveness of design features and “right” choice of media to enhance learning, ease of use/accessibility, the quality of online interactions between learners and instructor as well as amongst learners, student's perceptions of being in and belonging in an online course (social presence) as well as the degree to which the ELM offers enriching personal experiences similar to face-to-face classroom settings/instructions. Two other important factors include instructor competency and the commitment of the respective institution. The emerging model with its emphasis on learning performance and actual learning outcomes (e.g. grades) as dependant variable will have to be tested in a future empirical study with a larger number of respondents.

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Further Reading

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