Investigating the Knowledge Creation Processes in a Learning Management System (LMS)

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ABSTRACT

SECI model is commonly used in explaining the process of interaction and transaction of tacit and explicit knowledge between the experts and novices. The model involves Socialization, Externalization, Combination, and Internalization process derived from organizational practice. As its applicability in the educational context is inconclusive, an investigation was conducted to see if the model could explain the knowledge creation processes for the expository (high hierarchical structure) teaching method in a set of online courses. This paper reports the findings based on a survey conducted on a sample comprised of 371 students enrolled in LMS-supported courses at a university in Malaysia. The instrument has been developed based on the SECI model to measure the interaction and transaction processes for content-based and content-free skills. The data was collected in stages over a semester and analyzed using the latent variable method in Structural Equation Modeling (SEM). The latent variable method requires the extraction of the factors investigated through a measurement model followed by the construction of the structural model employing the extracted factors. For content-free skills, the measurement model reported a good fit for the data, with all factors having significant direct effects hence follows the complete SECI model. However, the structural model analysis for content-based skills reported an acceptable fit for the data with one insignificant hypothesized direct effect, thus produced an incomplete SECI model. The overall findings demonstrates that SECI model is applicable to educational settings and worked well in situations or contexts where students were already proficient.

Keywords: Knowledge Creation, Learning Management System, Tacit Knowledge, Explicit Knowledge

I INTRODUCTION

Higher learning institution is a center for knowledge creation (Chen & Burstein, 2006), whereby new knowledge from ongoing research works shared among experts and passed to the others (novice researchers and students) either as new practices or through teaching and learning process. Education domain is very contrast to the industrial domain that comprises of highly qualified personnel with strong hierarchical structures headed by experts. The experts possess expertise in two aspects, tacit knowledge and explicit knowledge. Instead, educational domain is usually influence by large gaps of knowledge and abilities between the instructors (experts) and the students (novices) determined by the various instructional methods and resources employed.

In the educational domain, the aim of knowledge creation or expertise development process focus more on the transfer of knowledge from the expert to the novices. The process involves iterative interaction and transaction between tacit and explicit knowledge until new knowledge is form. With the rapid growth of technology, the interaction and transaction processes are now enhanced into online methods utilizing the LMS. This has been demonstrated through the implementation of the WebCT and Blackboard technology in the teaching and learning process.

Polanyi (1966) suggests that knowledge could be divided into two forms; the tacit knowledge and explicit knowledge. Tacit knowledge is defined as a human judgment and decision-making through experience and thinking (Guthrie,1995; Gerard, 2003). Tacit knowledge is further categorized into two; (1)knowledge stored on a daily basis within an organization and (2)direct knowledge as well as indirect knowledge created by the novices from the learning process (Gerholm, 1990). In learning new knowledge naturally and dynamically, students developed

tacit knowledge in the form of independent learning, thinking and decision-making, accumulated from various subjects or learning courses. Since tacit knowledge is difficult to articulate, Nonaka and Takeuchi (1995) have introduced SECI model to explain the transaction process of tacit knowledge and explicit knowledge particularly for industrial sector based on the expertise hierarchy in a guided environment. The model consists of Socialization, Externalization, Combination and Internalization processes. SECI model explains on how individual expert's tacit knowledge is transform into a group explicit knowledge and then employed as an organizational tacit knowledge. SECI model has successfully exhibits the transaction process of tacit knowledge and explicit knowledge from expert to novice in building a successful and competitive organization (Nonaka, 1991; Nonaka & Takeuchi, 1995; Nonaka & Toyama, 2007).

Based on that reason, we suggest that SECI model may be a suitable model to also explain the knowledge creation process for tacit knowledge namely independent learning, thinking and decision-making within the conventional teaching and learning method supported by LMS. It was anticipated that the knowledge creation process involves interaction and transaction among students and elements in online learning environment.

II THEORETICAL FRAMEWORK FOR LMS

In the LMS environment, students interact with teaching materials, instructors, colleagues and the system infrastructure and architecture to generate tacit knowledge. The relationships between these elements (Figure 1) formed the basis of SECI model in culturing independent learning, thinking and decision-making among students in a guided, structured and systematic knowledge creation process.

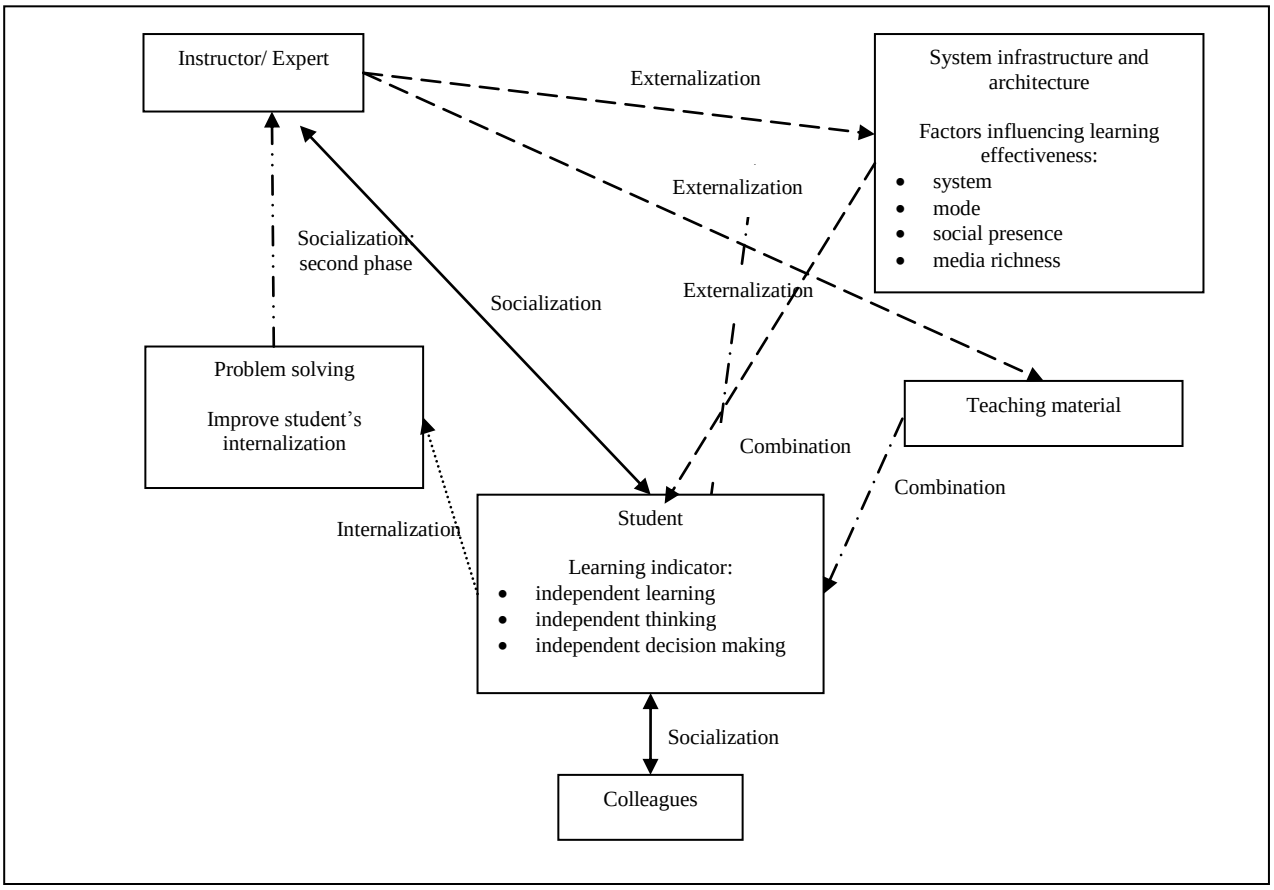

Figure 1. Theoretical framework in LMS

Current practice shows that LMS supported learning environment has been widely accepted in higher learning institutions. For example, many have utilized the use of applications like Moodle and WebCT as the alternatives to existing teaching and learning process. LMS functions are to manage and control activities with regard to guided online teaching and learning. Although the use of online system has been well accepted in higher learning institutions, the effectiveness of such technology in the knowledge creation process remains inconclusive. More studies are required for better understandings of such issues (Chua 2002) particularly for knowledge creation processes of independent learning, thinking and decision-making. Previous studies (Abdullah, Selamat, Sahibudin & Alias, 2005; Ahmad & Ives, 2000; Chen & Burstein, 2006; Hijazi & Kelly, 2003, Kutay & Aurum, 2007) do not show any significant relationship between elements in LMS learning environment that construct the SECI model.

The main aim of this research was to investigate the direct effects of knowledge creation processes in the development of independent learning, thinking and decision-making in a LMS environment. The following questions guided the research:

i. Does SECI model fit the data for online learning environment for expository method?
ii. What are the contributions of knowledge creation process based on SECI model in online learning environment for independent learning, thinking and decision-making?

Four hypotheses were postulated to answer the research questions analyzed by SEM. Therefore, only alternative hypotheses were used.

H1: SECI Model will provide good-fit statistics using the current data.
H2: Students' interaction in Socialization process contribute positively to students' tacit knowledge transformation in an understandable form for Externalization process for independent learning, thinking and decision-making.
H3: Externalization process contributes positively towards a complex and systematic knowledge for Combination process of independent learning, thinking and decision-making.
H4: Combination process contributes positively to the development of students' tacit knowledge for Internalization process of independent learning, thinking and decision-making.

III RESEARCH METHODOLOGY

This study was conducted using the survey research design (Cohen, Manion dan Marrison, 2000; Lavrakas, 2008). A set of instruments was developed based on the theoretical framework as suggested by Ally (2004) in accordance to the knowledge management criteria (Anantatmula & Kanungo, 2005), factors influencing the effectiveness of online learning (Chan et al., 2002) and knowledge creation process (Nonaka & Takeuchi, 1995). The instruments administered online, in two stages following the students' learning activities throughout the semester. A pilot study has been conducted earlier to establish the instruments validity and reliability. The instruments were reviewed by an experienced instructor and by the corresponding respondents. Analysis of the pilot study reveal that the reliability of the questionnaires represents by Cronbach alpha value was $r = 0.92$ which is greater than the acceptable range of 0.6 (Nunnally, 1978). Whilst, the feedback also requires some changes in terms of demographic information, wording, and restructuring of question number. These changes was considered and made accordingly.

The study sample consists of 371 students who were actively engaged in the teaching and learning activities supported by LMS. First phase of the survey consist of 31 questions covering items related to the system infrastructures and architecture designs of the LMS as the platform for online learning environment. Whereas, the second phase consists of 41 questions covering items related to students, instructors, teaching materials and learning outcomes of independent learning, thinking and decision-making.

IV FINDINGS

The findings will be discussed based on the research hypotheses hence answered the research

questions. As discussed earlier, SECI model is form of four construct namely Socialization, Externalization, Combination and Internalization. Socialization is represented by three indicators; email, forum and colleagues, whilst Externalization is represented by four indicators; mode, system, social present and media richness. Whereas, teaching materials, outside source and online system are the indicators for Combination construct. The remaining three indicators for Internalization are independent learning, thinking and decision-making.

H1: Model SECI will provide good-fit statistics using the current data.

Chi square ratios for the three independencies are satisfactory with value less than 5 (Schumacker & Lomax, 2004). Majority of the values for GFI, CFI, NFI and TLI are greater than 0.9, which are good, except for NFI and TLI for independent thinking and independent decision-making, which is within the range of 0.8 to 0.9, thus still acceptable (Marsh, Hau & Wen, 2004). The RMSEA values for all independencies are less than 0.08 and can be accepted (Brown & Cudeck, 1992). Based on the statistical analysis, SECI model for independent learning, thinking and decision-making hence fit various indices reported earlier proving that GOF for the model fit the data. All GOF indexes for independent learning, thinking and decision-making supporting the SECI model is depicted in Table 1. These fit indices indicated an acceptable fit between the model and data.

Table 1. GOF indices for independent learning, thinking and decision-making.

Indices	Independent learning	Independent thinking	Independent decision-making
CMIN/df	2.973	2.536	2.338
GFI	0.897	0.900	0.909
CFI	0.918	0.911	0.911
NFI	0.883	0.863	0.856
Tucker-Lewis	0.902	0.896	0.896
RMSEA	0.073	0.064	0.060

Note. CMIN/DF = ratio of the minimum discrepancy to degrees of freedom; GFI = Goodness fit index; CFI = Comparative fit index; NFI = Normed fit index; TLI = Tucker Lewis index; RMSEA = Root mean square error of approximation.

H2: Students' interaction in Socialization process contribute positively to students' tacit knowledge transformation in an understandable form for Externalization process for independent learning, independent thinking and independent decision-making.

Socialization process contributes positively and significantly to students' tacit knowledge transformation for independent learning (ß = 0.66), independent thinking (ß = 0.65) and independent decision-making (ß = 0.74).

H3: Externalization process contributes positively towards a complex and systematic knowledge for Combination process of independent learning, thinking and decision-making.

The relationship between Externalization process and Combination process is high for independent decision-making (ß = 0.83) compared to independent learning (ß = 0.78) and independent thinking (ß = 0.75). The Externalization process contributes positively and significantly to Combination process for all the independencies.

H4: Combination process contributes positively to the development of students' tacit knowledge for Internalization process of independent learning, thinking and decision-making.

The finding showed that Combination process contributes positively and significantly to the development of students' tacit knowledge for independent thinking (ß = 0.55) and independent decision-making (ß = 0.66). However, there was no significant effect for independent learning (ß = 0.00).

V DISCUSSION

Findings of this research showed that Socialization, Externalization, Combination and Internalization (SECI) processes exist significantly and complete for independent thinking and decision-making for all SECI processes active in interaction and transaction involving students' generic skill. This shows that content- free skills are suitable practice in LMS environment as students discover new knowledge from external sources and teaching materials to develop individual knowledge. Discovery of new knowledge and exploitation of existing

knowledge are the important elements in developing the knowledge to a higher level (March, 1991).

As for independent learning, which is content-based skill, only three processes namely Socialization, Externalization and Internalization report a significant effect while Combination process does not report any significant effect. The findings shows that interaction and transaction processes involved in independent learning do not occur completely and the weakness is in the Combination process. In general, the SECI model explained the knowledge transaction processes in full for the tacit knowledge components of content-free skills involving independent thinking and decision-making but proven otherwise for the explicit knowledge components of content-based skills involving independent learning.

VI CONCLUSION

From these findings, it can be concluded that knowledge creation processes as proposed by Nonaka & Takeuchi (1995, 2007) exists in the educational context considering the full use of technological facilities in LMS environment as well as the various strategies and techniques use by the students elastically in fulfilling the needs of the process. Furthermore, the knowledge creation process in SECI model contributes towards learning outcomes for content-free skills (independent thinking and independent decision-making). However, this does not works for content-based skill (independent learning) particularly in the Combination process due to minimal instructor's involvement whereby students are dependent of instructor in gathering knowledge. Low peer sharing is another factor that contributed to this lack of success in creating new knowledge. These findings also suggest that the knowledge creation processes involving SECI model depend upon the gaps of knowledge (expertise) between the experts and novices and the intensity of transactions between them

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