Measuring Knowledge Transfer as Learning Outcomes

Korawan Suebsom[1], Zulkhairi Md Dahalin[2]

[1]College of Arts and Sciences,
Universiti Utara Malaysia (UUM),
06010 UUM Sintok,
Kedah, MALAYSIA
Meena333@live.com

[2]College of Arts and Sciences,
Universiti Utara Malaysia (UUM),
06010 UUM Sintok,
Kedah, MALAYSIA
zul@uum.edu.my

ABSTRACT

This paper proposes using learning outcome as means to measure knowledge transfer. It is based on a study to assess the effectiveness of knowledge transfer using the knowledge management concept of externalization by means of weblog access. In the knowledge era, knowledge transfer between the instructor and learners is important since the goal of educational system is the learners gain the knowledge from the process of knowledge transfer by the instructor. Studies have shown that knowledge transfer can be problematic, and an effective transfer of knowledge can be difficult. The difficulty arises when the transferred knowledge becomes ambiguous, disrupted (hence incomplete), and distributed all over (making it difficult to link them together). Four hypotheses were formulated to examine the relationship between key characteristics of knowledge and learning outcome. The findings revealed some significant results involving the key characteristics of knowledge. The implication from this study can contribute much to the instructor and learners in knowing what knowledge that the instructor can transfer to learners and what knowledge is gained by learners as learning outcome. In addition, the learning outcome can tell the instructor to search for the right methodologies for improving the knowledge transfer to learners.

Keywords
Knowledge management, measurement, instructor, learner, characteristics of knowledge

1.0 INTRODUCTION

Knowledge includes both experience and understanding by learners in the educational system and the information artifacts such as homework, documents, projects and reports available within the university and the world outside (Nonaka et al.,2000; Argote et al.,2000). Knowledge can exist in two primary forms, explicit knowledge and tacit knowledge. Explicit knowledge is expressed and transferred in the form of documents and systematic methods by way, of rule and procedure (Nonaka et al, 1995; Gouza,2006). Tacit knowledge is highly personalized and hard to formalize, It is embedded in the human mind and body as ideas, experiences, insights and skills.

Knowledge transfer is a part of knowledge management and in education knowledge transfer is significant and useful since the goal of education is to improve the abilities and skills of learners as related to professional application (Simon & Soliman, 2003). The problem of transferring knowledge, as such, includes transferring learning experiences from an individual's memory. The success of knowledge transfer, in the educational system does not only depend on the instructors and learners but also on the factors that can cause problems in knowledge transfer such as characteristics of knowledge, and the methods of knowledge transfer used (Gouza,2006). The characteristics of knowledge transfer comprised of knowledge ambiguity, knowledge disruption and knowledge distribution (Newell, 2006) and will be described in the literature review section. This study used an assessment model to provide the important feedback at each stage of the knowledge transfer process. The assessment describes the learning outcome and the feedback obtained from the transferred knowledge, which represents knowledge gained and effectiveness of knowledge transfer itself. Therefore, the purpose of this study is assessing learning outcome in knowledge transfer from the instructor to learners and investigates the key characteristics of knowledge and their relationship to learning outcomes. The next section describes the literature review.

2.0 LITERATURE REVIEW

Knowledge transfer is important in the educational system since knowledge transfer is the process of transmitting knowledge such as experience and

lesson learned from the instructor to learners. According to Kennedy (2007), the goal of education is not only the acquisition of new knowledge but also the ability to retrieve that knowledge and apply it to new and novel situations. Therefore, assessing learning outcome from learners is important in education because the learning outcome can tell the instructor the type of knowledge that is transferred to the learners and whether it will be useful to the learners in preparing themselves for studies in the classroom.

2.1 Knowledge Transfer

Knowledge transfer involves communications between individuals in the transfer (Abilino et al.,2004). It can mediate by the technology in the translation of information. The study of knowledge transfer is necessary to understand and to see how knowledge transfer between the instructor and learners occurred so that the problems associated with the characteristics of knowledge can be better understood and hopefully resolved. (Gouza,2006).

2.2 Learning Outcomes

According to Shuell and Farber (2001) in the educational system teaching need to be improved by measuring learners' familiarity with technology as well as their learning activities and learning outcome on a more fine-grained and theoretically motivated level and by mean of objective measurements. For this study the learning outcome is a dependent variable which comprised of the perception of learners, the behaviors of learners (attitude and practice), the knowledge gained and the satisfaction of tools and teaching techniques. The next section describes the use of weblog as a tool to externalize knowledge in the form of learning outcome.

2.3 Characteristics of Knowledge

This paper describes the three key characteristics of knowledge as the independent variables, then suggests an assessment model to assess the knowledge transfer from the instructor to learners and shows the results of assessing knowledge transfer known as learning outcomes. The transfer of knowledge occurs when knowledge transfer is diffused from one source to another by storing or sharing. The characteristics of knowledge that can cause knowledge to become problematic are knowledge ambiguity, knowledge disruption and knowledge distribution. However, several researchers have identified the characteristics of knowledge transfer as follows. According to Szulanski (1995), knowledge ambiguity can be a significant predictor of stickiness through all phases of the knowledge transfer. Simonin (1999) states that, the difficulty in learning from others relates to the degree of knowledge ambiguity. Knowledge ambiguity refers to the underlying notion of knowledge transferability, and the tacitness of

knowledge, specificity of knowledge and complexity of knowledge will increase knowledge ambiguity. Manski (1999) defines that knowledge ambiguity affects decision making and he suggested that knowledge ambiguity can be treated by using nonparametric analysis to determine the nature of knowledge. Knowledge ambiguity also relates to the speed of learning, the strategy and the skills that will make it difficult to transfer knowledge, since the skills are embedded in humans and difficult to explain to others. Knowledge disruption occurs because learners come from different backgrounds, different cultures, have different perspectives and exhibit different behavior. Net Industries (2001) reported that knowledge can be disruptive when the students externalize behavior disorders such as attention-deficit hyperactivity disorder, and emotional or internalizing behavior such as anxiety and depression. In addition, Hanley (1994) states that the learning environment can make knowledge become disruptive because it is necessary for the instructor to engage the students' interest before taking on the role of assistant as student direct their own learning. Newell (2006) reported that knowledge can be disruptive, since, people had investment in their knowledge and knowledge is a source of power, therefore changes in practice that undermine one's knowledge will be resisted. The third characteristics, knowledge distribution can cause a problem in organizations; since the organization does not capture the knowledge from the personnel mind into a database (Carley, 2002). In addition, knowledge distribution can cause problems to knowledge transfer because learners cannot possess all the body of knowledge and knowledge is distributed in several places and people use the knowledge in different processes (Newell, 2006). The next section will be described the methodology of this study.

3.0 METHODOLOGY

This study used quantitative methods and selected stratified random sampling for data collection. The study collected data from three universities via Songkhla Rajabhat University, Nakhon Si Thammarat Rajabhat University and Taksin University. The two criteria for choosing these universities are that in the first place the respondents are in the third year level and the second is that they use Information Communication Technology (ICT) media to transfer knowledge from the instructor to learners. The ICT media can be e-learning system, weblogging, chatting, whiteboard, Wiki and so on. The sample size consisted of the participants who responded to the survey questionnaire and a multiple choices test in the classroom. The sample for this study consisted of 326 respondents from the three universities. The

next section will be described the findings of this study.

4.0 FINDINGS OF THE STUDY

This study shows the research findings into two parts as follows.

4.1 Four Hypotheses Testing
After the hypotheses have formulated, this study used linear regressions for testing and shows the results as follows.

Hypothesis 1: Knowledge Ambiguity Affects Learners' Perception
Knowledge ambiguity is one of the three key characteristics of knowledge that make knowledge transfer difficult and also affects the externalization process. This hypothesis was formulated to determine whether knowledge ambiguity affects the perception of learners. Hypothesis 1 was examined the relationship between knowledge ambiguity and learner's perception. The study used simple regression to test this hypothesis; the model from regression analysis reported that knowledge ambiguity is significantly related to learner's perception. The Pearson Correlation showed .618 of the relationship between knowledge ambiguity and learner's perception. The model was significant at the p<.01 level $(F$=77.17, R^2 =.382). Knowledge ambiguity can explained 38.2 percent of variance in learner's perception. Accordingly, Hypothesis 1 which state that knowledge ambiguity is significantly related to learner's perception is supported. The study provides support for Szulanski (2003) indicated that knowledge ambiguity was a statistically significant barrier to knowledge transfer and affected the learner's perception. In addition, the complexity of knowledge had increased vague and made it difficult to understand the meaning of knowledge (Simonin, 1999). Therefore, this study can summary that in the knowledge transfer from the instructor to learner, knowledge ambiguity is difficult and made knowledge transfer problematic and affect learner's perception.

Hypothesis 2: Knowledge Disruption Affects Behavior of Learners.
Knowledge disruption can be the disruptive behavior of learners in using the technology influenced by the learning environment in the form of attitudes among learners. This hypothesis attempts to examine the relationship between knowledge disruption and behavior of learners. The study used a simple regression to test this hypothesis. The model from regression found that knowledge disruption was not significantly related to behavior of learners. The regression model, which relates the independent variable of knowledge disruption and independent variable of behavior of learners (attitude and practice) shows the score of the standard coefficient beta as being equal to .002 (t=.029, p>.05). It shows that knowledge disruption was not affected by behavior of learners. This means that the power of knowledge disruption to this regression equation is at a low level because during the process of knowledge transfer from the instructor to learners, the learners felt happy to use the technology in the classroom such as searching information to support their work and discuss with the instructor. Therefore, the knowledge disruption was not affect the behavior of learners in the process of knowledge transfer from the instructor to learners. Accordingly, Hypothesis 2 is not supported.

Hypothesis3: Knowledge distribution affects knowledge gained
Knowledge distribution can make knowledge transfer problematic and affect externalization because knowledge is distributed in several places and people having the knowledge can use the knowledge in different ways and different processes. This hypothesis attempts to investigate the effect between knowledge distribution and knowledge gained from the process of knowledge transfer. The model of a linear regression reported that the result with knowledge distribution is significantly related to knowledge gain. The model is significant at the p<.01 level (F= 276.25, R^2 = .688) and explains additional 68.8 percent of variance in the knowledge gain has been influence and significantly explained by knowledge distribution. Accordingly, Hypothesis 3 is supported. This study supports Alavi and Tiwana (2002), who note that knowledge distribution becomes difficult within the process of knowledge transfer from the instructor to learners while, Charley (2002), states that knowledge distribution is a problem in the classroom since the learners are not able to possess or capture all of the knowledge from the instructor in the classroom or at any other places. Likewise Pfister et al., (2000), indicate that knowledge is distributed across different persons as well as embodied in external artifacts. Distributed knowledge is difficult for learning as activities that transfer knowledge from many sources and yield a corpus of socially shared knowledge, thus making it is difficult for learners to gain the knowledge that is needed. However, the process of knowledge transferred from the instructor is important to show the understanding of learners since understanding is one of the most cherished goals in education and transference for understanding can bring about knowledge by requiring learners to manipulate knowledge in various ways.

Hypothesis 4: Knowledge Distribution Affects The Satisfaction of Tools and Teaching Techniques Used By The Instructor.
Knowledge distribution is important in the knowledge transfer process, likewise tools and

teaching techniques used by the instructor are also important. Since, knowledge distribution is distributed in several places; it is difficult for learners to receive all the body of knowledge using the tools provided by the instructor. This hypothesis attempts to examine knowledge distribution in relation to the satisfaction of tools and teaching techniques used by the instructor. This hypothesis present the result with knowledge distribution is significantly related to tools and teaching techniques that used by the instructor. The model is significant at the p<.01 level (F= 5.73, R^2 = .267) and explains additional 26.7 percent of variance in tools and teaching techniques that used by the instructor has been influence and significantly explained by knowledge distribution. Accordingly, Hypothesis 4 is supported. This result supports Siritongthaworn and Krairit (2006), who had studied the satisfaction of the tools and teaching techniques used for instruction. They indicate that students need their instructors to be understandable, to inspire trust and confidence and they want the course materials to be presented in appropriate and varied formats.

As mentioned above, this study discusses the learning outcomes which consists of learners' perceptions, learners behaviors, knowledge gained by learners and the tools and teaching techniques used by the instructors and the influenced played by the three key characteristics of knowledge; knowledge ambiguity, knowledge disruption and knowledge distribution.

5.0 IMPLICATIONS FOR EDUCATION

The findings above show a significant relationship between the three key characteristics of knowledge and learning outcome. This study can, therefore serve and benefit the process of knowledge transfer in the educational system in the following ways. Learners' perceptions are influence by knowledge ambiguity. Since knowledge ambiguity is a problem in the knowledge transfer process, instructors are advised to reduce knowledge ambiguity in knowledge transfer process. For instance, when transferring knowledge to learners, the instructor must consider the meaning of the words, the vagueness of the sentences and the methods of transfer. Since, most knowledge is tacit, it will be difficult to articulate or express in words. Therefore, it is hoped that instructors find the right methodologies, in their efforts, to transfer knowledge to learners in the classroom and secondly, improve or make clear the knowledge before the transfer occurs. A strong predictor of learners' behavior is knowledge disruption and as such it would be useful for the instructor to know the attitudes and practices of learners when using technology as a tool in transferring knowledge. Findings from this study show that most learners are positive towards the use of technology to

support their studies. Therefore, finding the right attitude and practice of learners is useful for the instructors, especially in applying technology, in the classroom, to transfer knowledge to learners based on the tools the instructors has designed and also to be aware of whether the technology that the learners used is appropriate. Another strong predictor of the knowledge gained by learners is knowledge distribution. When knowledge is distributed in several places such as websites, textbooks and databases, the instructors must select the appropriate methods to transfer knowledge to the learners. The instructors need to know the prior knowledge of the learners by testing the level of knowledge of the learners - whether it is incompetent, medium or advanced level. Then the instructors need to select the appropriate technology and develop the right methods to transfer knowledge suitable at that level. Tools and teaching techniques can also influence knowledge distribution. In this study, the instructor used e-learning as the tool to transfer knowledge to learners. The findings shows that the tools used should have the approval of the learners. If not the learners will not be comfortable with them. Among the tools used is e-learning. E-learning can motivate learners to study but some parts of e-learning will not agree with the learners especially if they are slow in retrieving information, hard in communicating with the instructors and the learners do not understand how to search the database for information. It is the finding of this study that the instructors need to create information details which are suitable for their courses. The findings reported in this study justify the important of motivation to learning outcome. The findings have implications for the teachers to transfer knowledge to learners, they could try as much as they could make more interesting course of instruction to make the learners interested in the subject. The other findings based on the analysis of learners' weblogs are to improve the process of knowledge transfer. The content analysis findings of this study indicate that learners who favor working by themselves tend to have positive attitudes toward the information technology that transfers knowledge from the instructors to the learners. To use the information technology as tools to transfer knowledge from the instructors to learners, the instructors need to assist the learners by advising them, giving them suggestions or posing questions in ways that would enable the learners to make decisions and find out the information they need to complete particular tasks, by themselves. With this information it is hoped that learners can motivate, mange their own time and study by themselves. However, the instructors ought to design, organize and provide the instructional materials, resources and courses that can effectively integrate e-learning to the process of transferring knowledge to the learners. The results from this study suggests that the success of using e-learning as tools to transfer knowledge

from the instructors to the learners is fundamentally dependent not only on the process of knowledge transfer but also in the management and performance of the technology used in the teaching and learning, in the classroom. Learners need the time to study, externalize and apply the knowledge of the technology to the assignments or the projects given by the instructors. Based on the feedback from the learners, some learners who lacked the information technology skills and knowledge did not understand the knowledge from the instructor when the instructor gave the assignment workloads. These learners lacked the confidence to externalize their knowledge to others. Some learners had negative attitudes such being confused and being doubtful of the knowledge the instructor had transferred to them by using a particular information technology as a tool to transfer knowledge. Similarly, learners felt that using computers to communicate with the instructors is difficult because of the need to use e-mails and programs such as Adobe Photoshop and Flash Media. The study suggests that the instructors should allow learners time to study and use a program before using them due to low internet speed, outdated hardware and software in transferring and externalizing knowledge in the classroom. Another issue is the low number of functioning computers for learners to use for their studies and to externalize their knowledge. One glaring benefit, of this study based on the interview data from lecturers, is the experience of lecturers using e-learning in their transfer of knowledge to learners. They are not only happy in using e-learning as tools to transfer knowledge to learners but also in integrating the process of knowledge transfer, using e-learning tools, together with face-to-face teaching. These are the findings and implications of the study. The implication is that the instructors can use technology as a tool to transfer knowledge to learners based on the reflections of learners and interviews with instructors. It can benefit and improve teaching methods.

5.0 SUMMARY

This study measured the learning outcomes from knowledge transfer from the instructor and learners and focused on the problem of knowledge transfer that occurred based on the three key characteristic of knowledge. The study also examined how the learning outcomes can be influenced by the three key characteristics of knowledge. The study found that there was significant relationship between the characteristics of knowledge and learning outcome. However, to extent this study, it would be valuable to do studies base on gathering qualitative data from focus groups of the instructor; by examining the methods, tools and techniques in greater depth.

Finally, the study suggests that it will be beneficial if future research can explain the process of knowledge transfer by determining the right strategy for effective knowledge transfer under different transformation processes.

REFERENCES

Albino, V., Garavelli, A.C., & Gorgoglione, M. (2004). *Organization and technology in knowledge transfer.* Benchmarking*: An International Journal*, 11(6), 584-600.

Alvarez, K., Salas,E., & Garofano,C.M. (2004). *An integrated model of training evaluation and effectiveness.* Human Resource Development Review 3(4), 385-416.

Alavi. M., (1999). *Knowledge management system*: Issue, Challenges, and Benefits. *Journal of Communications of the Association for Information System,* 1(2), 1-37.

Carley, 2002] Kathleen M. Carley, (2002) "*Information Technology and Knowledge Distribution in C^3I Teams"* in *Proceedings of the 2002 Command and Control Research and Technology Symposium.* Conference held in Naval Postgraduate School, Monterey, CA. Evidence Based Research, Vienna, VA.

Davenport,T. (1998). Knowledge Management in Action: *Three knowledge management scenarios*. Retrieved August,20, 2006, from http://www. lotus.com/article.html.

Field,A.P. (2005). *Factor Analysis Using SPSS*, Retrieve Febuary, 25, 2008 from http://www.sussex.ac.uk/Users/andyf/factor.pdf

George D and P Mallery, 2006: *SPSS for Windows-Step by Step*. Pearson Education,

Gouza, A. (2006). *Key Factor of Knowledge Transfer within University Spin-offs*. Retrieve October, 30, 2006, from http://www.secience.uab.es/dep-economia

Hair F. Joseph., Black, C.W., Babin J.B., Anderson E. Ralph & Tatham L. Ronale. *Multivariate Data Analysis* sixth edition, ISBN 0-13-032929-0, Pearson Prentice Hall, 2006.

Hanley, S. (1994). *Maryland collaborative for teacher preparation.* University of Maryland. Retrieved January 18, 2008 from http://www.inform.umd.edu/UMS%2BState/UMD-Projects/MCTP/Essays/Constructivism.txt

Kaiser, H.F. (1974) *An index of factorial simplicity*. *Psychometrika*, 39, 31-36.

Manski ,F.C. (1999). *Treatment choice under ambiguity induced by Inferential Problems*,

International Symposium on Imprecise probabilities and their Applications.

Newell, S. & Galliers, R.(2006). *Knowledge Transfer and learning Problem of Knowledge Transfer Associated with trying to Short-Circuit the Learning Cycle. Journal of information and Technology Management,* 2(3), 275-290.

Nonaka, I. & Takeuchi, H.(1995). *The Knowledge-Creating Company. New York:* Oxford University Press. In Wu, C.F. & Lee, Y.C. (2006). Factors Affecting Knowledge transfer and Absorptive Capacity in Multination corporations. *Proceeding of Knowledge management International Conference & Exhibition (KMICE) 2006,* 141-148.

Perez, W. (2008). *Academic achievement profile and professional aspirations of undocumented students.* Invited presentation at the CHIRLA California Relay for Education Forum, Los Angeles, CA.

Simonin, B. (1999). *Ambituiy and the process of knowledge transfer in strategic alliances,* Strategic Management Journal, 20, 595-623.

Siritongthaworn, S. 2006). *Satisfaction in e-learning:*the context of supplementary instruction, *Journal of emeraldinsight,* 23(2),76-91, Retrieve August,11,2008, from http://www.emeralinsight,com/1065-0741.htm.

Shuell, T. J., & Farber, S. L. (2001). *Student perceptions of technology use in college courses. Journal of Educational Computing Research,* 24, 119–138.

Szulanski, G. (1995a*). Appropriating rents from existing knowledge: Intra-firm transfer of best practice*. Unpublished Empirical Dissertation Fontainebleau: INSEAD.

Szulanski, 2003 G. Szulanski, Sticky *Knowledge. Barriers to Knowing in the Firm*, Sage Publications, London, Thousand Oaks, New Delhi (2003).

Tran, H.T., Teresa, L.J., Patricia,H.J., Wang.D. (2006). *Antecedents to knowledge transfer in higher education effective teaching*, Proceeding International conference 2006: *Knowledge management in Institutes of Higher Learning*, 21st -23rd, February, Suan Dusit Rajabhat University.