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Knowledge Creation and Innovation in Classroom

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***Abstract*—**The concepts of knowledge creation and innovation have a strong relationship but this relationship has not been examined systematically. This study examines the utilization of knowledge creation processes of the Theory of Knowledge Creation in Higher Education Institutions. These processes consist of socialization, externalization, combination and internalization. This study suggests that the utilization of these processes will give impacts on innovation in academic performance. A cross-sectional study was conducted using survey questionnaires to collect data of the utilization of knowledge creation processes and classroom's innovation. The samples are Business Management students of a Malaysian Higher Education Institution. The results of this study could help Higher Education Institutions to enrich the learning process of students through knowledge creation and innovation.

***Keywords*—**Knowledge creation, innovation, business schools.

I. Introduction

INNOVATION efforts in Higher Education Institutions often target students and faculty groups. For students, innovation covers the behaviors and levels of engagement while for the faculty it focuses on the approaches to teaching [12]. Educational institutions' innovation involves the process of raising educational performance where the members' participation has a great effect toward it success [15], [10], [19].

According to Nonaka [13], the key for innovation is knowledge. He described innovation as a process of creating and defining problems and then actively creates new knowledge to solve them. This creation involves tacit knowledge which always started from individual which cannot be dissociated from the direct experience of the agent of knowledge. It is usually assumed that tacit knowledge related to professional knowing develops only through work experience, but findings suggest that the transformation of student's explicit "book knowledge" into implicit or tacit knowledge may have already begun while the student is still in education [5].

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II. Literature Review

Knowledge Creation Processes in Classroom

Nobel laureate economist Friedrich Hayek argues that nearly every person has unique information that can be put to use only with his 'active cooperation'. Thus, in the context of Higher Education Institutions, there are needs for active learning in student classroom activities to enrich learning experience as mentioned by Chalmers [3]:

"Students do not learn much just sitting in classes listening to teachers, memorizing prepackaged assignments, and spitting out answers. They must talk about what they are learning, write about it, relate it to past experiences, and apply it to what they feel is important. They must make what they learn a part of themselves. Equally important is the need make explicit the learning processes that are occurring in the learning environment and why particular strategies are being used. In the Higher Education Institutions context, the passive learning styles like just sitting in classes listening to teachers, memorizing prepackaged assignments, and spitting out answers could hinder student from learning much."

Ikujiro Nonaka [13] defined the following four active learning processes namely socialization, externalization, combination and internalization. According to the Theory of Knowledge Creation, there are two dimensions of knowledge creation – epistemological and ontological. The epistemological knowledge creation dimension consists of tacit and explicit knowledge while the ontological knowledge creation is concerned with the levels of knowledge-creating entities which are individual, group, organization, and inter-organization. Explicit knowledge is described in symbols, like mathematical expressions and statements. Tacit knowledge is automatic, resembles intuition, and is oral (Stewart, 1997, as cited in Smith, 2000). The four modes of knowledge conversion are created when tacit and explicit knowledge interact with each other. These four modes which are referred to as socialization, externalization, combination, and internalization constitute the "engine" of the entire knowledge-creation process. The descriptions of these modes are as follows:

Socialization

The mode usually starts with building a "field" of interaction. This field facilitates the sharing of members' experiences and mental models. In the classroom, this process could be utilized in generating initial ideas of the project or assignment. This activity could be done through informal discussion among students or with the lecturer.

Externalization

This is the process of articulating tacit knowledge into explicit concepts. This mode is triggered by meaningful "dialogue or collective reflection," in which using appropriate metaphor or analogy helps team members articulate hidden tacit knowledge. Tacit knowledge could be converted into explicit knowledge effectively and efficiently by sequential use of metaphor, analogy and model. This activity is possible during formal meeting or brainstorming session in order to improve the initial ideas generated in socialization process.

Combination

This is the process of combining different bodies of explicit knowledge. Reconfiguration of existing information through sorting, adding, combining and categorizing of explicit knowledge as conducted in computer databases can lead to new knowledge. Creative uses of computerized communication networks and large-scale databases facilitate this mode of knowledge conversion [13].

Internalization

This is the process of embodying explicit knowledge into tacit knowledge. It is closely related to "learning by doing" when experiences through socialization, externalization and combination are internalized into individuals' tacit knowledge bases in the form of shared mental models or technical know-how, then become valuable assets. The internalization could be facilitated through documented knowledge. This includes the practice of producing notes by students on the particular subject under investigation. For classroom activities, it helps if the knowledge is verbalized or diagrammed into documents, manuals, or oral stories.

The continuous and dynamic interaction between tacit and explicit knowledge is shaped by shift between different modes of knowledge conversion. Fig. 1 depicts the interaction between these modes and the activities that happen while the spiral spins.

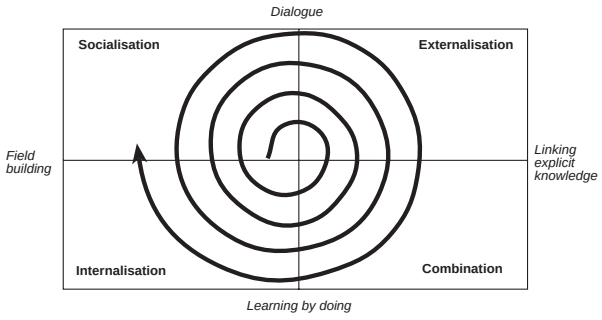

Fig. 1 Knowledge Spiral

Knowledge Management (KM) activities could improve innovation in Higher Education Institutions [17]. They have been used in graduate courses which are aimed to help students acquire and develop a useful base of relevant explicit and tacit knowledge and to encourage students make better use of what they already know. Positive results obtained in classrooms can be applied in the business settings [18].

Innovation in Academic Performance

Murnane and Nelson [11] characterized innovation in education as the result of a cumulative process of experimentation. Innovation in Higher Education Institution could be achieved through the presentations of academic results [4]. O'Sullivan [14] argued that innovation operation ought to include the production of creativity and ideas. In the context of graduate education this production is always measured through classroom assessment that finally determines the academic performance. Assessment becomes a collective means whereby colleagues discover the fit between institutional or programmatic expectations for student achievement and patterns of actual student achievement [8].

Student performance can be assessed through a variety of quantitative and qualitative measures such as portfolios, quizzes, tests, reflective essays, web-based tutorials, direct observations, successful completion of internships, or service learning opportunities [16]. In Malaysian Higher Education Institutions, student performance is evaluated through examination and continuous assessments as outlined by Malaysian Qualifications Agency. The continuous assessments include student participation, assignment, project paper and other relevant evaluation [9].

III. Research Objectives

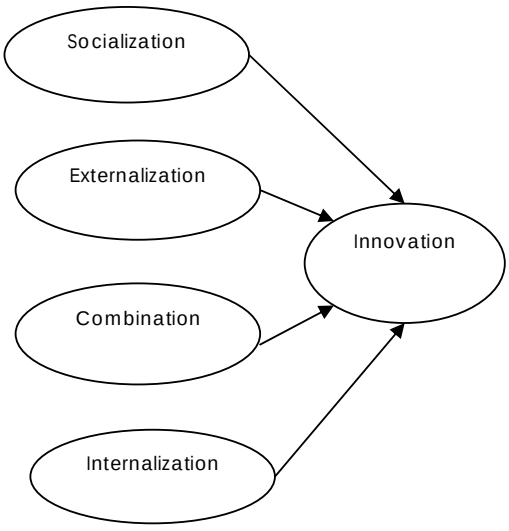

Fig. 2 Research Framework

IV. Methodology

A cross-sectional survey was used in this study where survey questionnaires were used to collect data from a Business Management graduate in a Malaysian Higher Education Institution. Likert scale which range from 1 (Strongly Disagree) to 5 (Strongly Agree) was used as a scale in the survey questions to ask respondents agreement and disagreement to the survey questions related to knowledge creation, innovation and class assessment. Data was analyzed using SPSS 15.0.

V. Results and Discussion

Respondents Profile

Respondents' profiles are based on gender, race, year of study, cumulative grade point average (CGPA) and courses as shown in Table II. Respondents consist of 70% female and 30% male, indicating a domination of female in the education line. Looking at the race factor, majority of them are Malay followed by Indian indicating 78% and 14% respectively. Sixty percent of the respondents were from Year 1 and 2 graduates. Majority of them were having CGPA more than 3.0 which comprised of 48% in total. Most of the respondents are taking accounting (30%) followed by Human Resource (29%) and average of 14% for Marketing, Entrepreneurs and Finance courses.

TABLE I
Demographic Profile

Profile	Classifications	Frequency	Percentage
Gender	Male	99	29.5
	Female	237	70.5
Race	Malay	263	78.3
	Chinese	22	6.5
	Indian	46	13.7
	Other	5	1.5
Year of Study	1 and 2	216	64.6
	3, 4 and 5	120	35.4
CGPA	< 2.0	4	1.2
	2.00 – 2.59	52	15.5
	2.60 – 3.00	118	35.1
	3.01 – 3.59	135	40.2
	3.60 – 4.00	27	8.0
Courses	Human Resource	96	28.6
	Marketing	53	15.8
	Entrepreneurs	42	12.5
	Accounting	99	29.5
	Finance	46	13.7

Reliability Test

Reliability test is an assessment of the degree of consistency between multiple measurements of a variable. Cronbach's alpha is the most widely used measurement tool with a generally agreed lower limit of 0.7. In Table II all the alpha coefficients were above the required level of 0.7 as suggested by Nunnally (1978).

TABLE II
Reliability Analysis

Factors	Number of Items	Cronbach's Alpha
Socialization Process	7	0.768
Externalization Process	5	0.748
Combination Process	5	0.701
Internalization Process	5	0.677
Innovation Elements	7	0.838

Regression

Multiple Regressions

Multiple regressions is used as an analysis in this study to examine the relationship between knowledge creation processes with innovation in the classroom. From Table III (see appendix), it shows there is a positive relationship between knowledge creation processes and innovation ($r = 0.429$). Only 18.4 % variation in innovation in the classroom is explained by these processes, which shows that students' innovation in the classroom does not mainly depend on these knowledge creation processes. Table IV (see appendix) presents the beta coefficient for each independent variable, where internalization process contributes more to students' innovation in the classroom.

Stepwise Regression

The above research model is also analyzed by using stepwise regression analysis in order to find which knowledge processes contributes most to the students' innovation. Table V (see appendix) presents 3 model summaries from the analysis. Model 1 indicates only externalization process, model 2 presents externalization and internalization process and model 3 comprises of externalization, internalization and combination processes as a predictor to innovation. However, only Model 1 and Model 2 show a significant relationship between knowledge creation processes and innovation. From the analysis it shows that externalization process contributes most to the knowledge creation processes as indicated in Table VI (see appendix) below. However, socialization process does not contribute to the learning process in this analysis.

From the above analysis, graduates prefer to communicate, use creative thinking and exchange various ideas and opinions among their colleagues in the learning process. However, the socialization process that is conversion of tacit knowledge to tacit knowledge is less preferred by them in their learning process. This is basically because of their limited experience, skill and exposures. For those who are in the working environment, especially managers, they prefer to use socialization process such as socializing, politicking and

interacting with others to increase their knowledge [1]. The lack of socialization practice among students as one of the learning process is a challenge for Higher Education Institutions' lecturers. This process need to be encouraged among students as what leaders in organizations feel their new hires need to know [18]. The findings of this study could give some insights of the current utilization of knowledge creation processes in the Malaysian Higher Education Institutions classroom. Further improvements need to be taken in order to enhance the learning process in Malaysian Higher Education Institutions.

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APPENDIX

TABLE III
MODEL SUMMARY

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.429	.184	.174	.53593	.184	18.617	4	331	.000	2.107

a Predictors: (Constant), socialization, externalization, combination, internalization
b Dependent Variable: innovation

TABLE IV
COEFFICIENTS

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta	B	Std. Error
1	(Constant)	2.124	.262		8.105	.000
	Socialization	.077	.081	.064	.958	.339
	Externalization	.182	.072	.161	2.527	.012
	Combination	.149	.072	.139	2.057	.041
	Internalization	.170	.058	.173	2.932	.004

TABLE V
MODEL SUMMARY

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.349(a)	.122	.119	.55326	.122	46.464	1	334	.000
2	.405(b)	.164	.159	.54073	.042	16.663	1	333	.000
3	.426(c)	.181	.174	.53586	.017	7.072	1	332	.008

a Predictors: (Constant), externalization
b Predictors: (Constant), externalization, internalization
c Predictors: (Constant), externalization, internalization, combination
d Dependent Variable: innovation

TABLE VI
COEFFICIENTS

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta	B	Std. Error
1	(Constant)	2.776	.221		12.560	.000
	externalization	.394	.058	.349	6.816	.000
2	(Constant)	2.415	.234		10.341	.000
	externalization	.278	.063	.247	4.396	.000
	internalization	.225	.055	.229	4.082	.000
3	(Constant)	2.218	.243		9.134	.000
	externalization	.201	.069	.178	2.899	.004
	internalization	.179	.057	.182	3.121	.002
	combination	.176	.066	.165	2.659	.008

a Dependent Variable: innovation