Asia Pacific Journal of Research in Business Management
Vol. 8, Issue 1, January2017 Impact Factor: 5.16,ISSN: (2229-4104)
www.skirec.org Email Id: skirec.org@gmail.com

RESOURCE CAPABILITIES OF VIRTUAL LEARNING SYSTEM AND ITS ADOPTION BEHAVIOR AMONG UNIVERSITY STUDENTS

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ABSTRACT:

This research's main objective is to identify the possible factors that impact the resource capability and adoption behavior of virtual learning systems among university students in Malaysia. The effectiveness and efficiency of virtual learning systems are primary factors that impact the resource capability and adoption behavior of virtual learning systems among university students while the flexibility of technology has a positive driving power but is less significant. This indicates that most students who participated in the research are aware of the existence of virtual learning, and have personal preferences on virtual leaning systems before adopting it. This research also provides insights for institutes and universities to develop and implement virtual learning systems that suit the preferences of their students to improve adoption behaviour of a virtual learning environment.

Key Words: Virtual Learning, Adoption Behavior, Effectiveness, Efficiency, Flexibility, Resource Capability

INTRODUCTION:

Virtual Learning is a concept that was innovated from conventional classroom learning methods that revolve around homework and examinations, and academic resources that are explicitly recorded. Virtual leaning methods first appeared in a significant way on the page of history during the late 1990's. The progress of technology motivates academicians to find education methods that could allow them to learn and teach at their own pace and place. The result was the birth of the virtual learning concept; a new learning and teaching method that merges the strength of technology and conventional education method.

A virtual learning environment secures it users with an integrated knowledge base. An integrated knowledge repository provides information and knowledge which is an attractive feature that smoothens education process (Xu, Park &Baek, 2011). Advance version of virtual learning systems

also comes with unique features such as progress tracking and assessment evaluating which allow educators to provide relevant help to weaker students (Blanco, Torrente, Plabo&Baltasar, 2010).

Virtual learning systems also provide the means to academicians to communicate with each other by utilizing the internet (Martins &Kellermanns, 2004). A virtual learning environment allows its users to refer to course documents from the knowledge repository while communicating through different channels such as online discussion platforms and chat boxes (Sun & Zhang, 2006). Intranet and internet in this era provide the means for information to fast travel from one individual to another regardless of the barrier of time and location, providing timely information and knowledge for students and educators (Martins &Kellermanns, 2004). Traditional classroom's knowledge sharing process comes in a form of lecture which is known to be a one way communication system to a great extent (Symons, 1996). The lack of anonymity raises one of the knowledge barriers which are known as social barriers. Social barriers exist when the community fails to facilitate the knowledge transfer process (Darr, Argote&Epple, 1995; Argote, 1999). Virtual learning environment allows students to be anonymous which encourages students to share knowledge and raise questions. Inadvertently, the student becomes an "educator" as an individual shares his or her experience and knowledge with others, and with the free will. Such collaborative approach could potentially change the dynamics of a traditional classroom and connect both students and educators more deeply and ultimately allow knowledge to be shared more effectively.

Since virtual learning environment is an innovation with the help of technology, technology itself became an important component of a virtual learning system. The flexibility of technology allows virtual learning to serve its purpose by providing knowledge anytime and anywhere. The potential convenience provided by virtual learning far exceeds the capability of conventional learning.

There are studies undertaken regarding the awareness level of virtual learning among students. Brodie conducted a study and reported that 72% of students were aware of the existence of virtual learning in the year 2009. Bieimann (2004) on the other hand describes that problem solving capabilities could be a potential factor to raise awareness of virtual learning among students. However, there were no studies conducted to achieve the capabilities stated. Therefore, this research aimed to identify the possible factors that impact the resource capability and adoption behavior of virtual learning systems among university students in Malaysia. This research provides insights to universities and institutes that plan to implement virtual learning system on their campuses.

VIRTUAL LEARNING & THE EDUCATION SECTOR:

Virtual Learning can be described as a platform that consists of multiple open systems that exist in a technology savvy environment which has the ability to provide an integrated resource of knowledge and information (Wilson, 1996). This virtual space was created and aimed to facilitate the knowledge transfer cycle with the aid of technology (Barajas & Owen, 2000). It is a method of education that can exist without a solid location yet consists of the key elements of an education system (Van Horn, 1997).

Virtual Learning methods could be divided into distance learning and E- Learning. Distance learning was once known as distance education, a process where academics conduct knowledge transfer process at two separate locations that are hard to reach physically (Joi L. Moore, Camille Dickson-Deane, Krista Galyen, 2010).The technology aspect of virtual learning provides the means for academics to share knowledge using lesser resource, making the knowledge transfer process more effective and efficient.

Distance learning rose to fame when travelling became more convenient and less costly. Students and mentors that are located in different places can now come together and share knowledge face to face with a much lower cost. Tacit knowledge that was once more difficult to be transferred has become easier to articulate, as practical teaching is involved.

E-Learning is an education method that is supported by online components. Tools such as accessing cloud components and online repository are part of E-Learning. Bensoon (2002) suggested that such method allows students to have access to more education material as internet could link several online repositories. The tremendous growth in mass education has been stated to raise awareness of virtual learning in the education sector. Some educational institutes have grown wary of their current technology infrastructure as it could be a medium for articulating knowledge. The rising of more challenges in the society inadvertently leads to the needs of reform in universities and institutes (Dickson, 2005).

RESOURCE CAPABILITY OF VIRTUAL LEARNING AND ITS ADOPTION BEHAVIOR:

In order to explain the behavioral aspects of virtual learning systems, the Technology Acceptance Model (TAM) is introduced in this research. TAM explains that the success of a system depends on how much it could contribute to the user's need. Users tend to be more willing to learn and understand a successful system as their needs were expected to be met (Succi& Walter, 1999).TAM was guided by the Theory of Reasoned Action (TRA) which interpreted that actions are guided with motivation. Motivation factors will then impact behavior which indicates how an individual will act

(Ajzen&Fishbein, 1980). The resource capabilities of virtual learning become a motivation factor, and ultimately impact its adoption behavior.

Resource capability can be defined as an entity's ability to provide relevant support on the precise time and also location (Stephenson &Yorke, 1998). A research by Arbaugh in 2002 reported that timely response and relevant help of an educator have positive impact on student's satisfaction level. This means that student perceived that an education system that provides relevant help at a correct time will only be judged as a "capable" system.Virtual learning boasts a more effective way of transferring knowledge through its superior technology component. Virtual learning systems consist of an integrated knowledge repository which allows users to accurately mine relevant data from it. Such "usability" could be tested and elaborated to assess the resource capability of virtual learning.

In a traditional classroom, a few key components such as location, educator and infrastructure are needed to support a learning environment which involves a substantial amount of resources. However, with large amount of resources invested, the speed of knowledge transfer did not increase. This phenomenon calls upon a single word which is "efficiency".Terzis (2010) defined the word efficiency as "individual's cognition of his or her potentiality when doing something". Efficiency is not to be confused with effectiveness as efficiency is the effort expectancy of an individual; and effectiveness is the "usability" or expected impact on performance (Raaij&Schepers, 2008).

The existence of a virtual learning classroom created a mediator for knowledge to transfer. An "E-Moderator" was introduced as an educator that could transfer knowledge anytime and anywhere. Education patterns have changed as students can now perform self-study and connect them to an educator in a faster manner with lesser resource (Nunes. 2016). This could potentially smoothen the knowledge transfer process for both tacit and explicit knowledge, as emphasized in the SECI Model introduced by Nonaka&Takuechi in 1995.The SECI model has become the cornerstone of knowledge creation and transfer theory, by focusing upon **s**ocialization (tacit to tacit), **e**xternalization (tacit to explicit), **c**ombination (explicit to explicit) and **i**nternalization (explicit to tacit) of knowledge.

The virtual learning environment supports knowledge transfer cycle with the least amount of time and resources with relevant knowledge for academicians. This could be seen as the resource capabilities of virtual learning systems. The advantages provided by virtual learning systems are the motivations that drive students to adopt its system which fit TAM (technology acceptance model) and TRA (theory of reasoned action) model.

FLEXIBILITY OF TECHNOLOGY & VIRTUAL LEARNING ENVIRONMENT:

With the existence of intranet and internet, communications methods have become far more convenient than in the past. Knowledge and information flow have become convenient, and user friendly, thus advancing the education sector by leaps and bounds. Such results are sought from the benefits of technology, where its flexibility plays an important role in virtual learning.

Flexibility can be described as a perceived satisfaction when an individual is able to perform a task on his or her own pace and place (Arbaugh, 2002; Berger, 1999; Leidner&Jarvenpaa, 1995). The ability of technology devices to deploy anywhere and anytime make it valuable as a platform for virtual learning to operate.Virtual learning could use such platforms to provide timely response to academicians with feedbacks which result in successful knowledge transfer. These unique characteristics are invaluable for students of different age groups, status and for those having different personal preferences. A teaching device which is a fragment of technology could aid education in many ways. A technology giant could then utilize more advanced technology to aid and support a group of people. Web- based technology and cloud technique could provide an even more effective and simpler learning (Allen & Seaman, 2003).

The combination of the flexibility of technology and the resource capability of virtual learning could provide relevant knowledge at a precise time anywhere. Such convenience contributes to the characteristics of a successful system and thus increases the satisfaction of users, which ultimately becomes a motivation factor that drives students to adopt virtual learning systems during their education process.

RESEARCH METHODOLOGY:

Figure 1 shows the theoretical framework of this research. The dependent variables are the factors that influence the resource capability and behavior of virtual learning among university students in Malaysia. The independent variables are the effectiveness, and efficiency of virtual learning. Flexibility of technology has been introduced as a mediating variable between adoption of virtual learning and its potential drivers. Physical questionnaires were distributed to collect data. Questionnaires were anonymous to encourage respondents to answer honestly. An adequate amount of data was collected from respondents out of a large group of people to increase validity; and hence results generated are scientifically proven through the use of statistical software package. As data are scientifically calculated, results can also be used to create new theories or support an existing model.

Descriptive design is adopted in this study as all subjects were measured once only. The behavioral data were collected without changing the environment. Likert Scale was utilized to test opinions and

thoughts of respondents which explain their attitude towards virtual learning. Stratified sampling method was used as the targeted population consists of university students who have the highest level of cognitive thinking, and are more exposed to technology. Hence, they represent a subgroup of a population which comprises of university students. Participants were selected from various universities that have utilized virtual learning systems in Malaysia.

RESEARCH FRAMEWORK:

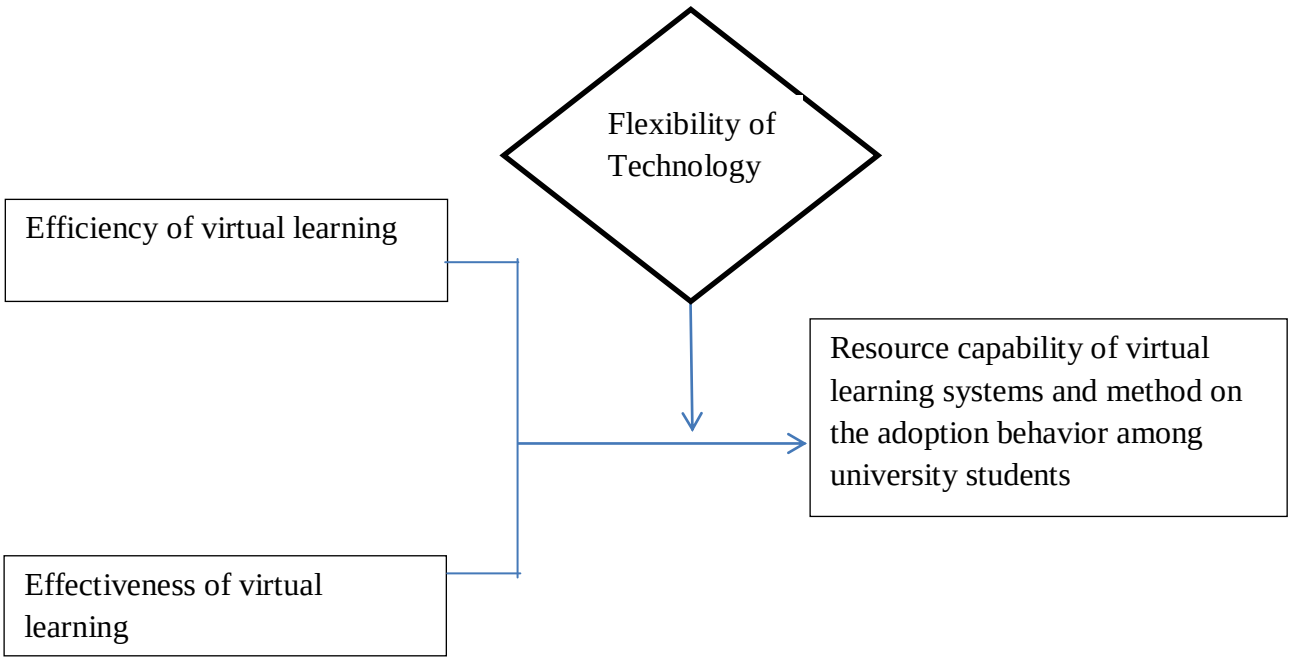

Figure 1: Independent variable that can potentially influence the adoption of virtual learning among university students in Malaysia

RESULTS OF DATA ANALYSIS:

Data collected are explained and interpreted to allow readers to understand the statistics involved in the research. Statistical analyses have generated results through the use of primary data. Primary data are gathered through questionnaires from surveys given out. SPSS Software package has been used to generate results.

Table 1: The frequency of education level among respondents

Education Level

	Frequency	Percent	Valid Percent	Cumulative Percent
Diploma	45	11.7	14.1	14.1
Foundation/A-Level	42	10.9	13.1	27.2
Degree	222	57.5	69.4	96.6
Masters	3	0.8	0.9	97.5
Doctorate	8	2.1	2.5	100.0
Total	320	82.9	100.0	

Table 1 shows data of the respondents and their education level. Since the research is conducted among university students, education level related were “Diploma”, “Foundation/ A-Level”, “Masters” and “Doctorate”. A total of 320 surveys were given out. Report shows that 57% of students that have taken part in this survey are degree students, 11.7 % are diploma students, 10.9% are pre-U students, 2.1% are doctorate students, and lastly 0.8 % is students in master level programs.

FREQUENCY OF CURRENT DISTINCTION AMONG RESPONDENTS:

Table 2 shows the data of the current distinctions of the respondents. Respondents were required to provide responses on their current courses that they are engaged in. Analysis shows that 35% of respondents stated that they are enrolled in business courses, 15% in engineering courses, 13.5% in IT courses, 11.7% in art courses, 5.2% in medical courses and 2.6% in law courses.

Table 2: The frequency of current distinction of respondents

Current Distinction

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Business	135	35.0	42.2	42.2
	Engineering	58	15.0	18.1	60.3
	IT	52	13.5	16.3	76.6
	Law	10	2.6	3.1	79.7
	Arts	45	11.7	14.1	93.8
	Medical	20	5.2	6.3	100.0
	Total	320	82.9	100.0	

FREQUENCY OF TECHNOLOGY USAGE IN CURRENT UNIVERSITY:

Table 3 shows a report of the frequency of technology usage in the respondent's university. Respondents were to judge their amount of technology usage in their university. Report shows that 34.7% of respondents acknowledge a high usage of technology while 34.5% of respondents acknowledge a moderate usage, 7.5% acknowledge a high usage, 5.4% acknowledge low usage and 0.8% acknowledges a very low usage of technology.

Table 3: The frequency of technology usage in current university

Technology Usage In Current University

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very Low	3	.8	.9	.9
	Low	21	5.4	6.6	7.5
	Moderate	133	34.5	41.6	49.1
	High	134	34.7	41.9	90.9
	Very High	29	7.5	9.1	100.0
	Total	320	82.9	100.0	

MEAN & STANDARD DEVIATION ANALYSIS:

Table 4 reports the mean and standard deviation of the main variables that influence the adoption behavior of virtual learning systems among university students. Generated results evince that efficiency of virtual learning systems has the highest mean of 3.7513, meaning that it has the most potential in influencing the adoption behavior of virtual learning systems among university students. The lowest mean is held by effectiveness of virtual learning with the mean of 3.6406. Resource capability and flexibility of technology in education process held a mean of 3.7058 and 3.7187 respectively. The highest standard deviation among the variables is the efficiency of virtual learning systems with a value of 0.62115 while the lowest is resource capability of virtual learning system with a value of 0.55020.

Table 4: Mean & Standard Deviation Analysis for the variables: Resource Capability of Virtual Learning Systems, Efficiency of Virtual Learning Systems, Effectiveness of Virtual learning Systems and Flexibility of Technology

Descriptive Statistics of Variables					
	N	Minimum	Maximum	Mean	Std. Deviation
Resource Capability of VL Systems	320	2.00	5.00	3.7058	0.55020
Effectiveness of VL Systems	320	1.60	5.00	3.6406	0.57402
Efficiency of VL Systems	320	1.40	5.00	3.7513	0.62115
Flexibility of Technology	320	2.00	5.00	3.7187	0.58927
Valid N (listwise)	320				

NORMALITY TEST:

One of the parts of descriptive analysis is normality test. This test determines whether the samples were distributed normally or not (n=320). SPSS software generated the mean, standard deviation, skewness and kurtosis for this test. Test Result show that the mean varies from 3.640 to 3.751 which is around to the scale midpoint of 3. Scales are higher for Efficiency of Virtual learning systems and lower for Effectiveness of virtual learning systems. On the whole, the mean and standard deviation values show a narrow spread around the mid-point.

Kline (2005) stated that a skewness of -3 and +3 with kurtosis of -10 and 10 is an acceptable range for a data set. The data is concluded as normally distributed. SPSS generated a result of skewness of -0.060 to 0.034 and kurtosis of -0.222 to 0.223 hence fitting the guidelines and criteria stated by Kline. The data is negatively skewed and has a long tail to the left and since the kurtosis shows negative value, the peak is not sharp.

Table 5 : Descriptive Statistics for the Variables

Variable	Mean	Standard Deviation	Skewness	Kurtosis
Resource Capability	3.705	0.55020	-0.054	0.223
Effectiveness	3.640	0.57402	-0.004	0.278
Efficiency	3.751	0.62115	0.034	-0.222
Flexibility In Technology	3.718	0.58927	-0.060	-0.220

RELIABILITY ANALYSIS:

The main purpose for which reliability analysis was carried out was to ensure that all variables were consistently measured across time with no biasness. Reliability Analysis generated by SPSS statistical software utilizes Cronbach's coefficient alpha as its measuring tool. Cronbach's coefficient alpha measures and determines the relationship's strength on variables involved in this research. In a Likert's scale survey, a Cronbach's coefficient alpha of 0.7 is favorable as it shows an average consistency and correlation of the collected data set (Santos, 1999). Table 6 reports the result of the reliability test. The variable resource capability of virtual learning systems has the highest Cronbach's coefficient alpha value of 0.819. This means that this particular variable is highly reliable. The variable that has the lowest Cronbach's coefficient alpha is flexibility of technology with a value of 0.705. Since the value is above 0.7, it is safe to assume that this variable is reliable. Effectiveness and Efficiency of virtual learning system obtained a Cronbach coefficient alpha of 0.707 and 0.751 respectively.

Table 6: Cronbach's Coefficient Alpha of each variable

Variable	**Cronbach's Alpha**	**Number of Items**
Resource Capability of VL Systems	0.819	7
Effectiveness of VL Systems	0.707	5
Efficiency of VL Systems	0.751	5
Flexibility of Technology	0.705	5

MULTIPLE LINEAR REGRESSION ANALYSIS:

The SPSS Statistical software generated three tables for Multiple Linear Regression Analysis which comprise of the Model Summary Table, Anova Table and Coefficients Table. The Model Summary table explains details such as R, R^2, adjusted R^2 and standard error of the estimate. The generated R has a value of 0.731, R^2 at 0.535, adjusted R^2 at 0.530 and Standard Error of the Estimate of 0.37702.Since R^2 has a value of 0.535, this means that the linear regression explains 53.5% of the model.

Table 7 is a report on the Anova Table. The table shows that the linear regression's F-Test has null hypotheses; and, therefore, has no linear relationship between the variables ($R^2 = 0$). While $p< 0.001$ F= 121.120

The equation of $Y_{it} = B_0 + 0.433\ X_1 + 0.305\ X_2 + 0.040\ X_3\ (0.433*0.305) + E_{it}$ can be derived from Table 4.9 which is the coefficients table. Y represents the dependent variable while X is the independent variables. The relationship represented could be calculated as the increment of every single unit value of independent variable will increase the beta coefficient (b- value). This means that every one unit of X_1 increases, the adoption behavior of virtual learning system increases by 0.433 units. As for X_2, every unit increase in X_2 increases the adoption behavior by 0.305 units. X_3 is the moderating term while the equation (0.433 *0.305) is the interacting term.

The final equation will be: $RC_{adb} = 0.837 + 0.433\ EFF + 0.305\ EFFI + 0.040\ FLEX + 0.0053 + E_{it}$

$RC_{adb} = 0.837 + 0.433\ EFF + 0.305\ EFFI + 0.040\ FLEX(0.433 *0.305) + E_{it}$

$RC_{adb} = 0.837 + 0.433\ EFF + 0.305\ EFFI + 0.040\ FLEX\ (0.132065) + E_{it}$

$RC_{adb} = 0.837 + 0.433\ EFF + 0.305\ EFFI + 0.0052826\ FLEX + E_{it}$

EFF = Effectiveness of Virtual Learning

EFFI = Efficiency of Virtual Learning

FLEX = Flexibility of Technology

Table 7: Model Summary

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.731[a]	.535	.530	.37702

Table 8: Anova Table

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	51.651	3	17.217	121.120	.000[b]
	Residual	44.918	316	.142		
	Total	96.569	319			

Table 9: Coefficients Table

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	P-value
	Resource Capability of VL Systems (Constant)	.837	.164		5.102	.000
	Effectiveness of VL Systems (X_1)	.433	.047	.452	9.307	.000
	Efficiency of VL Systems (X_2)	.305	.043	.344	7.058	.000
	Flexibility of Technology (X_3)	.040	.041	.043	.962	.337

CONCLUSION:

Independent variable of this research has been tested through multiple methods. The variable "flexibility of technology" has a positive driving force, but is not as significant compared to other variables. The respondents that participated in the survey showed positive reaction towards features and usability of the system itself rather focusing on its accessibility. It is possible that convenient features and macros could be factors that influence adoption behavior of virtual learning. Another variable that could be a factor that influences adoption behavior of virtual learning is computer self-

efficacy. This factor was first mentioned by Compeau& Higgins in 1995 utilizing the Unified Theory of Acceptance and Use of Technology (UTAUT) to explain the perceived ease of the use of computer based assessment. Since a virtual learning system has assessment criteria for students, it is possible that computer self-efficacy could be a potential factor that influences adoption behavior of virtual learning. As the modern world is developing with a tremendous speed, a system that could satisfy user's need and solve problems can only be classified as a useful system. This research has provided useful insights to virtual learning inventors and practitioners to further develop virtual learning systems in the future.

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