INTERNATIONAL JOURNAL OF ACADEMIC RESEARCH IN BUSINESS & SOCIAL SCIENCES

Vol 9, Issue 14, (2019) E-ISSN: 2222-6990

A Measurement Model of Independent Learning Based on Connectivism Theory and Web 2.0: Partial Least Squares-Structural Equation Modeling (Pls-Sem) Approach

Zulkifley Mohamed[1], Nor Hasbiah Ubaidullah[2], Siti Ilyana Mohd Yusof[3]

[1]*Sultan Idris Education University, Tanjung Malim, Perak; zulkifley@fsmt.upsi.edu.my*

[2]Sulltan Idris Education University, Tanjung Malim, Perak; hasbiah@fskik.upsi.edu.my

[3]*Aminuddin Baki Institute of Educational Management and Leadership,* Genting Highlands, Pahang; Email: sitiilyana@iab.edu.my

To Link this Article: http://dx.doi.org/10.6007/IJARBSS/v9-i14/6508 DOI:10.6007/IJARBSS/v9-i14/6508

Published Date: 28 September 2019

Abstract

The study aims to evaluate an independent learning measurement model based on connectivism theory and Web 2.0. The quantitative method is used in this study. The data is obtained through the instrument of connectivism theory and Facebook usage. The subject of this study was 81 students of Two Year Programme in one of the matriculation colleges in Malaysia. These respondents were selected based on purposive sampling. The statistical analysis involved descriptive statistics and Partial Least Squares-Structural Equation Modeling (PLS-SEM) as the method used in this study. The findings indicated that there were significant structural relationships between connectivism theory and Web 2.0 towards students' achievement. Furthermore, the structural model showed that students' achievement is influenced by the principles of connectivism theory and Facebook as a learning tool. In conclusion, this study had successfully developed and evaluated an independent learning model based on connectivism theory and Web 2.0 through PLS-SEM. This study implied that apart from connectivism theory, Web 2.0 learning tool which is Facebook is also contributed a different perspective to the process of students' learning at matriculation colleges.

Keywords: Connectivism, Web 2.0, Students' Learning.

Introduction

Previous researchers have shown that the collaborative affordances and utilisation of Web 2.0 technologies for classroom utility has a high potential to impact the learner's experiences and their performances (Bernsteiner, Ostermann, & Staudinger, 2008; Crook, Cummings, Fisher, Graber, Harrison, & Lewin, 2008; Drexler, Baralt, & Dawson, 2008; McLoughlin & Lee, 2010). For example, the emergence of social network platforms such as Facebook, Twitter,

Instagram, and many others are altering the way learners communicate, collaborate, access, learn, and seek new information (Campbell, Wang, Hsu, Duffy, & Wolf, 2010; Drexler et al., 2008; Greenhow, Robelia, & Hughes, 2009).

With the intensified use of Web 2.0 in a classroom context, it is clearly observed that learners can play an active and productive role in their learning environment (Crook et al., 2008; Glud, Buus, Ryberg, Georgsen, & Davidsen, 2010; Ryberg, Dirckinck-Holmfeld, & Jones, 2010a). Many social-based software tools provide great support to the learners by allowing enhanced autonomy and dynamic engagement in learning communities. According to Dron (2007), there is a growing need to support and motivate learners to be in control over the entire learning process. McLoughlin and Lee (2010) also stated that the learning experiences that are made possible by social-based software tools are active, process based, anchored in, and driven by learners' interests, and therefore have the potential to cultivate self-regulated, independent learning (IL).

Self-regulated learning is defined as 'independent, highly effective approaches to learning that are associated with success in and beyond school (Meyer, Haywood, Sachdev, & Faraday, 2008). Candy (1991) further suggested that IL is a method and educational philosophy in which learners acquire knowledge by themselves and develop the ability to undertake enquiry and critical reflection. Learner independence is also known by a number of other terms such as learner autonomy, IL, lifelong learning, learning to learn, and thinking skills (Sinclair, 2001). It has also been argued that the advent of online learning, which encourages social interaction and collaboration, has challenged the concept of independence in adult learning and encouraged socially mediated learning (Dabbagh, 2007).

However, Dunlap and Lowenthal (2011) have insisted that self-directed learning (SDL) is a quality of successful adult learning. It appears essential; however the effort is needed to ensure appropriate pedagogical considerations including not simply the basic curriculum but the significant changes to pedagogy, philosophy, and consideration for individualising learning objectives if the SDL is to be realised in any context (Du, 2012). Pedagogical changes will therefore be crucial in all types of educational content delivery methods in order to maximise the potential for self-directed learners and graduates (Fein, 2014).

Several researchers in the field of SDL interpret learner autonomy as an important component of SDL (Ponton, Derrick, & Carr, 2005; Bouchard, 2009; Boucouvalas, 2009). Bouchard (2009) and Boucouvalas (2009) highlighted that some of the determinants to SDL include their learning environment, context, and the connections that people build during their learning. As a result, new structures and environments are developed to facilitate autonomous learning among people. However, a key question raised by Kop and Bouchard (2011), is whether or not people can engage in self-learning in an effective way?

Downes and Siemens (2009) have developed a theory for the digital age called connectivism, which denounce elements like behaviourism, cognitivism, and constructivism. This learning theory has created new opportunities for people to learn and share information across the World Wide Web. This study applied the theoretical model based on Downes (2010); Sangakala, Ahmed, & Pahi, (2016); Matarid, Sobh, & Ahmed, (2018) four properties

of connectivism which are: diversity, autonomy, interactivity, and openness. The key theoretical assumptions are: being a member of an online network, communicating with others and filtering information, and ideas that others provide will lead to knowledge creation and learning advancement. Hence, connectivism advocates the active engagement of people with resources in communication with others, rather than the transfer of knowledge from educator to learner. Moreover, they promote a learning organisation whereby there is not a body of knowledge to be transferred from educator to learner, and where learning does not take place in a single environment. Instead, knowledge is distributed across the web and a person engaged with it creates learning.

Methodology

The data collection took place in a matriculation college that involved a sample of Two Year Programme students. The accessible population from which the sample was drawn included all students of Two Year Programme students in SMC. The population of Two Year Programme students at the selected college is 188 (N=188) and 81 students which involves 6 classes will be selected for data sampling. This population was chosen for this study because they are currently taking programming subject in Computer Science course and are semester 4 students from a Two Year Programme who are now in their final semester. In the final semester, they are anticipated to complete a final year project which they have the potential to use Web 2.0 tools in carrying out the project. Hence, this is the main reason why they were chosen as sample in this study.

There are two main approaches of structural equations modeling (SEM): (1) a component-based approach such as PLS-SEM and (2) a covariance-based structural equations modeling (CB-SEM) approach (Fornell & Bookstein, 1982, Marcoulides, Chin, & Saunders, 2009; Wetzels, Odekerken-Schroder, & van Oppen, 2009). These two approaches are different in terms of underlying statistical assumptions and the nature of fit statistic they produce (Gefen et al., 2000).

In the literature, PLS-SEM is viewed as a method that is less rigorous and not suitable for examining relationships between LVs (Rouse & Corbitt, 2008). Despite all of the critiques, recently PLS-SEM has been applied increasingly in marketing and other business disciplines (Henseler, Ringle, & Sinkovics, 2009). Scholars are now accepting the PLS-SEM method as a more robust estimation of the structural model (Henseler et al., 2009). PLS-SEM is also viewed as an alternative method when CB-SEM distributional assumptions cannot be met (Hair, Ringle, & Sarstedt, 2011). So, the method used in this study is PLS-SEM.

Findings

The measurement model in PLS-SEM is evaluated in terms of internal consistency (composite reliability), indicator reliability, convergent validity, and discriminant validity (Hair et al., 2014). Figure 1 illustrates the measurement model for this research.

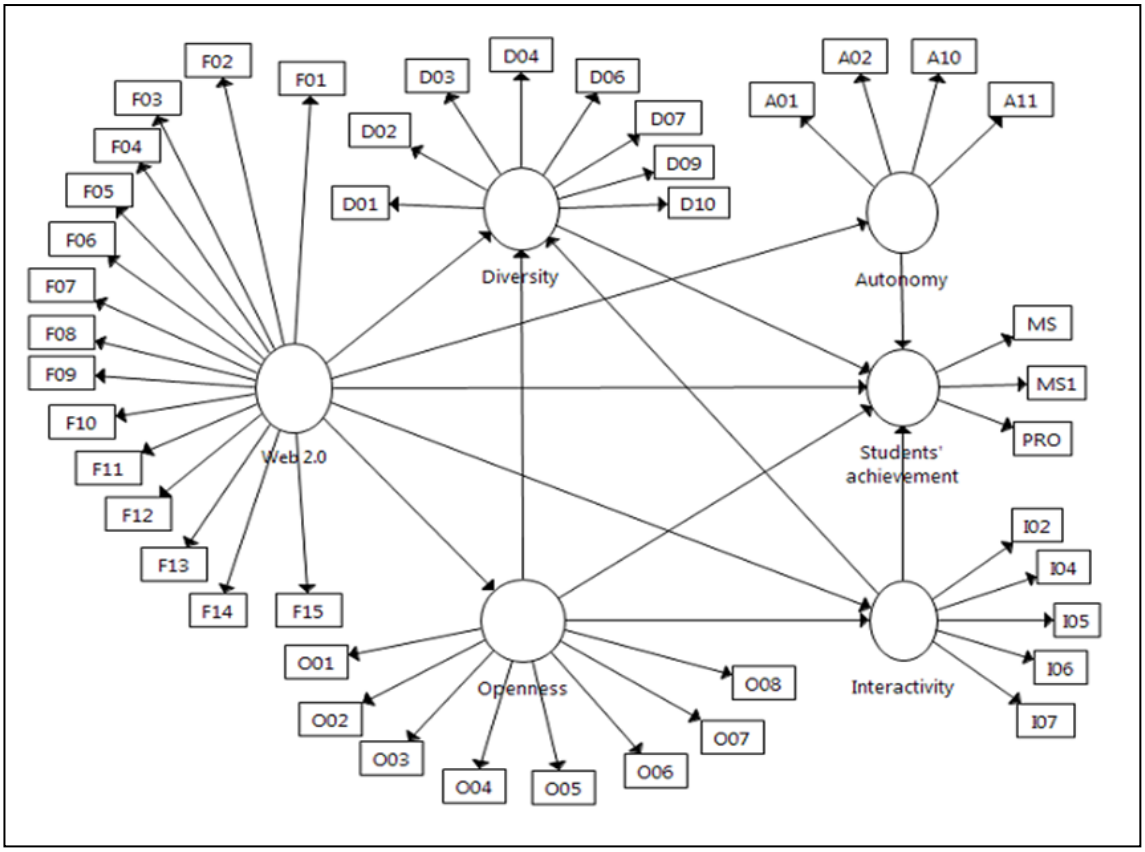

Figure 1. A Measurement Model

For the evaluation of the measurement model, there are several criteria that must be complied with and for this part of the analysis; it was conducted based on predefined criteria. This section introduces these terms and the rest of this section discusses how these reliabilities and validities are addressed in the context of PLS-SEM.

Table 1 shows the assessment procedure for a measurement model systematically by Hair et al. (2014).

Table 1: Systematic Assessment Procedure for a Measurement Model by Hair et al. (2014).

Evaluation of the Measurement Model	
Reflective Measurement Model	**Formative Measurement Model**
Internal consistency (composite reliability)	Convergent validity
Indicator reliability	Collinearity among indicators
Convergent validity (average variance extracted)	Significance and relevance of outer weights
Discriminant validity	

Note. *N*'s range from 107 to 109 due to occasional missing data. For sex, 0 = male, 1 = f emale. Educ. = education. Dist. Intol. = distress intolerance. Relig. = religiosity.

Internal Consistency Reliability

Internal consistency reliability can be assessed through the values of Composite Reliability (CR). A measurement model has satisfactory internal consistency reliability when the CR of each construct exceeds the threshold value of 0.7. The CR values of each construct for this study ranged from 0.953 to 0.991 which exceeding the recommended threshold value of 0.7. In this analysis, the internal consistency reliability is also estimated by using Cronbach's Alpha (CA).

The rule of thumb for both CR and CA is above 0.7 to indicate acceptable internal consistency reliability (Henseler et al., 2009). Thus, the results indicated that the items used to represent the constructs have satisfactory internal consistency reliability in Table 2.

Table 2: Results of PLS-SEM Analysis: Composite Reliability (CR) and Cronbach's Alpha (CA).

Construct	Composite Reliability (CR)	Cronbach's Alpha (CA)
Autonomy	0.981	0.975
Diversity	0.971	0.976
Interactivity	0.974	0.967
Openness	0.984	0.981
Students' Achievement	0.953	0.926
Web 2.0	0.991	0.991

Indicator Reliability

Indicator reliability of the measurement model is measured by examining the items loadings. A measurement model is said to have satisfactory indicator reliability when each item's loading is at least 0.7 and is significant at least at the level of 0.05. Based on the analysis, all items exhibited loadings exceeding 0.7 in the measurement model. Figure 2 exhibits the complete structural model for IL and Table 3 shows the loading for each item and its t-statistics values on their respective constructs. Based on the results, most of the items used for this study have demonstrated satisfactory indicator reliability.

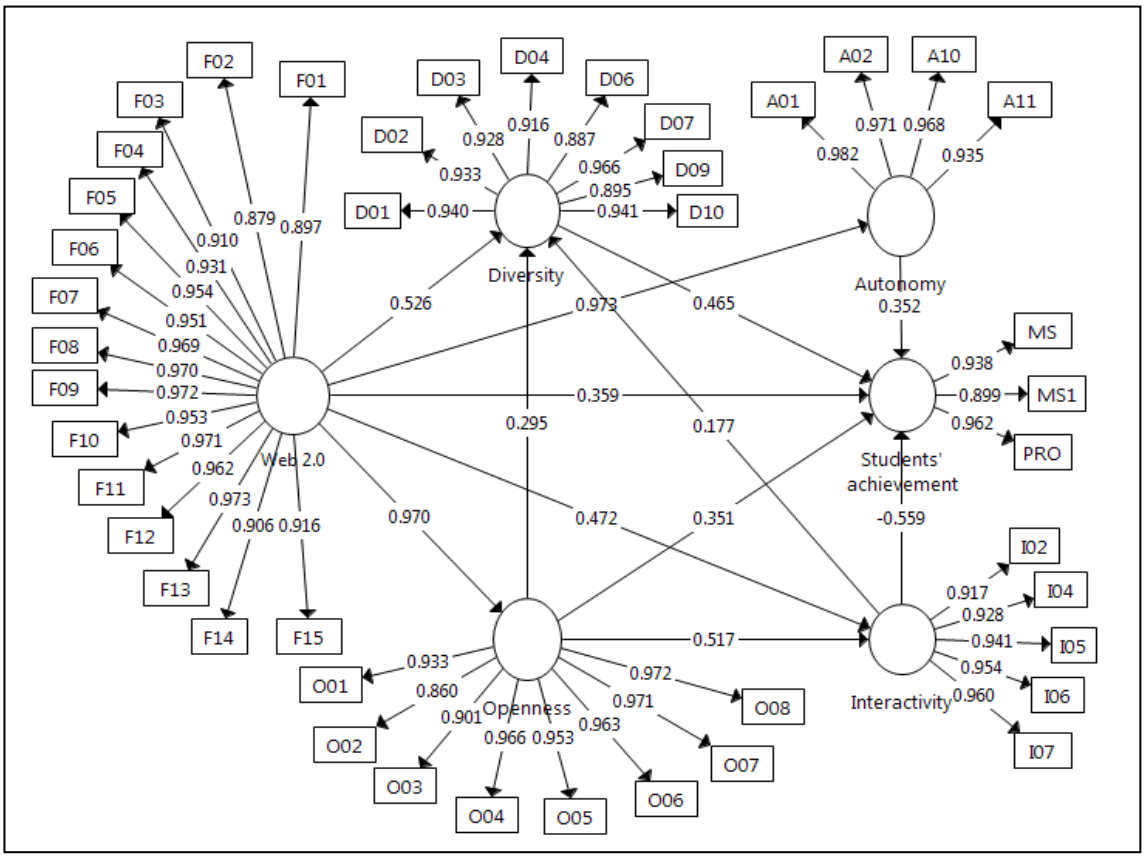

Figure 2. A Complete Structural Model for IL

Table 3: Descriptive and Reliability Statistics.

Items/Constructs	Original Sample Loading	Sample Mean Loading	Standard Deviation	*t*-statistics	*t*-statistics
A01 <- Autonomy	0.982	0.981	0.003	300.235	<0.001
A02 <- Autonomy	0.971	0.971	0.006	172.729	<0.001
A10 <- Autonomy	0.968	0.967	0.007	136.927	<0.001
A11 <- Autonomy	0.935	0.934	0.015	63.01	<0.001
D01 <- Diversity	0.94	0.939	0.012	81.166	<0.001
D02 <- Diversity	0.933	0.933	0.012	80.632	<0.001
D03 <- Diversity	0.928	0.927	0.013	70.691	<0.001
D04 <- Diversity	0.916	0.915	0.015	59.642	<0.001
D06 <- Diversity	0.887	0.886	0.018	50.344	<0.001
D07 <- Diversity	0.966	0.966	0.006	173.578	<0.001
D09 <- Diversity	0.895	0.893	0.023	39.383	<0.001
D10 <- Diversity	0.941	0.941	0.007	130.216	<0.001
F01 <- Web 2.0	0.897	0.897	0.015	58.389	<0.001
F02 <- Web 2.0	0.877	0.877	0.019	45.525	<0.001
F03 <- Web 2.0	0.909	0.909	0.018	49.65	<0.001
F04 <- Web 2.0	0.931	0.931	0.011	83.992	<0.001

Items/Constructs	Original Sample Loading	Sample Mean Loading	Standard Deviation	*t*-statistics	*t*-statistics
F05 <- Web 2.0	0.954	0.955	0.007	143.156	<0.001
F06 <- Web 2.0	0.952	0.952	0.007	130.953	<0.001
F07 <- Web 2.0	0.969	0.969	0.006	161.91	<0.001
F08 <- Web 2.0	0.97	0.97	0.005	190.237	<0.001
F09 <- Web 2.0	0.972	0.972	0.005	203.598	<0.001
F10 <- Web 2.0	0.953	0.953	0.008	121.698	<0.001
F11 <- Web 2.0	0.971	0.971	0.005	213.78	<0.001
F12 <- Web 2.0	0.962	0.963	0.006	173.283	<0.001
F13 <- Web 2.0	0.974	0.974	0.005	215.299	<0.001
F14 <- Web 2.0	0.906	0.906	0.019	47.159	<0.001
F15 <- Web 2.0	0.916	0.915	0.015	59.118	<0.001
I02 <- Interactivity	0.917	0.917	0.016	59.014	<0.001
I04 <- Interactivity	0.928	0.927	0.013	70.847	<0.001
I05 <- Interactivity	0.941	0.94	0.012	76.136	<0.001
I06 <- Interactivity	0.954	0.954	0.008	112.828	<0.001
I07 <- Interactivity	0.96	0.96	0.008	125.76	<0.001
O01 <- Openness	0.933	0.933	0.018	52.047	<0.001
O02 <- Openness	0.86	0.859	0.02	43.873	<0.001
O03 <- Openness	0.901	0.9	0.019	47.252	<0.001
O04 <- Openness	0.966	0.966	0.009	109.014	<0.001
O05 <- Openness	0.953	0.952	0.013	74.272	<0.001
O06 <- Openness	0.963	0.963	0.01	100.085	<0.001
O07 <- Openness	0.971	0.971	0.008	123.537	<0.001
O08 <- Openness	0.972	0.972	0.007	147.16	<0.001
MS <- Students' achievement	0.938	0.938	0.012	78.382	<0.001
MS1 <- Students' achievement	0.899	0.897	0.021	42.87	<0.001
PRO <- Students' achievement	0.962	0.961	0.008	121.679	<0.001

Convergent Validity

In this study, the measurement model's convergent validity is assessed by examining its Average Variance Extracted (AVE) value (See Table 4). Convergent validity is adequate when constructs have an AVE value of at least 0.5 or more.

Table 4: Descriptive and Reliability Statistics.

Construct	Average Variance Extracted (AVE)
Autonomy	0.929
Diversity	0.857
Interactivity	0.884
Openness	0.885
Students' Achievement	0.871
Web 2.0	0.886

Convergent Validity

In this study, the LV's of the measurement model discriminant validity are assessed by using Torkzadeh, Koufteros, and Pflughoeft (2003) approach. As discussed in Chapter 4, the discriminant variability is supported if the confidence interval of the paired correlation between two LV's does not include the value of 1. Based on Table 5, all the confidence intervals of the paired correlations do not include the value of 1. Hence, the result affirmed the discriminant validity of all the LV's.

Table 5: Correlations between LV's and Confidence Interval.

Latent variable	Statistic	1	2	3	4	5	6
1 Autonomy	Correlation		0.968	0.951	0.945	0.951	0.973
	p value		< .005	< .005	< .005	< .005	< .005
	n		81	81	81	81	81
	Std. Error		0.006	0.009	0.01	0.01	0.004
	Lower limita		0.955	0.932	0.924	0.931	0.964
	Upper limita		0.977	0.965	0.963	0.971	0.981
2 Diversity	Correlation	0.968		0.977	0.978	0.956	0.985
	p value	< .005		< .005	< .005	< .005	< 0.005
	n	81		81	81	81	81
	Std. Error	0.006		0.005	0.004	0.008	0.002
	Lower limita	0.955		0.967	0.969	0.938	0.98
	Upper limita	0.977		0.986	0.985	0.971	0.989
3 Interactivity	Correlation	0.951	0.977		0.975	0.922	0.974
	p value	< .005	< .005		< .005	< .005	< .005
	n	81	81		81	81	81
	Std. Error	0.009	0.005		0.006	0.012	0.005
	Lower limita	0.932	0.967		0.964	0.897	0.964
	Upper limita	0.965	0.986		0.985	0.944	0.983
4 Openness	Correlation	0.945	0.978	0.975		0.942	0.97

Latent variable	Statistic	1	2	3	4	5	6
	p value	< .005	< .005	< .005		< .005	< .005
	n	81	81	81		81	81
	Std. Error	0.01	0.004	0.006		0.01	0.005
	Lower limita	0.924	0.969	0.964		0.917	0.961
	Upper limita	0.963	0.985	0.985		0.958	0.979
	Correlation	0.951	0.956	0.922	0.942		0.955
5 Students' Achievement	p value	< .005	< .005	< .005	< .005		< .005
	n	81	81	81	81		81
	Std. Error	0.01	0.008	0.012	0.01		0.007
	Lower limita	0.931	0.938	0.897	0.917		0.942
	Upper limita	0.971	0.971	0.944	0.958		0.969
	Correlation	0.973	0.985	0.974	0.97	0.955	
	p value	< .005	< .005	< .005	< .005	< .005	
	n	81	81	81	81	81	
6 Web 2.0	Std. Error	0.004	0.002	0.005	0.005	0.007	
	Lower limita	0.964	0.98	0.964	0.961	0.942	
	Upper limita	0.981	0.989	0.983	0.979	0.969	

Std error, lower limit and upper limit are based on 500 bootstrap samples.

a. Lower limit and upper limit are based on 95% confidence interval.

Discussions

PLS-SEM is used to examine the determinants influencing students' achievement within matriculation college students through connectivism principles and Web 2.0. A number of observations can be made from the analysis conducted on the measurement and structural model.

The measurement model demonstrated satisfactory reliability and validity measures. In terms of internal consistency, all constructs have composite reliability values more than 0.7. All item loadings are greater than 0.7 and are significant at the level of 0.001, demonstrating indicator reliability. The measurement model also demonstrated satisfactory convergent and discriminant validity by having AVE value greater than 0.50, and all the confidence intervals of the paired correlations do not include the value of 1. The following table (See Table 6) shows the result of hypotheses testing conducted in this study and it consists of all proposed relationships.

Table 6: Hypotheses.

Hypothesis	Result
H1: The structural model of Independent Learning (IL) with Web 2.0 adoption using connectivism theoretical fits the empirical data well.	Supported
H2: Web 2.0 has a significant positive relationship with autonomy	Supported
H3: Autonomy has a significant positive relationship with students' achievement	Supported
H4: Web 2.0 has a significant positive relationship with diversity	Supported
H5: Interactivity has a significant positive relationship with diversity	Supported
H6: Diversity has a significant positive relationship with students' achievement	Supported
H7: Web 2.0 has a significant positive relationship with interactivity	Supported
H8: Openness has a significant positive relationship with interactivity	Supported
H9: Interactivity has a significant positive relationship with students' achievement	Supported
H10: Web 2.0 has a significant positive relationship with openness	Supported
H11: Openness has a significant positive relationship with diversity	Supported
H12: Openness has a significant positive relationship with students' achievement	Supported
H13: Web 2.0 has a significant positive relationship with students' achievement	Supported

The finding indicates that:

i. Web 2.0 was found to have a positive relationship with autonomy. The relationship was practically significant. The results suggest that when autonomy is high, students are more likely to perceive Web 2.0 as useful. The result supported hypothesis H2;
ii. Autonomy was found to have a positive relationship with students' achievement which is coordinated to expectations. Therefore this hypothesis (H3) is confirmed by the result;
iii. Web 2.0 was found to have a positive relationship with diversity. The results suggest that when diversity is high, students are more likely to perceive Web 2.0 as useful. This evidence supported hypothesis H4;
iv. The path coefficient shows a positive and significant relationship between interactivity and diversity. Therefore, this hypothesis (H5) is supported by the data;
v. Students' achievement is influenced directly by diversity. As a result, hypothesis H6 is supported;
vi. Interactivity is influenced directly Web 2.0. As a result, hypothesis H7 is supported;
vii. It was also shown that interactivity is influenced directly by openness. Based on the results, hypothesis H8 is supported;
viii. Students' achievement is influenced directly by interactivity. As a result, hypothesis H9 is supported;

ix. Web 2.0 has a positive relationship with openness. Consequently, hypothesis H10 is supported;
x. Analysis of the computed results shows that openness has a positive relationship with diversity. As a result, hypothesis H11 is supported;
xi. This study has shown that openness has a positive relationship with students' achievement. This means from the results, hypothesis H12 is supported; and
xii. A significant finding to emerge from this study is that students' achievement is influenced directly by Web 2.0. So from the results, hypothesis H13 is supported.

Conclusion

From a practical viewpoint, this study provides an important guidance to matriculation colleges in implementing IL. Although in this study the site sample used was considerably small sample size that focused on just one institution, the experience from this initiative is very meaningful and contributes to many aspects of students' learning development, growth, and achievement. In general, the findings of this study can help the administration of matriculation colleges to understand: i) how students evaluate their level of satisfaction when using Web 2.0; ii) how to promote cooperative and committed surroundings within a Web 2.0 platform that is Facebook; and iii) how to encourage students to apply the principles of connectivism in assisting their learning. Having a clear understanding of what and how these determinants influence students' achievement is important as it can help make the administration of matriculation colleges as the main source of reference when it comes to knowledge about students' opinions or recommendations regarding learning mode or strategy. Not only that, it also provides the opportunities for the administrators to channel their ideas and suggestions in co-creating the learning mode or strategy in which they are interested.

References

Sangakala, M., Ahmed, U., & Pahi, M. H. (2016). Empirical investigating on the role of supervisor support, job clarity, employee training and performance appraisal in addressing job satisfaction of nurses. *International Business Management*, *10*(23), 5481-5486.

Matarid, N. M., Sobh, O. S., & Ahmed, U. (2018). The Impact of Organizational Justice and Demographics on Faculty Retention in Bahrain. *Le travail humain*, (3).

Bernsteiner, R., Ostermann, H., & Staudinger, R. (2008). Facilitating e-learning with social software: Attitudes and usage from the student's point of view. International Journal of Web-Based Learning and Teaching Technologies, 3(3), 16-33.

Campbell, T., Wang, S., Hsu, H.-Y., Duffy, A., & Wolf, P. (2010). Learning with web tools, simulations, and other technologies in science classrooms. Journal of Science Education and Technology, 19(5), 505-511. doi:10.1007/ s10956-010-9217-8

Candy, P. C. (1991). *Self-Direction for Lifelong Learning. A Comprehensive Guide to Theory and Practice*. Jossey-Bass, 350 Sansome Street, San Francisco, CA 94104-1310.

Crook, C., Cummings, J., Fisher, T., Graber, R., Harrison, C., & Lewin, C. (2008). Web 2.0 technologies for learning: The current landscape-opportunities, challenges and tensions.

Dabbagh, N. (2007). The online learner: Characteristics and pedagogical implications.*Contemporary Issues in Technology and Teacher Education*, *7*(3), 217- 226.

Dabbagh, N., & Reo, R. (2011). Back to the future: Tracing the roots and learning affordances of social software. Hershey, PA: IGI Global.

Downes, S. (2010). Learning networks and connective knowledge. In H. Yang & S. Yuen (Eds.), Collective intelligence and e-learning 2.0: Implications of web-based communities and networking (pp. 1-26). Hershey, PA: IGI Global.

Drexler, W., Baralt, A., & Dawson, K. (2008). The teach Web 2.0 consortium: A tool to promote educational social networking and Web 2.0 use among educators. Educational Media International, 45(4), 271-283. doi:10.1080/09523980802571499

Dron, J. (2007). Designing the undesignable: Social software and control. Educational Technology & Society, 10(3), 60-71. http://www.ifets.info/journals/10_3/5.pdf Educause (2006). 7 Things you should know about facebook. Educause Learning Initiative. http://net.educause.edu/ir/library/pdf/ELI7017.pdf> Retrieved 18.01.10.

Du, F. (2012). Using study plans to develop self-directed learning skills: Implications from a pilot project. *College Student Journal*, *46*(1), 223-232.

Dunlap, J. C., & Lowenthal, P. R. (2011). Learning, unlearning, and relearning: Using Web 2.0 technologies to support the development of lifelong learning skills.

Fein, M. L. (2014). *Redefining higher education: How self-direction can save colleges.* New Brunswick, NJ: Transaction.

Fornell, C., & Bookstein, F. L. (1982). two structural equation models: LISREL and PLS applied to consumer exit-voice theory. *Journal of Marketing Research, 19*(4), 440-452.

Fornell, C., & Cha, J. (1994). Partial least squares. *Advanced methods of marketing research*, *407*(3), 52-78.

Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable and measuremenr error *Journal of Marketing Research, 34*(2), 161-188.

Gefen, D., Straub, D. W., & Boudreau, M. C. (2000). Structural equation modelling and regression: Guidelines for research practice. *Communication of the Association for Information Systems, 4*(7), 2-77.

Glud, L. N., Buus, L., Ryberg, T., Georgsen, M., & Davidsen, J. (2010). Contributing to a learning methodology for Web 2.0 learning—Identifying central tensions in educational use of Web 2.0 technologies. In L. Dirckinck-Holmfeld, V. Hodgson, C. Jones,M. de Laat, D. McConnell, & T. Ryberg (Eds.), *Proceedings of the 7th International Conference on Networked Learning* (pp. 934–942). Retrieved from: http://www.lancs.ac.uk/fss/organisations/netlc/past/nlc2010/abstracts/PDFs/N%C3%B8rgaard%20Glud.pdf

Greenhow, C., Robelia, B., & Hughes, J. E. (2009). Learning, teaching, and scholarship in a digital age: Web 2.0 and classroom research: What path should we take "now"? Educational Researcher, 38(4), 246 259.doi:10.3102/0013189X09336671

Hair, J. F., Ringle, C.M., & Sarstedt, M. (2011). PLS-SEM: Indeed a silver bullet. *Journal of Marketing Theory and Practice, 19*(2), 139-151.

Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2014). A primer on partial Least Squares Structural Equation Modeling (PLS-SEM). Thousand Oaks, california: SAGE Publications.

Henseler, J., Ringle, C.M., & Sinkovics, R. (2009). The use of Partial Least Squares path modeling in International Marketing. International Marketing, 20, 277-319.

Marcoulides, G.A., Chin, W.W., & Saunders, C. (2009). A critical look at Partial Least Square Modeling. *MIS Quarterly, 33*(1), 171-175.

McLoughlin, C., & Lee, J. W. (2008). The three P's of pedagogy for the networked society: Personalization, participation, and productivity. *International Journal of Teaching and Learning in Higher Education, 20*(1), 10–27. Retrieved from http://www.isetl.org/ijtlhe/pdf/IJTLHE395.pdf

Meyer, B., Haywood, N., Sachdev. D., & Faraday S. (2008). Independent Learning Literature Review. (Research Report No. DCSF-RR05). Retrieved from Learning and Skills Network

Rouse, A. C., & Corbitt, B. (2008). There's SEM and "SEM": A critique of the use of PLS regression in Information System research*AIS.* Symposium conducted at the meeting of the 19th Australasian Conference on Information Systems, Christchurch, New Zealand.

Ryberg, T., Dirckinck-Holmfeld, L., & Jones, C. (2010a). Catering to the needs of the "digital natives" or educating the "net generation"? In M. J. W. Lee & C. McLoughlin (Eds.), Web 2.0-Based E-Learning: Applying Social Informatics for Tertiary Teaching (pp. 301–318). Hershey, PA: IGI Global.

Sinclair, B. (2001). What do we mean by learner independence and wrestling with a jelly: The evaluation of learner autonomy. Workshops given at the Higher Colleges of Technology, United Arab Emirates.

Torkzadeh, G., Koufteros, X., & Pflughoeft, K. (2003). Confirmatory analysis of computer self-efficacy. *Structural Equation Modeling*, *10*(2), 263-275.

Wetzels, M., Odekerken-Schroder, G., & Oppen, V. C. (2009). Using PLS path modeling for assessing hiererchical construct models: Guidelines and empirical illustration. *MIS Quarterly, 33*(1), 177-195