

AN INVESTIGATION OF THE RELATIONSHIP BETWEEN PSYCHOLOGICAL FACTORS AND THE FREQUENCY USE OF E-LEARNING TOOLS AMONG TERTIARY STUDENTS USING THE LEARNER-CENTRED FRAMEWORK FOR E-LEARNING PROPOSED BY MCCOMBS AND VAKILI

Siew Pei Hwa

Faculty of Creative Industries,
Universiti Tunku Abdul Rahman,
Bandar Sungai Long, Cheras, 43000 Kajang, Selangor, Malaysia
Email: siewph@utar.edu.my

Sophia Latt bt Hj. Hasan Latt @ Hnin Wai Latt

Faculty of Engineering and Science,
Universiti Tunku Abdul Rahman,
Bandar Sungai Long, Cheras, 43000 Kajang, Selangor, Malaysia
Email: sofinsadiq@gmail.com

Lee Kong Chian

Faculty of Engineering and Science,
Universiti Tunku Abdul Rahman,
Bandar Sungai Long, Cheras, 43000 Kajang, Selangor, Malaysia

ABSTRACT

With the creation of e-learning tools, the web is transforming into an interactive space and control of content that has been decentralised to allow the learners to collaborate, create, publish, subscribe, and share information (Saeed & Yang, 2008). As higher education attempts to meet the increasing demand for courses delivered via e-learning, investigation of the relationship between psychological factors and the frequency use of e-learning tools among tertiary students are needed. This paper highlights a Learner-Centred Framework for E-Learning (LCFEL) proposed by McCombs and Vakili. Through this research, the relationship between the four domain factors, i.e. Cognitive and Metacognitive (CM), Motivational and Affective (MA), Developmental and Social (DS), and Individual-Difference (ID) factors in LCFEL proposed by McCombs and Vakili with respect to their frequency use of selected e-learning tools had been examined. These e-learning tools include the learning management system (LMS) used to supplement the instructional process in a Malaysian private university called Blackboard E-Learn, search engines, YouTube, Facebook, and email. A Malaysian private University had been chosen as the ground for data collection. The research employed a questionnaire survey approach. Self-administered questionnaire was used to gather users' opinion on their degree of agreement with each statement that built into CM, MA, DS and ID factors in the structured questionnaire. The questionnaire was pilot-tested and had demonstrated a high level of internal consistency and reliability among items. Students from five schools in the University had participated in the survey. The findings of the research revealed that students' frequency use of the e-learning tools such as Blackboard E-Learn, search engines, YouTube, Facebook, and email had different relationships with the four domain factors in the LCFEL.

Key words: E-learning, E-learning tools, Learner-Centred Framework for E-learning, tertiary students.

Introduction

The advancement of digital technologies have revolutionised the notion of teaching and learning. Kop et al. (as cited in Shafie and Mansor 2009, p. 69) asserted that teaching in the digital age is no longer telling, and learning is no longer listening. Shafie and Mansor added that "the ideal learning environments for digital learners are rich learning environments that enable and support learners to learn independently and collaboratively" (p. 70). Digital learning, or online education, allows students to learn at any time, any place, and any pace, through any path. An online learning and the networked learning is also best described as e-learning (Coldwell et al., 2008). The term e-learning was coined in the mid-1990s along with developments in the World Wide Web and interest in asynchronous discussion groups. The technological foundation of e-learning is the Internet and associated communication technologies (Garrison, 2011). Clark and Mayer (2011) noted that, e-learning involves the use instructional methods (such as examples and practice) and multimedia elements (such as pictures and videos) to assist learning by delivering content which is pertinent to the learning objective. With e-learning, students and lecturers are able to interact with each other using IT tools and applications (Nordin et al., 2011). Ever since the introduction of e-learning, it has gradually becomes an important facilitator in teaching-learning process. The growing interest in e-learning seems to be coming from different directions such as corporate and educational sectors. Corporate sees e-learning as a tool to save cost in terms of training and travelling to the learning centre (Bassi, 2015). As from the educational point of view, it is an additional access to improving the teaching and learning process and to provoke a better communication between the instructors and learners. E-learning has increased rapidly in higher education.

Higher Education Institutions (HEIs) were the early adopter of the concept of web-based teaching and learning due to the availability of ICT resources, funds, and personnel (Mohamad et al., 2005). The adoption of e-learning tools has developed tremendously in educational settings. These e-learning tools range from blogs, wikis, instant messengers, social networks, podcast, vodcasts, blackboards, and so forth (Long, 2006 as cited in Saeed & Yang, 2008). Almost all the lecturers in the University were mainly using word processing and presentation tools such as Microsoft Word and Microsoft PowerPoint. Microsoft Word was usually used to create notes, assignments and tutorials, whereas Microsoft PowerPoint was used to create lecture slides. These course materials were then uploaded to a resource web site called Blackboard E-Learn. In addition to Blackboard E-Learn, some lecturers were using additional e-learning tools in the teaching-learning process. For instances, some lecturers used YouTube to create videos, Google Docs to share documents, and Facebook for communication purposes. Meanwhile, the University students were using Blackboard E-Learn to retrieve course materials, assignments, announcements and view grades posted by lecturers.

However, past studies had found that the adoption of e-learning tools in higher education has not reached to the level that enables teaching and learning to be as effective and interesting as possible. The reason for its ineffectiveness at the moment is because higher education failed to choose the right media or tool for their teaching and learning processes. This is in line with not having enough research on potential of IT technologies and which tools suit the institution best. This in return do not support and reflect new teaching principles and practices well (Dewan, 2010). To address this issue, the McCombs and Vakili's LCFEL (2005) which comprises of psychological principles is used to identify the learner's behaviour towards learning and to find out how these principles influence their frequency use of e-learning tools. It is very important to evaluate e-learning from a psychological perspective so that the instructors know what type of e-learning tools can be used to create the instructional materials and which tools are suitable to assist them in the teaching and learning processes, and thus enhance students' learning achievement.

The paper highlights the main focus of the research, which investigates the relationship between the four domain factors that built into LCFEL proposed by McCombs and Vakili and the frequency use of e-learning tools among tertiary students. These four factors include Cognitive and Metacognitive (CM), Motivational and Affective (MA), Developmental and Social (DS), and Individual-Difference (ID) factors, whereas the selected e-learning tools are Blackboard E-Learn, search engines, YouTube, Facebook and email. The remainder of this paper is structured as follows. Section 2 presents LCFEL proposed by McCombs and Vakili, section 3 describes the proposed research framework and hypotheses, section 4 discuss the research methodology, while section 5 reports the findings of the hypotheses testing. Section 6 concludes the paper.

The learner centred framework for e-learning proposed by McCombs and Vakili

A myriad of researchers had studied about the potential to construct learner-centred learning experiences via e-learning (e.g. Anderson, 2010; Glancy & Isenberg, 2013; Mbuli, 2015; McCombs & Vakili, 2005; McIntyreMills et al., 2014; Veletsiano, 2010). McCombs and Vakili (2005) defined "learner-centred" as: "the perspective that couples a focus on individual learners such as their heredity, experiences, perspectives, backgrounds, talents, interests, capabilities, and needs with a focus on leaning which is the best available knowledge about learning and how it occurs and about teaching practices that are most effective in promoting the highest levels of motivation, learning, and achievement for all learners" (p. 1584). McCombs and Vakili proposed a theory on learner centred framework for e-learning that provides the theoretical foundation for this research. McCombs and Vakili added that learner-centred is the reflection in the practice of Learner-Centred Psychological Principles with a complication of programmes, practices, policies, and people that support learning for all.

Building on the work from Task Force on Psychology in Education, in association with American Psychological Association (APA), the Learner Centred Framework for E-Learning (LCFEL) proposed by McCombs and Vakili comprises 14 principles for designing learner-centred practices at all levels and types of school learning including distance education (Hannum et al., 2008; McCombs and Vakili, 2005). These 14 principles encompass:

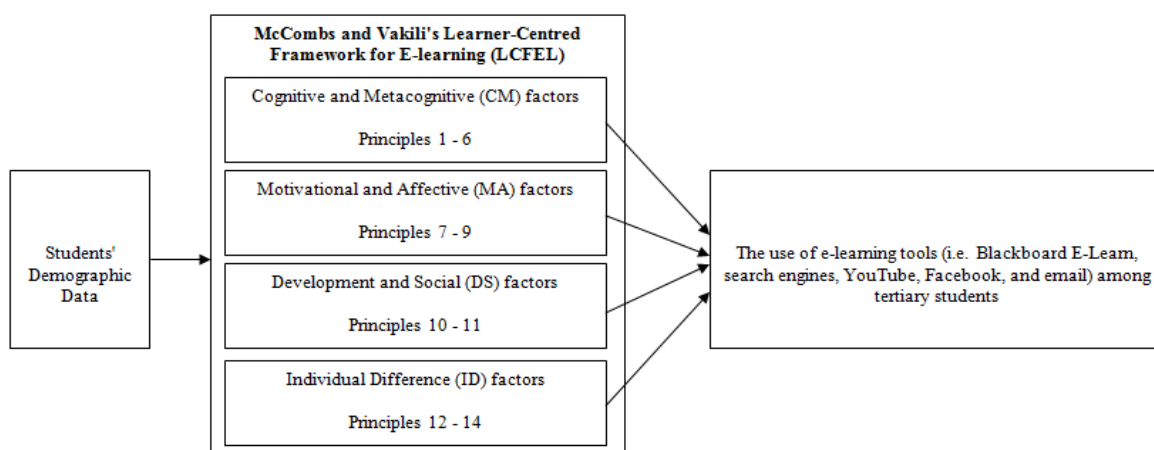
- **Principle 1- Nature of the learning process:** Learning complex subject matter is most effective when there is an intentional process to construct the meaning from the information and experience. There are different learning approaches that could be used in schools namely from motor skills, generating knowledge from subject matter and learning cognitive skills and strategies.
- **Principle 2- Goals of the learning process:** In order to be a successful learner, he or she must have a goal and support with good instructional guidance to create meaningful representations of knowledge. Teachers should help students to set short and long term goals in the perspective of personal and education.
- **Principle 3- The construction of knowledge:** A successful learner can take new information and construct it together with existing knowledge in a meaningful way. Different student has different ways of organizing information that is unique. Teachers can help students to develop important knowledge and skills. However, unless new knowledge becomes integrated with the learner's prior understandings, the new knowledge remains isolated and difficult to apply to new situations.
- **Principle 4- Strategic thinking:** A successful learner is able to use variety of thinking and strategies to solve complex learning goals. Successful learners use strategic thinking in problem solving, learning and define concepts. They can use a variety of strategies and continue to expand their repertoire by reflecting on and changing their current strategies, observing others, and benefiting from instruction.
- **Principle 5- Thinking about thinking:** Higher-order strategies for "thinking about thinking and learning" for overseeing and monitoring mental operations-facilitate creative and critical thinking and the development of expertise. Successful learners can reflect on how they learn, set reasonable goals, select appropriate strategies, monitor progress toward goals, and change strategies when necessary. These abilities can be developed through instruction.

- **Principle 6- Context of learning:** Learning is influenced by environmental factors such as culture, technology, and instructional practices. Teachers play major roles which is interactive with both learners and the learning environment. Instruction by the teachers must fit the students' level or prior knowledge, cognitive abilities, and ways of thinking. The nurturing qualities of the classroom environment are particularly influential in student learning.
- **Principle 7- Motivational and emotional influences on learning:** What and how much is learned is influenced by the learner's motivation. Motivation to learn is influenced by the individual's emotional states, beliefs, interests and goals, and habits of thinking. The depth and breadth of information processed and how much a learner learn a subject matter and remember are influenced by several factors namely (a) self-awareness and beliefs about personal control, competence, and ability; (b) clarity and saliency of personal values, interests, and goals; (c) personal expectations for success or failure; (d) affect, emotion, and general states of mind; and (e) the resulting motivation to learn. Cognitions and emotions such as feeling insecure, worrying about failure, being self-conscious or shy, and fearing punishment, ridicule, or stigmatizing labels can have negative influence on the learner's learning ability.
- **Principle 8- Intrinsic motivation to learn:** Creativity, higher order thinking, and natural curiosity contributes to motivation to learners. Intrinsic motivation is triggered by the task, personal interests of the learner and personal choice of control. Students need opportunities to make choices about learning in line with their personal interests. Students are more likely to be creative and think deeply about projects that are as complex as real-world situations.
- **Principle 9: Effects of motivation and effort:** In order to acquire complex knowledge and skills, learners must put effort and follow guidelines provided by the teachers. Learning complex knowledge and skills requires lots of time and energy.
- **Principle 10- Developmental constraints and opportunities:** As learners develop, there are different opportunities and constraints they will face. Learners will go through physical, intellectual, emotional, and social development in their live. Learning will be more effective when learners take into account different physical, intellectual, emotional, and social domains. Students learn best when materials are development appropriately. Overemphasis on one kind of developmental readiness such as reading readiness, for example may interfere with development in other areas.
- **Principle 11- Social influences on learning:** Learning is influenced by social interactions, interpersonal relations, and communication with others. Learning can be developed when students have the opportunity to interact and collaborate with others on instructional tasks. Learning situations that allow for and respect diversity encourage flexible thinking, social competence, and moral development. Learning and self-esteem increases when individuals are in respected and caring relationships with others who see their potential, appreciate their unique talents, and accept them as individuals.
- **Principle 12- Individual differences in learning:** Learners tend to have different strategies, approaches, and capabilities for learning that develops through experience and inheritance. This involves learning coming from different cultures or other social groups and inheritance such as genes. Through learning and social, learners have acquired preferences for how and at what pace they like to learn. Teachers need to mole learners' learning preferences and modify them if necessary, while respecting individual differences.
- **Principle 13- Learning and diversity:** Learning is most effective when different learners from different cultural background comes together to achieve their learning goals. Learners' linguistic, cultural, and social behaviour are factors that influence the effectiveness of learning. Learning, motivation, and effective instruction that apply to all learners, language, ethnic group, race, beliefs, and socioeconomic status all can influence learning. When learners see their differences in background and culture are respected, their motivation level tends to increase and learning is thus supported.
- **Principle 14- Standards and assessment:** Setting appropriate high and challenging standards and assessing the learner and the learning process are important parts of successful learning. Assessment provides important information on how the learners perform in schools and how much they know about the subject matter. Assessments are very important to both the learner and the teacher at all stages of the learning process. Ongoing assessment can provide feedback of progress toward goals. Standardized, performance, and self-assessments when used appropriately can guide instructional planning, support motivation, and provide necessary corrections to guide learning.

Research framework and hypotheses

The McCombs and Vakili's LFCEL has been adopted as the core of the proposed research framework for this research. The research framework can be perceived through Figure 1 with arrows representing causal relationships.

Figure 1: Research framework



The LFCEL proposed by McCombs and Vakili was chosen as the theoretical foundation of this research since it covers a holistic 360 degree view of learning principles from the learners' perspective, whereas other frameworks were more emphasised on what the instructors think and the approaches they used in the instructional process. This research concerns more about the learners, so this framework was chosen because it was the most appropriate framework to show the principles involving the learning process among learners. It is an interesting area to investigate which involves learners' characteristics from the learning perspective. A better understanding of how learners think about their current learning processes would be an advantage for the outcome of this research and to investigate whether the framework is the right model to assess learners' usage of e-learning tools.

As shown in Figure 1, the four psychological factors that may affect the use of e-learning tools among tertiary students:

- **Cognitive and Metacognitive (CM) Factors:** This dimension refers to the cognitive control and monitoring of all sorts of cognitive processes like perception, action, memory, reasoning or emoting. Six principles behind this domain are nature of the learning process, goals of the learning process, the construction of knowledge, strategic thinking, thinking about thinking, and context of learning (McCombs & Vakili, 2005). By understanding what these principles cover, it gave a thorough knowing on how cognitive and metacognitive play a role in engaging learners in using e-learning tools. According to Murphy and Rodriguez-Manzanares (2009, p. 600), this factor relates to how the learner constructs meaning and links new information with existing knowledge, applies a repertoire of learning strategies including higher-order strategies, pursues personally relevant goals, and is influenced by the context of learning.
- **Motivational and Affective (MA) factors:** This dimension comprises motivational and emotional influences on learning, intrinsic motivation to learn, and the effects of motivation and effort (McCombs & Vakili, 2005). It represents how good learning strategies and effort increases the learning process of learners. Murphy and Rodriguez-Manzanares (2009) noted that learner effort and commitment is an indicator of motivation (p.600).
- **Development and Social (DS) factors:** This dimension refers to the factors that involve the level of opportunities and constraints students' perceived through their learning process. The development differs through the stages they go through during their learning process. Learning also involves social interaction and communication with others (McCombs & Vakili, 2005). Murphy & Rodriguez-Manzanares (2009) claimed that learning is most effective when developmental levels, across intellectual, emotional, and physical domains, and social interactions are taken into account creating a positive climate for learning (p. 600).
- **Individual Difference (ID) factors:** This dimension indicates that there are differences in learners' learning process in terms of learning strategies, approaches and capabilities. Instructors should ensure that appropriate set of assessments should be created based on learners' ability and level (McCombs & Vakili, 2005). Murphy & Rodriguez-Manzanares (2009) reported that learning is most effective when learners examine their learning preferences, appraise their strengths and weaknesses, receive assessment at all stages of the learning process, and when they perceive that their linguistic, cultural, and social backgrounds are taken into account (p. 600).

The research framework highlights the importance of CM, MA, DS and ID factors as the critical determinants of students' frequency usage of e-learning tools, and assumes that all the four factors have relationship with the the frequency use of e-learning tools. Therefore, it is hypothesized that:

- H1: There is a significant relationship between CM factors and the frequency use of e-learning tools among tertiary students.
- H2: There is a significant relationship between MA factors and the frequency use of e-learning tools among tertiary students.
- H3: There is a significant relationship between DS factors and the frequency use of e-learning tools among tertiary students.
- H4: There is a significant relationship between ID factors and the frequency use of e-learning tools among tertiary students.

Research methodology

Research samples

The population for this research consists of tertiary students from a Malaysian private University in Klang Valley area. Five schools had taken part in the research. Research samples were randomly selected from each school. Random sampling was chosen because is easy to conduct and save time (Statistical Consultants Ltd, 2012). A total of 200 samples participated in this research. The consent to disseminate the survey questionnaires to the selected samples was granted before the commencement of the survey.

Research instrument

The principle research method employed in this research was self-administrated questionnaire survey approach. The main instrument developed in this research was a survey questionnaire that contained four sections:

- **Section A:** Information about students' e-learning frequency of use, experiences of using the selected learning tools and students' opinions on the purposes of using the e-learning tools and the strengths of those tools,
- **Section B:** Students' current course delivery methods and their preferences of the course delivery methods,
- **Section C:** Students' perceptions toward e-learning tools based on four main factors (i.e. Cognitive and Metacognitive, Motivational and Affective, Developmental and Social, and Individual-Difference factors), and
- **Section D:** Peronal details to solícite demographic data of the students.

However, this paper focuses on Section C in the questionnaire which examines the perceptions of students toward e-learning tools using the four domain factors that built into the research framework which was developed based on the core ideas of the Learner-Centred Framework for E-Learning (LCFEL) framework proposed by McCombs and Vakili. In the third section, 30 items were constructed to measure the factors that influence students' frequency use of e-learning tools and their perceptions toward e-learning. It comprises the following four dimensions:

- Cognitive and Metacognitive factors (items 1 – 6),
- Motivational and Affective factors (items 7 – 15),
- Developmental and Social factors (items 16 – 25), and
- Individual-Difference factors (items 26 – 30).

Each participant was required to complete the questions in Section C indicating his/her agreement or disagreement with each statement that built into those dimensions. Respondents were asked to rate their opinion on each item based on using a 5-point Likert-type scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree).

Prior to the empirical study, a preliminary study was carried out among 15 students to pilot-test the survey questionnaire for its reliability. These respondents were excluded from the empirical study to avoid contamination (van Teijlingen & Hundley, 2002). A reliability test was carried out using Cronbach's alpha, which measures the internal consistency of the survey questionnaire. The questionnaire has demonstrated a high level of internal consistency and reliability among items in which the Cronbach's alpha coefficient of the four dimensions ranging from 0.707 to 0.893 as shown in Table 1.

Table 1: Cronbach Alpha testing results for the four factors

Factors	Items	Cronbach's Alpha (α)
Cognitive and Metacognitive (CM)	6	0.742
Motivation and Social (MA)	9	0.878
Development and Social (DS)	10	0.893
Individual-Difference (ID)	5	0.707
Total	30	0.848

Extant literature (e.g. Coakes & Ong, 2011; Curtis & Drennan, 2013) reported that the Cronbach's alpha values greater than 0.70 are considered acceptable. Since the Cronbach's alpha values for all the four dimensions exceeded the minimum acceptance level of 0.70, thus, the results of Cronbach's analysis show that the questionnaire was well constructed and reliable.

Data collection procedure

After research samples were identified, the questionnaire was administered to them with the assistance of several lecturers during the regular class time. The survey was completed in approximately 20-minute for each participant. Participants were made aware of the objective and voluntary participation of the research. All research participants were assured that their responses would be anonymous to their perception. Of the 200 questionnaires collected, only 191 were usable.

Data analysis

Data analysis involved the coding of data and interpreting the results using SPSS (Statistical Package for Social Science). Both descriptive and inferential analysis techniques were used to analyze the data collected from questionnaire, to empirically test the research framework via formulated hypotheses. Pearson's Correlation Coefficient (r) was used to test the null hypotheses 1, 2, 3 and 4 formulated at the early stage of the research.

Research findings

Testing of Hypothesis 1

The following null hypothesis was tested:

- H₀₁: There is no significant relationship between CM factors and the frequency use of e-learning tools among tertiary students.

The Pearson correlation analysis was used to analyse H₀₁ which was divided into five sub- null hypotheses (i.e. H_{01a} through H_{01e}) for further analysis. These sub- null hypotheses attempted to show that CM factors do not have any significant relationship with the frequency use of Blackboard E-Learn, search engines, YouTube, Facebook and email among tertiary students respectively. The results of these sub- null hypotheses testing are shown in Tables 2 (H_{01a}), 3 (H_{01b}), 4 (H_{01c}), 5 (H_{01d}), and 6 (H_{01e}).

Table 2: Correlation results between CM factors and the frequency use of Blackboard E-Learn

CM factors	CM factors	The frequency use of Blackboard E-Learn
Pearson Correlation	1.00	-0.165*
Sig. (2-tailed)		0.022

	N	191	191
The frequency use of Blackboard E-Learn	Pearson Correlation	-0.165*	1.00
	Sig. (2-tailed)	0.022	
	N	191	191

* Correlation is significant at the 0.05 level (2-tailed)

Table 3: Correlation results between CM factors and the frequency use of Search Engines

		CM factors	The frequency use of Search Engines
CM factors	Pearson Correlation	1.00	0.243**
	Sig. (2-tailed)		0.001
	N	191	191
The frequency use of Search Engines	Pearson Correlation	0.243**	1.00
	Sig. (2-tailed)	0.001	
	N	191	191

** Correlation is significant at the 0.01 level (2-tailed)

Table 4: Correlation results between CM factors and the frequency use of YouTube

		CM factors	The frequency use of YouTube
CM factors	Pearson Correlation	1.00	0.021
	Sig. (2-tailed)		0.768
	N	191	191
The frequency use of YouTube	Pearson Correlation	0.021	1.00
	Sig. (2-tailed)	0.768	
	N	191	191

Table 5: Correlation results between CM factors and the frequency use of Facebook

		CM factors	The frequency use of Facebook
CM factors	Pearson Correlation	1.00	-0.145*
	Sig. (2-tailed)		0.046
	N	191	191
The frequency use of Facebook	Pearson Correlation	-0.145*	1.00
	Sig. (2-tailed)	0.046	
	N	191	191

* Correlation is significant at the 0.05 level (2-tailed)

Table 6: Correlation results between CM factors and the frequency use of Email

		CM factors	The frequency use of Email
CM factors	Pearson Correlation	1.00	-0.107
	Sig. (2-tailed)		0.140
	N	191	191
The frequency use of Email	Pearson Correlation	-0.107	1.00
	Sig. (2-tailed)	0.140	
	N	191	191

Based on the results for CM factors as shown in Tables 2 to 6, the frequency use of Blackboard E-Learn (see Table 2), Search Engines (see Table 3), and Facebook (see Table 5) show a significant relationship with CM factors. For the relationship between CM factors and the frequency use of Search Engines, the p-value was found to be highly significant ($r = 0.243$, $p < 0.01$) (see Table 3). Therefore, there was strong evidence to reject the sub- null hypothesis 1b (H_{01b}). The CM factors were positively correlated with the frequency use of Search Engines ($r = 0.243$). As for the relationship between CM factors and the frequency use of Blackboard E-Learn, the p-value was found to be significant ($r = -0.165$, $p < 0.05$) (see Table 2). Therefore, there was enough evidence to reject the sub- null hypothesis 1a (H_{01a}). The CM factors were negatively correlated with the frequency use of Blackboard E-Learn ($r = -0.165$). Then, for the relationship between CM factors and the frequency use of Facebook, the p-value was also found to be significant ($r = -0.145$, $p < 0.05$) (see Table 5). Therefore, there was enough evidence to reject the sub- null hypothesis 1d (H_{01d}). The CM factors were negatively correlated with the frequency use of Facebook ($r = -0.145$).

As for the other two e-learning tools which are YouTube (see Table 4), and Email (see Table 6), the findings reveal that there were no significant relationships between the CM factors and the frequency use of these e-learning tools. The research findings indicate that these e-learning tools are not as academic-oriented compared to Blackboard E-Learn, search engines and

Facebook which were not much used in teaching-learning process that require cognitive skills, but were more related to communication and sharing information.

Overall, the null hypothesis 1 (H₀₁) was partially rejected which indicates that there were significant relationships between CM factors and the frequency use of some e-learning tools which encompass Blackboard E-Learn, search engines, and Facebook.

Testing of hypothesis 2

The following null hypothesis was tested:

H₀₂: There is no significant relationship between MA factors and the frequency use of e-learning tools among tertiary students.

The Pearson correlation analysis was used to analyse H₀₂ which was divided into five sub- null hypotheses (i.e. H_{02a} through H_{02e}) for further analysis. These sub- null hypotheses attempted to show that MA factors do not have any significant relationship with the frequency use of Blackboard E-Learn, search engines, YouTube, Facebook and email among tertiary students respectively. The results of these sub- null hypotheses testing are shown in Tables 7 (H_{02a}), 8 (H_{02b}), 9 (H_{02c}), 10 (H_{02d}), and 11 (H_{02e}).

Table 7: Correlation results between MA factors and the frequency use of Blackboard E-Learn

		MA factors	The frequency use of Blackboard E-Learn
MA factors	Pearson Correlation	1.00	-0.213**
	Sig. (2-tailed)		0.003
	N	191	191
The frequency use of Blackboard E-Learn	Pearson Correlation	-0.213**	1.00
	Sig. (2-tailed)	0.003	
	N	191	191

** Correlation is significant at the 0.01 level (2-tailed)

Table 8: Correlation results between MA factors and the frequency use of Search Engines

		MA factors	The frequency use of Search Engines
MA factors	Pearson Correlation	1.00	0.132
	Sig. (2-tailed)		0.069
	N	191	191
The frequency use of Search Engines	Pearson Correlation	0.132	1.00
	Sig. (2-tailed)	0.069	
	N	191	191

Table 9: Correlation results between MA factors and the frequency use of YouTube

		MA factors	The frequency use of YouTube
MA factors	Pearson Correlation	1.00	-0.169*
	Sig. (2-tailed)		0.019
	N	191	191
The frequency use of YouTube	Pearson Correlation	-0.169*	1.00
	Sig. (2-tailed)	0.019	
	N	191	191

* Correlation is significant at the 0.05 level (2-tailed)

Table 10: Correlation results between MA factors and the frequency use of Facebook

		MA factors	The frequency use of Facebook
MA factors	Pearson Correlation	1.00	-0.102
	Sig. (2-tailed)		0.160
	N	191	191
The frequency use of Facebook	Pearson Correlation	-0.102	1.00
	Sig. (2-tailed)	0.160	
	N	191	191

Table 11: Correlation results between MA factors and the frequency use of Email

		MA factors	The frequency use of Email
MA factors	Pearson Correlation	1.00	-0.231**

	Sig. (2-tailed)		0.001
	N	191	191
The frequency use of Email	Pearson Correlation	-0.231**	1.00
	Sig. (2-tailed)	0.001	
	N	191	191

** Correlation is significant at the 0.01 level (2-tailed)

Based on the results for MA factors as shown in Tables 7 to 11, the frequency use of Blackboard E-Learn (see Table 7), YouTube (see Table 9), and Email (see Table 11) show significant relationships with MA factors. For the relationship between MA factors and the frequency use of Blackboard E-Learn, the p-value was found to be highly significant ($r = -0.213$, $p < 0.01$) (see Table 7). Therefore, there was strong evidence to reject the sub- null hypothesis 2a (H_{02a}). The MA factors were negatively correlated with the frequency use of Blackboard E-Learn ($r = -0.213$). Then, for the relationship between MA factors and the frequency use of email, the p-value was also found to be highly significant ($r = -0.231$, $p < 0.01$) (see Table 11). Therefore, there was strong evidence to reject the sub- null hypothesis 2e (H_{02e}). The MA factors were negatively correlated with the frequency use of Email ($r = -0.231$). As for the relationship between MA factors and the frequency use of YouTube, the p-value was found to be significant ($r = -0.169$, $p < 0.05$) (see Table 9). Therefore, there was enough evidence to reject the sub- null hypothesis 2c (H_{02c}). The MA factors were negatively correlated with the frequency use of YouTube ($r = -0.169$) too.

As for the other two e-learning tools such as search engines (see Table 8) and Facebook (see Table 10), the findings reveal that there were no significant relationships between the MA factors and the frequency use of these e-learning tools. The results show that the e-learning tools such as search engines and Facebook did not have motivational and affective influences on learning, but had been used for social communication, looking for relevant information and as devices for human interaction.

Overall, the null hypothesis 2 (H_{02}) was partially rejected which affirms that there were significant relationships between MA factors and the frequency use of some e-learning tools which include Blackboard E-Learn, YouTube, and email. The results show negative correlations between MA factors with these three e-learning tools.

Testing of hypothesis 3

The following null hypothesis was tested:

H_{03} : There is no significant relationship between DS factors and the frequency use of e-learning tools among tertiary students.

The Pearson correlation analysis was used to analyse H_{03} which was divided into five sub- null hypotheses (i.e. H_{03a} through H_{03e}) for further analysis. These sub- null hypotheses attempted to show that DS factors do not have any significant relationship with the frequency use of Blackboard E-Learn, search engines, YouTube, Facebook and email among tertiary students respectively. The results of these sub- null hypotheses testing are shown in Tables 12 (H_{03a}), 13 (H_{03b}), 14 (H_{03c}), 15 (H_{03d}), and 16 (H_{03e}).

Table 12: Correlation results between DS factors and the frequency use of Blackboard E-Learn

		DS factors	The frequency use of Blackboard E-Learn
DS factors	Pearson Correlation	1.00	-0.146*
	Sig. (2-tailed)		0.044
	N	191	191
The frequency use of Blackboard E-Learn	Pearson Correlation	-0.146*	1.00
	Sig. (2-tailed)	0.044	
	N	191	191

* Correlation is significant at the 0.05 level (2-tailed)

Table 13: Correlation results between DS factors and the frequency use of Search Engines

		DS factors	The frequency use of Search Engines
DS factors	Pearson Correlation	1.00	0.212**
	Sig. (2-tailed)		0.003
	N	191	191
The frequency use of Search Engines	Pearson Correlation	0.212**	1.00
	Sig. (2-tailed)	0.003	
	N	191	191

* Correlation is significant at the 0.01 level (2-tailed)

Table 14: Correlation results between DS factors and the frequency use of YouTube

		DS factors	The frequency use of YouTube
DS factors	Pearson Correlation	1.00	0.052
	Sig. (2-tailed)		0.478

	N	191	191
The frequency use of YouTube	Pearson Correlation	0.052	1.00
	Sig. (2-tailed)	0.478	
	N	191	191

Table 15: Correlation results between DS factors and the frequency use of Facebook

		DS factors	The frequency use of Facebook
DS factors	Pearson Correlation	1.00	-0.133
	Sig. (2-tailed)		0.067
	N	191	191
The frequency use of Facebook	Pearson Correlation	-0.133	1.00
	Sig. (2-tailed)	0.067	
	N	191	191

Table 16: Correlation results between DS factors and the frequency use of Email

		DS factors	The frequency use of Email
DS factors	Pearson Correlation	1.00	0.078
	Sig. (2-tailed)		0.287
	N	191	191
The frequency use of Email	Pearson Correlation	0.078	1.00
	Sig. (2-tailed)	0.287	
	N	191	191

Based on the results for DS factors as shown in Tables 12 to 16, only the frequency use of Blackboard E-learn and search engines show significant relationships with DS factors. For DS factors and the frequency use of Search engines, the p-value was found to be highly significant ($r = 0.212$, $p < 0.01$) (see Table 13). Therefore, there was strong evidence to reject the sub- null hypothesis 3b (H_{03b}). The DS factors were positively correlated with the frequency use of Search Engines ($r = 0.212$). As for the relationship between DS factors and the frequency use of Blackboard E-Learn, the p-value was found to be significant ($r = -0.146$, $p < 0.05$) (see Table 12). Therefore, there was enough evidence to reject the sub- null hypothesis 3a (H_{03a}). The DS factors were negatively correlated with the frequency use of Blackboard E-Learn ($r = -0.146$).

As for the rest of the e-learning tools namely YouTube (see Table 14), Facebook (see Table 15), and Email (see Table 16), the findings reveal that there were no significant relationships between the DS factors and the frequency use of these e-learning tools. The research findings indicate that the frequency use of YouTube (see Table 14), Facebook (see Table 15), and Email (see Table 16) in the teaching-learning process did not affect the students' social interactions, interpersonal relations, and communication with others. May be the materials presented via these tools did not directly relate to the course requirements.

Overall, the null hypothesis 3 (H_{03}) was partially rejected which indicates that there were significant relationships between DS factors and the frequency use of two e-learning tools which are Blackboard E-Learn and search engines. Research had a positive with relation DS factors which indicates that as the usage of this tool increases, same goes to their development and social activities. When search engines were used frequently, it enables the students to increase their exploration for better knowledge and opportunities with the integration of social interactions. As students explore for ideas, more knowledge will be developed and by communicating with people, learning can be more interesting. However, the higher the usage of Blackboard E-Learn did not have great impact on the social engagement among students. This contradicts with the past studies that indicate that e-learning influences the development and social factors among students. This may due to the Blackboard E-Learn is a supplementary tool used by all students every semester in managing course materials instead of socialising. Moreover, they only use the common functions for their course management, i.e. download course materials, check announcements, check grades and upload assignments. Hence, even though there is a high usage of Blackboard E-Learn among students, it did not indicate high increment of development and social skills.

Testing of hypothesis 4

The following null hypothesis was tested:

H_{04} : There is no significant relationship between ID factors and the frequency use of e-learning tools among tertiary students.

The Pearson correlation analysis was used to analyse H_{04} which was divided into five sub- null hypotheses (i.e. H_{04a} through H_{04e}) for further analysis. These sub- null hypotheses attempted to show that ID factors do not have any significant relationship with the frequency use of Blackboard E-Learn, search engines, YouTube, Facebook and email among tertiary students respectively. The results of these sub- null hypotheses testing are shown in Tables 17 (H_{04a}), 18 (H_{04b}), 19 (H_{04c}), 20 (H_{04d}), and 21 (H_{04e}).

Table 17: Correlation results between ID factors and the frequency use of Blackboard E-Learn

		ID factors	The frequency use of Blackboard E-Learn
ID factors	Pearson Correlation	1.00	-0.086
	Sig. (2-tailed)		0.238
	N	191	191
The frequency use of Blackboard E-Learn	Pearson Correlation	-0.086	1.00
	Sig. (2-tailed)	0.238	
	N	191	191

Table 18: Correlation results between ID factors factors and the frequency use of Search Engines

		ID factors	The frequency use of Search Engines
ID factors factors	Pearson Correlation	1.00	0.225**
	Sig. (2-tailed)		0.002
	N	191	191
The frequency use of Search Engines	Pearson Correlation	0.225**	1.00
	Sig. (2-tailed)	0.002	
	N	191	191

** Correlation is significant at the 0.01 level (2-tailed)

Table 19: Correlation results between ID factors and the frequency use of YouTube

		ID factors	The frequency use of YouTube
ID factors	Pearson Correlation	1.00	-0.009
	Sig. (2-tailed)		0.896
	N	191	191
The frequency use of YouTube	Pearson Correlation	-0.009	1.00
	Sig. (2-tailed)	0.896	
	N	191	191

Table 20: Correlation results between ID factors and the frequency use of Facebook

		ID factors	The frequency use of Facebook
ID factors	Pearson Correlation	1.00	-0.089
	Sig. (2-tailed)		0.219
	N	191	191
The frequency use of Facebook	Pearson Correlation	-0.089	1.00
	Sig. (2-tailed)	0.219	
	N	191	191

Table 21: Correlation results between ID factors and the frequency use of Email

		ID factors	The frequency use of Email
ID factors	Pearson Correlation	1.00	-0.104
	Sig. (2-tailed)		0.154
	N	191	191
The frequency use of Email	Pearson Correlation	-0.104	1.00
	Sig. (2-tailed)	0.154	
	N	191	191

Based on the results for ID factors as shown in Tables 17 to 21, only the frequency use of search engines shows a significant relationship with ID factors. The p-value was found to be highly significant ($r = 0.225$, $p < 0.01$) (see Table 18). Therefore, there was strong evidence to reject the sub- null hypothesis 4b (H_{04b}). The ID factors were positively correlated with the frequency use of Search Engines ($r = 0.225$). As for the rest of the e-learning tools which are Blackboard E-Learn (Table 17), YouTube (see Table 19), Facebook (see Table 20), and Email (see Table 21), the findings reveal that there were no significant relationships between the ID factors and the frequency use of these e-learning tools. The findings prove that the individual difference factors did not influence by the frequency use of e-learning tools.

Overall, the null hypothesis 4 (H_{04}) was partially rejected which indicates that there was only a significant relationship between ID factors and search engines. In order to use search engines, a student must know how to use appropriate keywords to look for information. If he/she failed to do so, it may not obtain the desired results. McCombs and Vikili (2005) emphasized in their research that setting appropriate set of assessments and standard are integral part of learning process. Students tend to use search engines in the study especially in conducting researches for assignments, thesis, journal papers and so forth. The only difference

is their capability in using the search tool. Thus, search engines were proved to have a positive relationship with individual-difference factors.

Findings of the hypotheses testing

This research has tested a series of hypotheses to validate the research objectives formulated at the early stage of the research. The research has corroborate that there was significant relationships between the the four domain psychological factors in the LCFEL (i.e. Cm, Ma, DS, and ID factors) and the frequency use of some e-learning tools. Table 22 summarises the overall findings of the hypotheses testing highlighted in the paper.

Table 22: Summary of null hypotheses testing and the decisions

Null Hypotheses		Decision
H₀₁ : There is no significant relationship between CM factors and the frequency use of e-learning tools among tertiary students.		Partially Rejected H₀₁ H₁ has been partially substantiated: The findings indicate that there were significant relationships between CM factors and the frequency use of some e-learning tools which encompass Blackboard E-Learn, search engines, and Facebook.
H_{01a}	There is no significant relationship between CM factors and the frequency use of Blackboard E-Learn.	Rejected H_{01a} H_{1a} has been substantiated: The findings indicate that there was a significant negative relationship between CM factors and the frequency use of Blackboard E-Learn.
H_{01b}	There is no significant relationship between CM factors and the frequency use of search engines.	Rejected H_{01b} H_{1b} has been substantiated: The findings indicate that there was a significant strong positive relationship between CM factors and the frequency use of search engines.
H_{01c}	There is no significant relationship between CM factors and the frequency use of YouTube.	Failed to reject H_{01c} Failed to support H_{1c}: The findings indicate that there was no significant relationship between CM factors and the frequency use of YouTube.
H_{01d}	There is no significant relationship between CM factors and the frequency use of Facebook.	Rejected H_{01d} H_{1d} has been substantiated: The findings indicate that there was a significant negative relationship between CM factors and the frequency use of Facebook.
H_{01e}	There is no significant relationship between CM factors and the frequency use of email.	Failed to reject H_{01e} Failed to support H_{1e}: The findings indicate that there was no significant relationship between CM factors and the frequency use of email.

Table 22 (Continued)

Null Hypotheses		Decision
H₀₂ : There is no significant relationship between MA factors and the frequency use of e-learning tools among tertiary students.		Partially Rejected H₀₂ H₂ has been partially substantiated: The findings affirm that there were significant relationships between MA factors and the frequency use of some e-learning tools which include Blackboard E-Learn, YouTube, and email.
H_{02a}	There is no significant relationship between MA factors and the frequency use of Blackboard E-Learn.	Rejected H_{02a} H_{2a} has been substantiated: The findings indicate that there was a significant strong negative relationship between MA factors and the frequency use of Blackboard E-Learn.
H_{02b}	There is no significant relationship between MA factors and the frequency use of search engines.	Failed to reject H_{02b} Failed to support H_{2b}: The findings indicate that there was no significant relationship between MA factors and the frequency use of search engines.
H_{02c}	There is no significant relationship between MA factors and the frequency use of YouTube.	Rejected H_{02c} H_{2c} has been substantiated: The findings indicate there was a significant negative relationship between MA factors and the frequency use of YouTube.
H_{02d}	There is no significant relationship	Failed to reject H_{02d}

	between MA factors and the frequency Facebook.	Failed to support H2d: The findings indicate that there was no significant relationship between MA factors and the frequency use of Facebook.
H02e	There is no significant relationship between MA factors and the frequency use of email.	Rejected H02e H2e has been substantiated: The findings indicate that there was a significant negative relationship between MA factors and the frequency use of email.
H03:	There is no significant relationship between DS factors and the frequency use of e-learning tools among tertiary students.	Partially Rejected H03 H3 has been partially substantiated: The findings indicate that there were significant relationships between DS factors and the frequency use of two e-learning tools which are Blackboard E-Learn and search engines.
H03a	There is no significant relationship between DS factors and the frequency use of Blackboard E-Learn.	Rejected H03a H1a has been substantiated: The findings indicate that there was a significant relationship between CM factors and the frequency use of Blackboard E-Learn.
H03b	There is no significant relationship between DS factors and the frequency use of search engines.	Rejected H03b H1b has been substantiated: The findings indicate that there was a significant relationship between CM factors and the frequency use of search engines.
H03c	There is no significant relationship between DS factors and the frequency use of YouTube.	Failed to reject H03c Failed to support H3c: The findings indicate that there was no significant relationship between CM factors and the frequency use of YouTube.
H03d	There is no significant relationship between DS factors and the frequency Facebook.	Failed to reject H03d Failed to support H3d: The findings indicate that there was no significant relationship between CM factors and the frequency use of Facebook.
H03e	There is no significant relationship between DS factors and the frequency use of email.	Failed to reject H03e Failed to support H3e: The findings indicate that there was no significant relationship between CM factors and the frequency use of email.

Table 22 (Continued)

Null Hypotheses		Decision
H04:	There is no significant relationship between ID factors and the frequency use of e-learning tools among tertiary students.	Partially Rejected H04 H4 has been partially substantiated: The findings prove that there was only a significant relationship between ID factors and search engines.
H04a	There is no significant relationship between ID factors and the frequency use of Blackboard E-Learn.	Failed to reject H04a Failed to support H4a: The findings indicate that there was no significant relationship between ID factors and the frequency use of Blackboard E-Learn.
H04b	There is no significant relationship between ID factors and the frequency use of search engines.	Rejected H04b H4b has been substantiated: The findings indicate that there was a significant strong positive relationship between ID factors and the frequency use of search engines.
H04c	There is no significant relationship between ID factors and the frequency use of YouTube.	Failed to reject H04c Failed to support H4c: The findings indicate that there was no significant relationship between ID factors and the frequency use of YouTube.
H04d	There is no significant relationship between ID factors and the frequency Facebook.	Failed to reject H04d Failed to support H4d: The findings indicate that there was no significant relationship between ID factors and the frequency use of Facebook.
H04e	There is no significant relationship between ID factors and the frequency use of email.	Failed to reject H04e Failed to support H4e:

	The findings indicate that there was no significant relationship between ID factors and the frequency use of email.
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Conclusions

The research highlights the theoretical explanation on the adoption of McCombs and Vakili's LCFEL to predict the relationship between the four factors in LCFEL and the frequency use e-learning tools; the research also adopts the four domain factors in the LCFEL to formulate the research framework and hypotheses. The inferential statistical analysis such as Pearson's Correlation Coefficient (r) was employed to empirically test the research framework via hypotheses testing. As what can be seen in the previous section, McCombs and vakili's learner-centred framework plays a vital role in determine the perception of tertiary students towards the selected e-learning tools. The findings have proved that there were significant relationship between the four psychological factors and the frequency use of selected e-learning tools among tertiary students. According to McCombs and Vakili (2005), e-learning technologies can provide a capacity to bring people together to expand and transform information into knowledge from a learner-centred perspective. However, human factor should also be taken into consideration in giving support and guidance to the learners. There should be a blended learning education system where technology does not control learners but to supplement the learning practices to the learners.

Moreover, McCombs and Vakili's learner-centred psychological principles, which comprises of four domain factors used in this research has influenced the students when using the e-learning tools. The e-learning tools could change the way the students think and change the way of solving complex problems through guidance and support, regardless of the level of study, cause of study, gender, age, and cultural background of a student. The demographic background of students could be correlated to the third domain factors in the LCFEL which demonstrate the relationship between development and social factors and some of the selected e-learning tools. This research has also proved that there were significant relationships between the four domain factors in the LCFEL and the frequency use of some of the e-learning tools in the context of tertiary education. The findings also tend to suggest that students are, on the whole willing to accept e-learning tools for their learning process and were influenced by psychological factors. While most of the students use e-learning tools for studying purpose, they also use them heavily for social networking and communication purposes.

However, this research has a limitation in term of generalizability to the whole Malaysia because the data were only collected from a single private higher institution among undergraduate students, and limited to several e-learning tools. Students from different universities may behave differently thus may have different research outcomes. Future research may be conducted to investigate the relationship between the four psychological factors and the frequency use of selected e-learning tools among tertiary students from other universities in Malaysia, which include both public and private institutions, as well as postgraduate students and include more e-learning tools.

The research made important contributions to emerging body of knowledge on the understanding of psychological principles pertaining to the learners' learning process. In conclusion, Higher Educational Institutions should develop strategic plans and provide guidelines considering students' acceptance of e-learning tools in order to include all critical success factors for the sustainable deployment of e-learning. The results of this research could provide insight into what factors need to be considered for designing an e-learning system and the guideline to enhance existing e-learning tools or future IT implementation.

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