CRITICAL FACTORS INFLUENCING THE SUCCESS OF MASSIVE OPEN ONLINE COURSES IN MALAYSIAN PUBLIC UNIVERSITIES

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ABSTRACT

The purposes of this study are to investigate the critical factors influencing successful implementation of MOOCs in Malaysia higher education and to propose a model to assess MOOCs success which includes seven factors: system quality, information quality, service quality, student attitude, course quality, self-regulated learning, and satisfaction. The framework of this study was based on DeLone and McLean model that enlisted three factors i.e. learner attitude, course quality and self-regulated learning to reflect the quality of teaching and learning process. A correlation design method was conducted at five public universities who received highest MOOCs enrollment in the Malaysia MOOCs. A 56-item 5-point Likert-scale instrument was then administered to 622 undergraduate students. Data were analyzed using the Partial Least Squares-Structured Equation Modeling (PLS-SEM) approach. Findings revealed that there were significant relationships between three factors (system quality, attitude, and course quality) and students' satisfaction, and a positive correlation between the factors (i.e. service quality, attitude and course quality) and students' self-regulated learning (SRL). Findings also indicated that satisfaction have significant mediating effect on the relationship between system quality and SRL, and between attitude and SRL. Additionally, the results confirmed that the proposed model is valid and reliable to measure the success of MOOCs systems. The study contributed to the body of knowledge by providing a valid and reliable model to measure the success of MOOCs systems which will be useful for MOOCs researchers, practitioners, and educational institutions in developing successful MOOCs systems.

FAKTOR KRITIKAL YANG MEMPENGARUHI KEBERHASILAN SISTEM *MASSIVE OPEN ONLINE COURSES* DI UNIVERSITI AWAM MALAYSIA

ABSTRAK

Kajian ini bertujuan untuk menyelidik tentang faktor-faktor kritikal yang mempengaruhi keberhasilan pelaksanaan MOOCs di institusi pengajian tinggi Malaysia dan mencadangkan sebuah model untuk menilai keberhasilan MOOCs yang mengandungi tujuh faktor: kualiti sistem, kualiti maklumat, kualiti perkhidmatan, sikap pelajar, kualiti kursus, pembelajaran kendiri, dan kepuasan. Rangka kajian ini adalah berdasarkan model DeLone dan McLean yang menyenaraikan tiga faktor iaitu sikap pelajar, kualiti kursus dan pembelajaran kendiri, untuk mencerminkan kualiti proses pengajaran dan pembelajaran. Kaedah korelasi telah diaplikasikan untuk kajian ini. Pengumpulan data telah dijalankan di lima universiti awam yang menerima pendaftaran tertinggi dalam Malaysia MOOCs. Satu instrumen berskala Likert lima mata dengan 56 item telah diberikan kepada 622 pelajar ijazah sarjana muda. Data yang diperoleh telah dianalisis menggunakan pendekatan Kuasa Dua Terkecil Separa-Pemodelan Persamaan Berstruktur (PLS-SEM). Dapatan kajian menunjukkan bahawa terdapat perhubungan yang signifikan antara ketiga-tiga faktor (kualiti sistem, sikap, dan kualiti kursus) dan tahap kepuasan pelajar. Dapatan kajian juga mendapati terdapat korelasi positif antara faktor-faktor (kualiti perkhidmatan, sikap, dan kualiti kursus) dan pembelajaran kendiri pelajar (SRL). Dapatan kajian juga menunjukkan bahawa kepuasan mempunyai kesan pengantaraan yang ketara ke atas perhubungan antara kualiti sistem dan SRL, dan antara sikap dan SRL.

Seterusnya, keputusan kajian telah mengesahkan bahawa model yang dicadangkan adalah sahih dan boleh dipercayai untuk mengukur keberhasilan sistem MOOCs. Kajian ini telah menyumbang kepada pengetahuan dengan cara menghasilkan sebuah model yang sahih dan yang boleh dipercayai untuk mengukur keberhasilan sistem MOOCs yang akan memberi manfaat kepada para pengkaji dan pengamal MOOCs serta institusi pendidikan dalam membentuk sistem MOOCs yang berjaya.

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LIST OF SYMBOLS AND ABBREVIATIONS

MOOCs	:	Massive Open Online Courses
D & M	:	DeLone and McLean
SQ	:	System Quality
IQ	:	Information Quality
SRQ	:	Service Quality
AT	:	Attitude
CQ	:	Course Quality
SAT	:	Satisfaction
SRL	:	Self-regulated learning
HE	:	Higher Education
IS	:	Information system

CHAPTER 1

INTRODUCTION

Introduction

Introduction of e-learning systems is one of the vital revolutions in the educational development as the integration of technology into learning environments results in better, effective and attractive learning experiences (Zhao, 2016). E-learning provides educational opportunities to learn at anytime and anywhere, allowing learners from different countries to collaborate and communicate in the same class regardless of time zone or geography area (Yusop & Correia, 2018).

However, many studies indicated that online education should not be considered as purely successful. Babson Survey Research Group's 2011 report revealed that more than 2/3 of e-learning instructors indicated that students do not learn in online courses as much as they learn in the traditional classroom (Allen & Seaman, 2011). One of the reasons is because the content in traditional online courses is presented in a delivery format rather than a true self-instructional device that enables students to engage in learning at their own pace (Cole & Timmerman, 2015).

Within this ambiguous nature of e-learning, Massive Open Online Course (MOOCs) has arisen as a modern generation's mode of automated instruction. Cole and Timmerman (2015) argued that the content in MOOCs is represented to students using a preprogrammed automated system. This format allows students to learn and engage in course material as well as receiving feedback at their own pace (Cole & Timmerman, 2015), hence provide better learning experiences.

To date, MOOCs appears as a new unique open learning style. MOOCs is an online learning platform where the participants can communicate, collaborate, and exchange information to improve their knowledge (de Waard et al., 2014). Millions of students were involved in the first-generation courses of MOOCs though they do not know much about this new online learning style. The students were signing up and enrolling in MOOCs courses which offer certificates from top universities around the world such as Stanford and Harvard at no cost (Yuan & Powell, 2013a).

The number of students who enroll in one or more online courses has increased in rates exceeding the growth of overall higher education (HE) enrollments (Allen & Seaman, 2013). Consequently, higher education administrators started to adapt this new educational model in their institutions. MOOCs proved to have a significant effect in higher education institutions by creating both intentional and unintentional changes and by transforming the values and beliefs of the higher education industry (Mitchell, 2009).

Background to the Study

E-Learning systems are a developing concept, derived in the concept of computer-assisted instruction (CAI) that first introduced in 1955 to reflect teaching problem-solving (Zinn, 2000). Table 1 .1 shows different e-learning concepts.

Table 1.1

E-learning Concepts

E-learning type	Focus
Computer- Assisted Instruction (CAI)	CAI Focus on programming teaching employed in several fields such as psychology, engineering, physics, and business (Anderson, 2008)
Learning Management Systems (LMS)	LMS focuses on contents and the interaction between students and teachers. It also highlights learner's improvement and evaluating their results (Lee & Lee, 2008).
Electronic Learning (e-learning)	E-Learning focuses on learning via electronic sources and providing communicating through distance learning (Piccoli, Ahmad, & Ives, 2001).
Mobile Learning (m-Learning)	m- Learning is the focus on using of several learning sources to provide flexible learning class environment (Rushby, 1998).
Blended Learning (B-Learning)	B-learning is aiming to complement distance learning with face-to face classes by focusing on mixing different learning environments (face to face and distance) (Singh, 2003).
Massive Open Online Course (MOOC)	Distribution of content courses to a worldwide learner through the Internet. Participation through social networking, facilitation via experts and collection of freely accessible online resources (Peter & Deimann, 2013).

Source: Aparicio, M., & Bacao, F. (2013, July). E-learning concept trends. In *Proceedings of the 2013 International Conference on Information Systems and Design of Communication* (pp. 81-86). ACM.

The e-learning concepts have been changing over time. In general, all the e-learning concepts used to conceptualize the use of computer systems to empower or enable the learning process. E-learning, LMS, and MOOCs are the most terms used in online literature that have two features in common: learning and computers (Aparicio & Bacao, 2013).

Massive Open Online Course (MOOCs) is a new online learning style which has a real ability to offer online courses to enormous participants around the world for free. MOOCs are different from other types of online learning applied in institutions. The core difference between MOOCs and previous online learning models is the structure, design, and the scalability that allows a huge number of learners to engage in their learning (Carr, 2012).

Additionally, the traditional courses offer expensive education to a small group of select individuals who have passed the admission criteria; in contrast, MOOCs offers cheap education to a much larger audience. Traditional courses can provide education for up to around 250 students and often far fewer, whereas a MOOCs can extend to over 1 million learners. As such there are no entrance qualifications and anyone can participate as long as the Internet connection is available.

The original idea for establishing MOOCs is the ability to reach massive population around the world especially those who do not have the opportunity of obtaining a good education (Bombardieri, 2013). The vision of MOOCs is providing open online courses to thousands of low-income learners and reduces the cost of higher education (Cusumano, 2013). Learners can participate in MOOCs without worries about physical location, official prerequisites, or any financial issues. MOOCs has the view in changing the third world by offering free and accessible education to anyone, particularly young people from these countries (Bombardieri, 2013).

MOOCs provide one-to-one tutoring that makes education more efficient by supporting active learning by using video, audio, and others communication tools. MOOCs is time-controlled, well structured, designed like a short course with self-directed study method. MOOCs is delivered in modules (short videos) that included various topics rather than presenting an hour-long lecture (Voss, 2013).

Why this study specially focuses on MOOCs?

The definition of MOOCs is derived from several concepts, such as openness, online learning, massive communication, and sharing knowledge. MOOC concept focuses on sharing and discussion ideas with peers in an open environment through social networks and digital communication artifacts (de Waard et al., 2014). Through

MOOCs, learners are empowered and able to learn about a numerous of topics and areas, allowing for the development of skills and education in a truly independent way.

MOOCs are providing effective learning with very low-cost to massive learners and improving the reputation of the institutions (Farmer, 2013). The main features of MOOCs are (1) open access where the participation in online courses is free for anyone and (2) scalability where the designing of the MOOCs courses is suitable for the massive number of participants (Yuan, Powell, & CETIS, 2013). MOOCs provide opportunities to open up learning for a gigantic number of learners all over the world and has the ability to provide a wide choice in different disciplines and fields without any admission requests (Liyanagunawardena, Adams, & Williams, 2013). MOOCs contribute to improve educational institutions by allowing learners to share knowledge and experiences through cooperative learning (Mazoue, 2014). Additionally, MOOCs provide numerous feature (e.g. collaboration, interaction, self-reflection, and evaluation) that have the ability to support the learning experience (de Waard et al., 2014).

To realize the full potential of MOOCs as new learning opportunities, number of challenges regarding successful implementation of MOOCs need to be addressing, and low completion rates in MOOCs courses is one of these challenges (Parr, 2013). For example, in 2012 the Massachusetts Institute of Technology (MIT) provided its first MOOCs and 155,000 learners around the world participated in it. Yet, 95 % of the participants dropout rate the course and only 7,000 of them accomplished the course successfully (Daniel & Uvalic-Trumbic, 2013).

Literature highlighted that the high rate of dropout in online learning associated to self -regulated learning (SRL) factor (e.g., Auvinen, 2015; Azevedo, Cromley, Winters, Moos, & Greene, 2005) and other factors that related to the quality of the courses, services, and education as well as learner behavior (Alsabawy, Cater-Steel, & Soar, 2012). Rai and Chunrao (2016); Albelbisi, Yusop, and Salleh (2018). highlighted that learner behavior and quality of MOOCs course are the main factors should be included to ensure success implementation of MOOCs. These issues of MOOCs are related and interlinked. Together, these factors become the main factors that influence its success.

The literature has emphasized the importance of evaluating the factors that influencing the success of online learning as it will provide critical information for stakeholders and scholars in planning its implementation (Alsabawy, Cater-Steel, & Soar, 2011). Unfortunately, there is a deficiency of such studies especially those related to MOOCs. Two possible reasons are related to the lacking of studies about MOOCs success. First, the literature indicated disagreement regarding the factors that have the substantial influence on measuring the success of the systems (Al-adaileh, 2009; Al-Mamary, Shamsuddin, & Aziati, 2014). The issue of evaluating the success of e-learning such as MOOCs has become more difficult due to the contradictory perspectives of stakeholders in e-learning and information systems (Ozkan & Koseler, 2009; Sedera, Tan, & Dey, 2007). Second, online learning success is often measured based on a particular factor such as learning satisfaction, rather than examining several interlinked factors that may impact on successful implementation of e-learning (Ehlers & Hilera, 2012).

In sum, identifying the key factors promoting the success of online learning environment, in the case of the current study, MOOCs are critical to increase the success of MOOCs implementation and reduce its failure (Taha, 2014).

Statement of the Problem

Growing students' dissatisfaction with the high cost of higher education has created an opportunity to make critical changes in the educational ecosystem. Massive Open Online Courses (MOOCs), with their free tuitions' fees and open educational philosophy, threatens to disrupt higher education by introducing a low-cost alternative for proving knowledge to a huge number of learners around the world (Claffey, 2015). In relation to that situation, MOOCs contribute to improve the higher education quality and reduce its cost (Pence, 2012).

Rivard (2013) highlighted that a massive number of participants around the world are enrolled in MOOCs courses to get free learning without paying any credit. Moreover, MOOCs do not require compulsory prerequisite courses, unlike some traditional colleges or universities. Despite this, the learners who successfully complete a MOOCs course and obtain a certificate are few. Many studies indicated that the completion rate of MOOCs courses is on the average of 7% (Parr, 2013). A particular fact suggests that the completion rates in MOOCs courses are below 10% (Alraimi, Zo, & Ciganek, 2015; Hew & Cheung, 2014; Kizilcec, Piech, & Schneider, 2013).

Jordan (2013) defined the completion rate as people who passed the course or got a certificate. According to this viewpoint, Belanger and Hornton (2013) stated that approximately 12,000 students enrolled of a Bioelectricity MOOCs by Duke University; within the first week, about the quarter of these students attempted

MOOCs quizzes. However, only 700 of the totals received excellent grades, in conclusion, the dropout rate was very high, around 94 %. Another example is a study by Meyer (2012) who stated that the dropout rates of the MOOCs for Stanford and MIT's MOOCs courses in edX were between (80 - 95) percent. For example, from 50,000 students who took *Software Engineering* course through Coursera and edX, only 3,500 actually completed the course with completion rate of 7%. Similar report of the high dropout rate is in *social network analysis* course presented from Coursera. In this course, the learners who received a basic certificate are only 2% and a few of them, around 0.17% earned the advanced level programming with distinction certificate.

The discrepancy between enrolment and completion rates in MOOCs suggest that learning via MOOCs present unique challenges, thus, MOOCs learners may require some form of additional support to become successful.

In regarding of this high dropout rate in MOOCs, it is necessary to figure out why many students do not complete MOOCs courses and to study the suggestions for system success consequently, introducing the factors that impact the successful implementation of MOOCs systems. Understanding the factors that encourage the learners to adopt MOOCs is a critical issue in MOOCs environment (Mendoza, Jung, & Kobayashi, 2017). Further research regarding the vital factors that influencing of MOOCs success would help to reduce the obstacles and the difficulties that may hinder MOOCs from attaining their objectives. Accordingly, measuring MOOCs success is considered one of the vital issues in higher educational institutions sector.

A deep understanding of the success factors that contribute in enhancing implementation MOOCs help in improvement of progress, utilization, and implementation of these systems. However, literature has revealed that rare of the study investigated the critical success factors influencing MOOCs except for a study by Gamage, Fernando, and Perera (2015). So far there is an absence of studies that measure the success of MOOCs from a systemic point of view that are inclusive of all dimensions.

MOOCs studies have explored the factors that impact learners' completion rate in MOOCs both in terms of learner characteristics and MOOCs characteristics (Hone & El Said, 2016). Khalil and Ebner (2014), for instance, indicated that lack of learner motivation and lack of interactivity are the main factors affect learners' completion in MOOCs. The authors also highlighted that the inadequate learners' background knowledge and skills are another key factor of low completion rate in MOOCs.

Other studies revealed that the low completion rates in MOOCs courses of below 10% (Alraimi et al., 2015; Hew & Cheung, 2014) can be related to students' problems in regulating their learning independently (e.g. Auvinen, 2015; Azevedo et al., 2005). A meta-analysis conducted by Broadbent and Poon (2015) highlighted the significant positive relationship between SRL strategies and online academic success. One of the main reasons of this low completion rate in e-learning environment might be related to the lack of engagement and motivation within the course and absence of SRL skills (Barnard, Lan, To, Paton, & Lai, 2009).

Due to scant research on MOOCs, we expanded our review to include factors that impact e-learning success from studies with empirical evidence that examined these factors (e.g. Zhao, 2016). Careful consideration of the factors influencing the success of e-learning is significant to understand the factors that affect the dropout rates in e-learning (Alsabawy et al., 2012) thus, improving the effectiveness and reducing systems failure (Al-Harbi, 2011; Zhao, 2016).

According to Bayne and Ross (2014), evaluating MOOCs learning needs new measures of system quality and novel method for assessing the success of the system that reflect the variety and the intentions of MOOCs participants. This study utilizes the DeLone & McLean Information system (2003) model, (D & M) model, to evaluate the success of MOOCs. Researchers have shown strong attention to the D& M (2003) model (Lee & Lee, 2008; Ramayah & Lee, 2012). Although MOOCs is not technically considered information systems, expanding the scope and adopt other models in evaluating e-learning systems- such as MOOCs- using the D & M (2003) model may be appropriate to evaluate these systems. Alsabawy et al. (2011) emphasized the important role of D & M (2003) model in gauging e-learning system success. This study adopted the D & M (2003) model to examine the critical factors that influencing MOOCs and to understand the success and effectiveness of MOOCs by developing an appropriate conceptual framework (Al-Harbi, 2011).

According to the discussion above, developing a model that can be integrated the factors that measure the success of MOOCs is required. However, only small number of empirical researches have been established conceptual frameworks for examining the e-learning system success in general (Alsabawy et al., 2011; Sun, Tasi, Finger, & Chen, 2008) and particularly in MOOCs field (Gamage et al., 2015). Consequently, it is important to create an operational model that includes major components that impact MOOCs success. This framework helps to shed a light on the critical factors that have the most influence on the implementation of MOOCs and contributes in achieving effective inclusive solutions to the challenges facing successful implementation of MOOCs in higher education.

Researches also indicated that the majority of participants in using MOOCs are from North America or Europe while few of them are being from developing world regions such as Asia and Africa (Liyanagunawardena et al., 2013).

Literature revealed that Malaysia needs to identify several key factors affecting MOOCs to provide a clear and realistic clarification of MOOCs, e.g. who are joining for MOOCs, what are their motivations to participate in MOOCs, and what elements affecting the completion and dropout from MOOCs (Bhandari, 2014; Fadzil, Latif, & Azzman, 2015; Tan, 2014). This study attempts to fill this gap in MOOCs literature by identifying the factors that have the most influence on the success of MOOCs in higher education in Malaysia context. This study expects to add to the present MOOCs literature by evaluating the factors that improve students' satisfaction and their self-regulated learning in MOOCs in some universities in Malaysia.

In sum, literature exposed the successful implementation of e-learning systems in many educational institutions; however, some of these systems such as MOOCs still facing slow implementation and many initiatives still unsustainable (Frimpon, 2012). Furthermore, due to the significance role of some factors such as (self-regulated learning, satisfaction, system quality, service quality, student attitude, course quality, and information quality) on MOOCs and due to the rare results found in the literature related to the relationship between these factors, it is important to investigate how these factors support successful implementation of MOOCs to fill this research gap in the literature.

Moreover, it was found that few of frameworks designed for examining MOOCs success; hence, this is considered the second research gap to be highlighted.

Purpose of the Study

The aim of this study is to evaluate the critical factors influencing the successful implementation of MOOCs and develop the most appropriate framework for MOOCs in higher education in Malaysia.

The Rationale of the Study

While many studies argue the benefits of MOOCs at the moment, there is an ambiguity regarding how MOOCs can implement effectively and successfully. Furthermore, only a few empirical studies have been focused on a systematic examination and exploration of the main elements that affect the success of MOOCs. These include the quality of course, service and education as well as the students learning behaviors.

Therefore, the key goal of this study is elucidating the success factors that promoting the implementation of MOOCs in higher education. Special emphasis is on the relationships between the investigated factors that contribute towards MOOCs success including students' satisfaction and self-regulated learning.

Research Objectives

The objectives of this research are:

1. To determine the factors that influence the success of MOOCs.

2. To determine the significant influence of the 5 success factors (i.e. system quality, information quality, service quality, student attitude, course quality) on learners' satisfaction.

This objective has been achieved according to the following sub-objectives:

a) To determine the significant influence of MOOCs' system quality on learners' satisfaction.
b) To determine the significant influence of MOOCs' information quality on learners' satisfaction.
c) To determine the significant influence of MOOCs' service quality on learners' satisfaction.
d) To determine the significant influence of students' attitudes on learners' satisfaction.
e) To determine the significant influence of MOOCs' course quality on learners' satisfaction.

3. To determine the significant influence of learners' satisfaction on learners' self-regulated learning.

4. To determine the significant influence of the 5 success factors (i.e. system quality, information quality, service quality, student attitude, course quality) on learners' self-regulated learning.

This objective has been achieved according to the following sub-objectives:

a) To determine the significant influence of MOOCs' system on learners' self-regulated learning.
b) To determine the significant influence of MOOCs' information quality on learners' self-regulated learning.
c) To determine the significant influence of MOOCs' service quality on learners' self-regulated learning.

d) To determine the significant influence of students' attitudes on learners' self-regulated learning.

e) To determine the significant influence of MOOCs' course quality on learners' self-regulated learning.

5. To determine the significant influence of learners' satisfaction in mediating the relationship between the five success factors (i.e. system quality, information quality, service quality, student attitude, course quality) and self-regulated learning.

This objective has been achieved according to the following sub-objectives:

a) To determine the significant influence of learners' satisfaction in mediating the relationship between system quality and self-regulated learning.

b) To determine the significant influence of learners' satisfaction in mediating the relationship between information quality and self-regulated learning.

c) To determine the significant influence of learners' satisfaction in mediating the relationship between service quality and self-regulated learning.

d) To determine the significant influence of learners' satisfaction in mediating the relationship between student's attitude and self-regulated learning.

e) To determine the significant influence of learners' satisfaction in mediating the relationship between course quality and self-regulated learning.

6. To establish the validity and reliability of the MOOCs success model.

This objective seeks to examine the validity and reliability of the model by testing the whole model, the factors of the model as well as the items used in measuring each factor, as a result, confirming that the study model is suitable to measure MOOCs success.

Research Questions

This study is guided by the following research questions:

1. *What are the factors that influence the success of MOOCs?*
2. *To what extent the 5 success factors (i.e. system quality, information quality, service quality, student attitude, course quality) significantly influence learners' satisfaction?*

This question has been achieved according to the following sub-questions:

a) To what extent MOOCs' system quality significantly influence learners' satisfaction?

b) To what extent MOOCs' information quality significantly influence learners' satisfaction?

c) To what extent MOOCs' service quality significantly influence learners' satisfaction?

d) To what extent students' attitudes significantly influence learners' satisfaction?

e) To what extent MOOCs' course quality significantly influence learners' satisfaction?

3. To what extent learners' satisfaction significantly influence learners' self-regulated learning?

4. To what extent the 5 success factors (i.e. system quality, information quality, service quality, student attitude, course quality) significantly influence learners' self-regulated learning?

This question has been achieved according to the following sub-questions:

a) To what extent MOOCs' system quality significantly influence learners' self-regulated learning?

b) To what extent MOOCs' information quality significantly influence learners' self-regulated learning?

c) To what extent MOOCs' service quality significantly influence learners' self-regulated learning?

d) To what extent students' attitudes significantly influence learners' self-regulated learning?

e) To what extent MOOCs' course quality significantly influence learners' self-regulated learning?

5. To what extent the influence of learners' satisfaction mediates the relationship between the five success factors (i.e. system quality, information quality, service quality, student attitude, course quality) and self-regulated learning?

This question has been achieved according to the following sub-questions:

a) To what extent the influence of learners' satisfaction mediates the relationship between system quality and self-regulated learning?

b) To what extent the influence of learners' satisfaction mediates the relationship between information quality and self-regulated learning?

c) To what extent the influence of learners' satisfaction mediates the relationship between service quality and self-regulated learning?

d) To what extent the influence of learners' satisfaction mediates the relationship between student's attitude and self-regulated learning?

e) To what extent the influence of learners' satisfaction mediates the relationship between course quality and self-regulated learning?

3. *Is the proposed model in the present study valid and reliable to measure MOOCs success?*

Research Hypotheses

The proposed model examined the following hypotheses:

$H_0$1: MOOCs' system quality has no significant influence on learners' satisfaction.

H1: MOOCs' system quality has a significant influence on learners' satisfaction.

$H_0$2: MOOCs' information quality has no significant influence on learners' satisfaction.

H2: MOOCs' information quality has a significant influence on learners' satisfaction.

$H_0$3: MOOCs' service quality has no significant influence on learners' satisfaction.

H3: MOOCs' service quality has a significant influence on learners' satisfaction.

$H_0$4: Student attitude has no significant influence on learners' satisfaction.

H4: Student attitude has a significant influence on learners' satisfaction.

$H_0$5: MOOCs' course quality has no significant influence on learners' satisfaction.

H5: MOOCs' course quality has a significant influence on learners' satisfaction.

$H_0$6: Learners' satisfaction has no significant influence on learners' self-regulated learning.

H6: Learners' satisfaction has a significant influence on learners' self-regulated learning.

$H_0$7: MOOCs' system quality has no significant influence on learners' self-regulated learning.

H7: MOOCs' system quality has a significant influence on learners' self-regulated learning.

$H_0$8: MOOCs' information quality has no significant influence on learners' self-regulated learning.

H8: MOOCs' information quality has a significant influence on learners' self-regulated learning.

$H_0$9: MOOCs' service quality has no significant influence on learners' self-regulated learning.

H9: MOOCs' service quality has a significant influence on learners' self-regulated learning.

$H_0$10: Student attitude has no significant influence on learners' self-regulated learning.

H10: Student attitude has a significant influence on learners' self-regulated learning.

$H_0$11: MOOCs' course quality has no significant influence on learners' self-regulated learning.

H11: MOOCs' course quality has a significant influence on learners' self-regulated learning.

H12: Learners' satisfaction has a significant influence on mediating the relationship between system quality and self-regulated learning. User satisfaction is assumed to enhance the relationship between system quality and self-regulated learning.

H13: Learners' satisfaction has a significant influence on mediating the relationship between information quality and self-regulated learning. User satisfaction is assumed to enhance the relationship between information quality and self-regulated learning.

H14: Learners' satisfaction has a significant influence on mediating the relationship between service quality and self-regulated learning. User satisfaction is assumed to enhance the relationship between service quality and self-regulated learning.

H15: Learners' satisfaction has a significant influence on mediating the relationship between student attitude and self-regulated learning. User satisfaction is assumed to enhance the relationship between student's attitude and self-regulated learning.

H16: Learners' satisfaction has a significant influence on mediating the relationship between course quality and self-regulated learning. User satisfaction is assumed to enhance the relationship between course quality and self-regulated learning.

The Significance of the Study

The operational model established in this study contribute towards better understanding of the factors affecting MOOCs success at institutional and individual course levels because it is designed based on two perspectives:

1. Technical perspective: to measure the technical performance of MOOCs, some factors (i.e., system quality, service quality) from this view have been selected from the literature to be included in the study model. These factors help to identify the effectiveness and quality of MOOCs.
2. Educational perspective: to measure the learners' behavior in using MOOCs, some factors (i.e., attitude, self-regulated learning) from this view have been involved in the proposed model. These factors deal with the learners and their satisfaction and attitude toward using MOOCs.

The conceptual framework developed in the present study aims to examine the factors influencing MOOCs success in higher education. This framework expects to enrich the field of MOOCs research and contribute to better understanding the particular issues surrounding the successful implementation of MOOCs systems, especially in a Malaysia context.

The proposed framework of this study could be beneficial for the government to use it as a frame of reference to define and examine implement MOOCs systems successfully; it also might be helpful to decision-maker to use it as a framework for higher education settings to improve their attempts to successfully implement MOOCs systems in their institutions. Further, identifying the factors that strongly associated with measuring the success of MOOCs systems and the factors that are not associated to system success could help the practitioners in developing and implementing successful MOOCs following these indicators.

Perhaps the information gathered from this study may even be of value to the programmers who design MOOCs systems so they can better improve their tools according to the students' satisfaction in order to facilitate stronger learning environments.

By carefully examining the relationship between the factors that influencing MOOCs success especially self-regulated learning and satisfaction, educators can hopefully create a more positive experience for students that will motivate them to continue participation and foster lifelong learning.

This research contributes to address the success factors that prompting the implementation of MOOCs at the most active universities in using MOOCs in Malaysia. The study also enriches MOOCs literature by providing evidence related to MOOCs success where only a few theoretical research and empirical studies examined this area.

Research Model

After reviewing a literature relating to MOOCs and e-learning systems success, the proposed framework of MOOCs success has been developed to answer the research questions.

The existing studies related to e-learning systems success suggested that the success dimensions of these systems are often similar to one or more of the success factors recognized by the D & M (2003) model. Other studies indicated the critical role of other factors that reflect the quality of teaching and learning (e.g. course quality and self-regulated learning) on the success of online learning systems.

In this study, D & M (2003) model has been adapted as a source for creating the theoretical research model for measuring MOOCs success. Numerous studies have investigated the reliability and validity of D & M (2003) model in the e-learning systems success settings, for instance, Ramayah and Lee (2012); Alsabawy et al. (2011); Lee and Lee (2008).

DeLone and McLean's model (2003) includes three independent factors: (system quality, service quality, and information quality), yet, these factors have not reflected all of the significant features of e-learning success (Samarasinghe, 2012). Thus, the proposed model combined the D & M model (2003) with other factors related to the quality of teaching and learning (i.e., learner attitude, course quality, and self-regulated learning) to examine the quality of the MOOCs and to understand the critical factors that affect implementation of MOOCs successfully in higher education.

The MOOCs success framework is presented in Figure (3.4) comprises several factors which are (‘system quality’, ‘information quality’, ‘service quality’, ‘student attitude’, ‘course quality’, ‘user satisfaction’, and ‘self-regulated learning’), all these factors are reflecting different facets of MOOCs success in higher education.

Delimitations of the Study

There are some delimitations that have significant effected on the generalization and the representative of the findings in this study which are:

1. The proposed framework was established according to the researcher experience in MOOCs, the prior MOOCs literature, and other relevant contexts with analogous characteristics (i.e., e-learning). Thus, examining and justifying the proposed model in the appropriate educational context and other training settings is required get more expectation about the suitability of using the model in other educational and training field.
2. Delimitation related to the factors examined in this study. The proposed model was developed based on seven critical factors (‘system quality’, ‘information quality’, ‘service quality’, ‘student attitude’, ‘course quality’, ‘user satisfaction’, and ‘self-regulated learning’) that influencing MOOCs success. Hence, it would be beneficial to involve more critical factors such as instructor and social factors in order to perform extra investigations regarding to MOOCs success.
3. Delimitation related to the scope of this study which is narrowed to top five active public universities in using MOOCs in Malaysia. The population and some cultural aspects in the geographical areas of these universities may differ from the other areas in the country. Hence, the finding may not be

generalized to all Malaysian students in all HE institutions in the country. More studies need to be conducted to confirm that the results obtained from the current study generalize to MOOCs learners in other universities and learning contexts.

4. Delimitation to the specific MOOCs platform used in the present study: all the data used in this study were collected from a particular MOOCs platform called "Open Learning". This MOOCs platform used has features, functions, and tools that may be unavailable on other MOOCs platforms. Thus, the findings obtained are delimitation to "OpenLearning" the MOOCs platform used in Malaysia, or may apply to different MOOCs platforms have similar features, functionality, and design.

Operational Definitions

Massive Open Online Course or MOOCs:

Massive Open Online Course (MOOCs) is a new online learning phenomenon that provides free materials to substantial learners without worries about the financial issues (Siemens, 2011).

Massive Open Online Course (MOOCs) in this study refers to the new model in online learning which has the ability to offer free online courses to huge learners around the world. OpenLearning is the MOOCs platform used in this study.

Critical Success Factors (CSFs):

Critical Success Factors (CSFs) are known as the restricted number of areas in which the outcomes are confirmed that the performance of the institutions, departments, or even individuals is successful (Bullen & Rockart, 1981).

Critical Success Factors (CSFs) in this study represent the link between the factors that have the highest impact on success of MOOCs.

System quality (SQ):

System quality (SQ) measures how well the hardware and the software work together; in other words, it refers to the effectiveness of processing the system information (DeLone & McLean, 2003).

System quality (SQ) in this study is defined as desirable performance characteristics of a MOOCs. In other words, system quality is referring to the integrity and reliability of the MOOCs system and the degree to which the learners perceive that using the MOOCs system is ease of use and easy to learn.

Information quality (IQ):

Information quality (IQ) is the measurement of the quality of the information the system creates, it refers to measure the output of the system (Petter, DeLone & McLean, 2008).

Information quality (IQ) in this study represents the quality and relevance of the information offered by MOOCs. In other words, the ability of MOOCs to provide the information that is: exactly what learners' need, relevant to the learner's job, easy to understand, and up-to-date information.

Service quality (SRQ):

Service quality (SRQ) is referring to the levels and the ways in which the services are provided by information system sectors or by the providers of the system (DeLone & McLean, 2003).

Service quality (SRQ) in this study represents the guidelines or the supporting documents delivered by MOOCs. Service quality refers to the extent to which MOOCs can provide an appropriate level of online assistance and clarifications.

Attitude (AT):

Attitude (AT) refers to the impression of the learners while participating in the system activities via using the computer (Sun et al., 2008). In this study, attitude has been measured by a set of beliefs that indicate whether MOOCs is good or bad.

User satisfaction (SAT):

Satisfaction (SAT) is defined as users' attitudes or feelings toward learning via a specific system (Liaw & Huang, 2013). Satisfaction in this study represents the user's level of expectation toward using of MOOCs.

Self-regulated learning (SRL):

Self-regulated learning (SRL) is referring to the voluntary behaviors of the learners to succeed in the learning process (Barnard-Brak et al., 2010).

Self-regulated learning (SRL) in this study represents the way that the learners participate in the activities and make decisions about their learning in MOOCs.

MOOCs system:

MOOCs system in the current study refers to the web-based technologies which are used in educational settings to deliver the educational services that facilitate and enable a massive number of students to access open learning via the Internet.

System success:

System success is referring to the degree of acceptance and usage in the system (Davis, 1989).

Summary

A description of the background, purpose, and objectives of this research is highlighted; in addition, the problem statement, the significance, and the rationale of the study were displayed. The delimitation and main definitions related to the study were also presented.

CHAPTER 2

LITERATURE REVIEW

Introduction

Chapter 2 reviews MOOCs literature to explore the system success issue and identify the factors influencing MOOCs systems success. This chapter presents an overview of MOOCs including its history, definition, types of MOOCs, MOOCs platforms, and benefits of MOOCs.

In this chapter a systematic review of the MOOCs literature from the year 2012 to 2016 is presented. Reviewing 102 MOOCs publications revealed 14 critical factors influencing MOOCs success which are: learner demographics, learner motivation, Interactivity, Instructor, Pedagogy, Instructional design, Pattern of engagement, Assessment, Credit, Plagiarism, Learning analytics, Sustainability, Dropout rates, and MOOCs quality. Finally, gaps found from current literature have been discussed such as the lack of research on satisfaction and quality of the MOOCs. The importance of this review is generated from the lack of studies that focus on MOOCs frameworks and critical factors influencing MOOCs as a way to provide a deep understanding of this phenomena and to raise the success rate and effectiveness of MOOCs in high education.

History of MOOCs

In September 2008 the first MOOCs has been presented by Downes and Siemens (Downes, 2012). First MOOCs was designed to be compatible with Connectivism theory; this course called as Connectivism and Connective Knowledge (CCK) (Downes, 2007). Further, the first use of the term "MOOCs" as an acronym was by

Dave Cormier in 2008 to describe the online course (CCK) (Bates 2014a; Yuan & Powell, 2013).

CCK course was presented to 25 tuition-paying students at the University of Manitoba, simultaneously it was also offered to approximately 2,300 learners who enrolled in the online class without paying any fees (Siemens, 2011). These initial MOOCs, called cMOOCs which focused on investigation, discussion, and examination rather than the depending on the instructors' support to provide contents. The features of cMOOCs include network-based, decentralized, and nonlinear structured (Margaryan, Bianco, & Littlejohn, 2015).

Many studies exposed that learners were interested in this style of online learning (e.g., Marques, 2013). This new style of online learning delivered by MOOCs has encouraged the Stanford University to design MOOCs initiatives.

In 2011, Thrun and Norvig opened access to their Stanford course called *Introduction to Artificial Intelligence* (CS 271) (Moe, 2015). This MOOCs course provided an opportunity for huge learners to access the same in-campus Stanford course content, materials, and assessments through using the learning management system (LMS) that included discussions, short videos, and quizzes regardless of past knowledge or educational experience (Cheal, 2013). More than 160,000 learners registered in the Stanford' AI MOOCs, yet only 12.5 % of the participants completed the course successfully (Bremer, 2012).

Another three online courses were offered that semester in 2011 by Stanford University (Yuan & Powell, 2013a). These courses were providing a qualitative transformation in the field of MOOCs by attracting a huge number of learners around the world.

The success of the Stanford MOOCs have inspired Thrun and Norvig to design MOOCs business models, thus, in 2012 Udacity has been introduced as a profit MOOCs model (Peter & Deimann, 2013). Additional, Koller and Ng -the Stanford professors- have also established a MOOCs model called Coursera that provide online courses by joining with many of famous universities around the world. The aim of Coursera is attracting a big number of learners around the world who interested in high-quality education and reputation institutions (Schuwer & Janssen, 2013). In 2013, universities from the United Kingdom opened their own MOOCs platform called FutureLearn. Furthermore, other non-profit MOOCs platform called edX has been launched by Harvard University and the Massachusetts Institute of Technology (MIT). All the above-mentioned MOOCs platforms are sharing the same goal which is designing large and high-quality learning networks to huge participants around the world.

In recent years, MOOCs have attracted millions of learners around the world. This is due to the types of elite institutions that provide MOOCs and the active participation for-profit companies (Gaebel, 2013). MOOCs are facilitated engaging huge number of learners in courses from famous educational institutions around the world.

MOOCs Definitions

Research indicated that there is no standard definition of MOOCs. There is confusion regarding what constitutes MOOCs. Daniel (2012) empathized that defining MOOCs is challenging for the general public and especially for academics. This ambiguity within the field of study has let a number of educational systems and models to use the MOOCs term with slight popularity (Watters, 2012). However, this study has provided some of the definitions of MOOCs according to different scholars to make the phenomenon clear.

McAuley, Stewart, Siemens, and Cormier (2010) defined MOOCs as a free online course that opened to any interested participants to register within the open curriculum and get the open-ended outcomes.

Siemens (2011) defined MOOCs as learning model that providing free online content without a request on attending.

According to Daniel (2012), MOOCs is commonly defined by distinct features that contain free courses which can be accessed easily through technological devices with Internet connectivity designed based on short video lectures with formative quizzes.

The European Commission (2014) gives a definition of MOOCs, which seems to be relevant to define a course provided by online learning platforms such a Coursera, Udacity, edX: they defined MOOCs as an online course that opened to interested participants without limitations regarding to tuitions fees or attendance, MOOCs conducted through a specific period of time with a beginning and end date and designed based on a set of learning goals in the area of the study, MOOCs aim to improve the interaction between learners and instructors that enable of establishing the learning community.

The majority of MOOCs systems share common characteristics which are (1) free of costs even though some MOOCs charge fees for certifications, (2) delivered online, and (3) anyone from anywhere can join to the MOOCs anytime. According to Siemens (2013) the features that distinguished of MOOCs from other standard online education should be taken into consideration thus, MOOCs name should be investigated:

Massive:

Anderson and McGreal (2012) defined the term Massive as the ability to expand the course to big number of participants. While few hundred participants registered in most of MOOCs courses, other courses extended to be involved more than 150,000 enrollments (Allen & Seaman, 2013). The massive feature can also be indicated to both learner experience and system structure. The massive course must not be limited be open to substantial learners, it must be confirmed that all learners receive a similar course experience such as learning materials, projects, assessments, and outcomes (Moe, 2015). Downes (2014) highlighted that the massive feature in MOOCs should not be restricted to attract a huge number of participants, but it has to make an opportunity of quality educating to be possible for a huge number of participants.

Open:

Koutropoulos et al. (2012) noted that the term open consists of open content, open access, and open courses. In MOOCs, openness refer to offer the learning experience for any interested participants without worries about any restrictions such as time, geographic location, or financial hardship. Rodriguez (2012) described openness in MOOCs as, open registration to any person, open curriculum, open the assessment process, open-source software, open the sources of information, and open the learners to a range of different learning settings.

The concept of open educational resources (OER) described any educational resources that can be used and re-used in teaching and learning. OER is providing educational materials such as video lectures, course notes, and assessment (Anderson & McGreal, 2012; Schuwer, Janssen, & Valkenburg, 2013). These educational resources are publicly available and free of charge (Schuwer & Janssen, 2013). OER represent a first implementation of openness in higher education institutions, OER shown a serious attention due to its role in increasing demand for lifelong learning opportunities.

Online:

Online concept is referring to the ability of the courses to be easily accessible for any area of study via the availability of Internet connectivity to provide both synchronous and asynchronous interaction between the learners and instructors (Schuwer et al., 2013). Online refers to the approach and process of acceding to the course activities. In the case of MOOCs, the learners are supposed to complete every part of the course online this includes lecture, assignments, supplemental materials, and assessment.

Course:

Course concept is defined in HE as a unit of teaching. Course is indicated to the registration of the learners within particular instructional groups. In MOOCs, course, refers to the academic curriculum that delivers to the learners within a specific period of time (beginning and end date of the course). MOOCs systems offer courses in a diversity of subjects and disciplines. The content in MOOCs must be organized and sequenced. The instructional materials are often included: the educational objectives, learning analytics and networking tools, and assessments (Allen & Seaman, 2013; Voss, 2013). The key elements of MOOCs are illustrated in Figure 2.1.

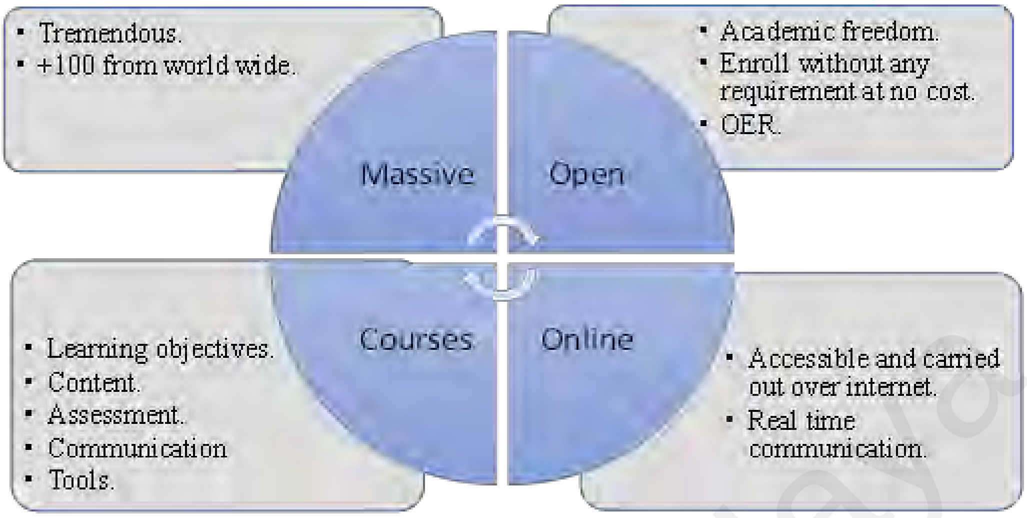

Figure 2.1. Key elements of MOOCs (Yousef et al., 2014a).

Source: Yousef, A. M. F., Chatti, M. A., Schroeder, U., Wosnitza, M., Jakobs, H. (2014a). MOOCss - A Review of the State-of-the-Art. In *Proc. CSEDU 2014 conference*, Vol. 3, pp. 9-20. INSTICC, 2014.

Types of MOOCs

The recent MOOCs literature classified MOOCs into two main categories, namely Connectivist MOOCs and extension MOOCs (Daniel, 2012). In order to distinguish between these MOOCs types, the *Connectivism* model has labeled as (cMOOCs) and the extension MOOCs called as (xMOOCs) (Rodriguez, 2012).

cMOOCs

cMOOCs is associated with the original MOOCs creation in 2008 when the concept of social learning and learning by interaction was presented (Siemens, 2011). cMOOCs is established according to the ideologies of *Connectivism* which are: interactivity, diversity, openness, and autonomy (Bell, 2011; Pence, 2012). The principle of the Constructivists is considered learning as an active procedure of producing meaning from different knowledge; this philosophy believes that the learners enhanced their learning by doing (Anderson & Dron, 2011). Connectivism focuses on the philosophy of a network-based pedagogy (Martin, 2013; Tschofen & Mackness, 2012). Siemens (2006) highlighted that the knowledge should exist in a spread way across a network instead of being only in the mind of an individual. According to Kop and Hill (2008), the initial point for learning in Connectivism happened when the information is activated through the interaction process between the learners and when the knowledge offered by a learning community.

According to Siemens (2011), cMOOCs is designed based on constructivist and networked learning approach which is more collaborative and authentic learning. cMOOCs is aimed in building and creating knowledge through communication in learner networks (Cabiria, 2012) which supported by current learning theories and models such as: (1) *the learning as a network theory* which views learning as a process for creating a personal knowledge network (Chatti, Schroeder, & Jarke, 2012) and (2) *Connectivism* which considers the learning as network-based pedagogy (Kop, 2011).

Thus, cMOOCs represents features such as openness and flexibility that reveal the new learning environments. cMOOCs has the ability to improve self-regulation learning skills where the learners can determine their own purposes and ideas, as well as creating and sharing the information collaboratively. Multiple and varied peer interactions in cMOOCs allow learners to create their own networks through social networking tools (e.g., Google groups, Blogs, Wikis, Facebook, and Twitter) and other tools outside of the learning platform that do not need any observation from the instructor (Kruiderink, 2013). The importance of cMOOCs is enabling learners to engage on a self-managed investigation of topics rather than depending on the teacher monitoring and the expertise of authorities.

Typical cMOOCs topics may be taken with an assessment or without assessment. Peer and self-assessment are designed based on pre-defined rubrics which employed to evaluate formal learners' coursework or quizzes that improve the understanding of the course content. cMOOCs focus on self-assessment such as reflection logs or diaries, or by essay feedback questionnaires (Kulkarni et al., 2013), and peer-assessment (Kellogg, 2013).

On the other hand, literature suggested that the majority of cMOOCs participations are mainly adult, lifelong learners who have not particularly focus on completing the content material (Rodriguez, 2012). Therefore, cMOOCs may attractive a huge of interested learners, but these learners may not actually interact in the course activities as in the courses prepared by lecturer-based style (Ahn, Weng, & Butler, 2013). Figure 2.2 summarizes cMOOCs and illustrates the key concepts of cMOOCs.

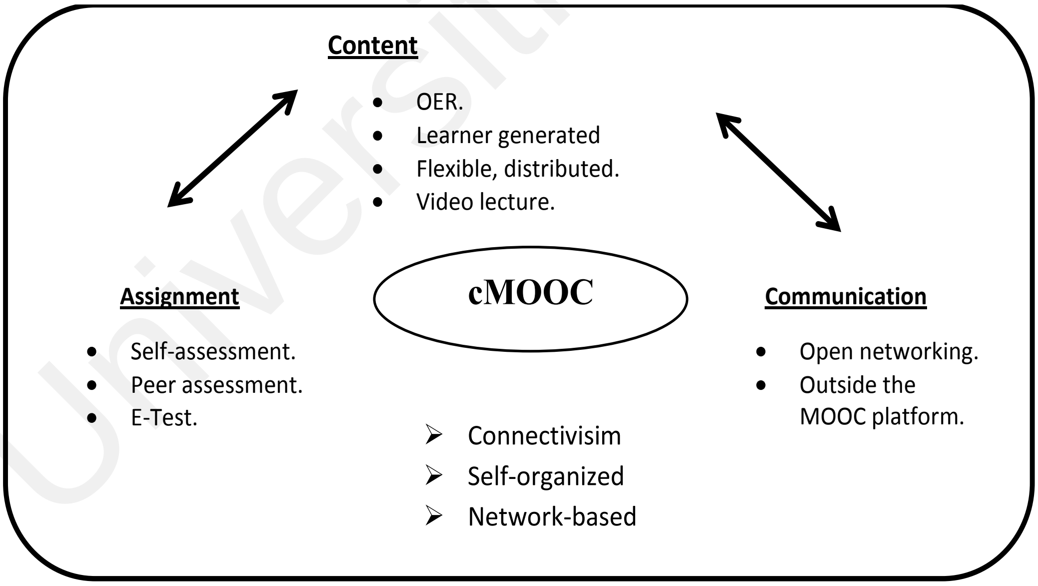

Figure 2.2. Main features of cMOOCs (adopted by Yousef et al., 2014a)

Source: Yousef, A. M. F., Chatti, M. A., Schroeder, U., Wosnitza, M., Jakobs, H. (2014a). MOOCss - A Review of the State-of-the-Art. In *Proc. CSEDU 2014 conference*, Vol. 3, pp. 9-20. INSTICC, 2014.

xMOOCs

Reviewing MOOCs literature revealed that xMOOCs is obtained a serious attention in most of the researchers due to its influence on HE as a modern model for developing teaching, learning and environment (Milligan, Littlejohn & Margaryan, 2013; Rodriguez, 2012). The xMOOCs has now become a dominant model rather than the cMOOCs (Sinclair, Boyatt, Foss, & Rocks, 2014; Yuan & Powell, 2013).

The learners build and construct knowledge in xMOOCs according to the cognitivism and behaviorism theories which indicated that the main sources of the learning experience is based on the human action with the learning environment (Kop & Hill, 2008). The learners create experiences in xMOOCs through constructivism features that emphasis on learning by performing such as the tasks of preparing projects and the experimental activities.

xMOOCs determined by the instructors, designed for huge learners who worked mainly on their own pace, guided by pre-recorded lectures (Bates, 2014). xMOOCs is more closely similar to traditional educational models; the instructors in xMOOCs often followed a previously established curriculum, and providing the course content in depth with arranging format (Pence, 2012).

The instructors in xMOOCs separated the courses into numerous lectures and these lectures are provided to the learners in videos pre-recorded format (El-Hmoudova, 2014). For assessment, xMOOCs use the traditional methods of e-assessment such as short quizzes and eTests (Kulkarni et al., 2013). Figure 2.3 shows the key concepts of xMOOCs.

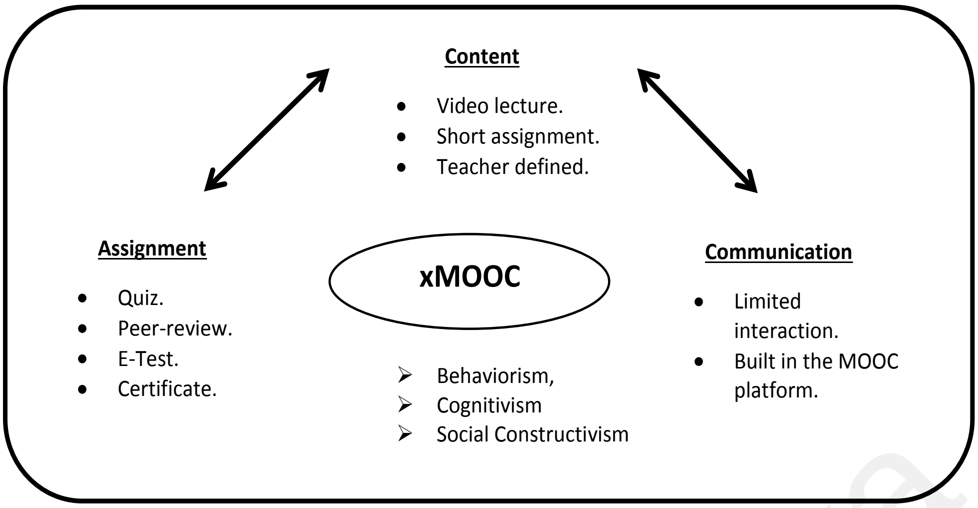

Figure 2.3. Main features of xMOOCs (Yousef et al., 2014a)

Source: Yousef, A. M. F., Chatti, M. A., Schroeder, U., Wosnitza, M., Jakobs, H. (2014a). MOOCss - A Review of the State-of-the-Art. In *Proc. CSEDU 2014 conference*, Vol. 3, pp. 9-20. INSTICC, 2014.

Recently, the common source for delivering the xMOOCs is by websites. There are various providers of xMOOCs such as US companies Coursera, EdX, Udemy and Udacity and the UK's Future learn.

Comparison between xMOOCs and cMOOCs

The difference between the two types of MOOCs is related to two main features: design and dynamics. xMOOCs is relying on old and obsolete behaviorist pedagogy, designing based mainly on transport information (Yuan & Powell, 2013). In contrast, cMOOCs designed based on advanced and developed conceptualization build on "to know and to learn" principle (Clow, 2013, p.185). Table 2.1 highlights the differences between xMOOCs and cMOOCs based on Crowley (2013):

Table 2.1

Differences between xMOOCs and cMOOCs

	xMOOCs	**cMOOCs**
The essential goal	Delivering content efficiently to a larger number of people. Grant certificates. Attracting new participants. Trying out the courses, outer the university framework.	Raising the cooperation and the connections between the participants. Offering real collaborations rather than providing a restricted learning experience in a specific end date.
Learning theory	Cognitive-behaviorist, it represents a teacher-centered process that relies on transfer the information from the teachers to learners.	Connectivism that represent the interaction and collaborations among the participants.
Role of instructor	The designer of the learning path (i.e., learning goals, course content, assessments, and activities).	Collaborate with other participants to construct new experience, build course content, and generate learning objectives.
Role of learner	The learners participated in a small group; received knowledge in the form of videos, and evaluated by quizzes.	The learner is a co-creator of the MOOCs.
Assessment	E-assessment such as eTests and short quizzes.	Self-assessment such as essay feedback questionnaires and peer-assessment.
Flexibility of the course and the course goals	Before launching the course, the instructors set the course outline, all the activities, and the assessments. Pre-recorded video executed during the learning path.	The general topics are established by collaborating small group of participants and then formed through the course of all participants.

Source: Crowley, J. (2013, August 15). cMOOCss: Putting collaboration first. Campus Technology. Retrieved from http://campustechnology.com/Articles/2013/08/15/cMOOCss-PuttingCollaboration-First.aspx?Page=2

Other Types of MOOCs

Several types of MOOCs have been presented in the MOOCs literature. Daniel (2012) and Siemens (2013) categorized MOOCs into Connectivist MOOCs (cMOOCs) and extension MOOCs (xMOOCs). However, due to the dissimilarity between cMOOCs and xMOOCs, the MOOCs literature started introducing different styles of MOOCs that identify the variety of MOOCs designs and purposes. Therefore, some scholars such as Waite, Mackness, Roberts, and Lovegrove (2013) have proposed the concept of ‘hybrid MOOCs’ to combine the advantages of both cMOOCs and xMOOCs and mediate the contrast between these MOOCs styles (Grunewald, Meinel, Totschnig, & Willems, 2013).

Blended MOOCs (bMOOCs) is another type of MOOCs (Ostashewski & Reid, 2012) which has the ability to deliver human interactions into a blended environment (Ghadiri, Qayoumi, Junn, Hsu, & Sujitparapitaya, 2013). bMOOCs aimed at creating and building online learning components in-class with a blended design. The bMOOCs model provides effective assessment and the feedback, allowing for the diverse perspectives of the MOOCs participants, however, this blended model of MOOCs resolve some of the obstacles facing achieve its objectives (Ghadiri et al., 2013).

Lately, unique formulas of MOOCs have been developed such as Small Private Online Course (SPOC) (Hashmi, 2013). This small cMOOCs style enables learners to be more open, connected, interactive, and independent, Small Private Open Courses (SPOCs) and Small Connectivist Open Online Courses (SCOOCs) platforms follow this new MOOCs style (Mackness, Waite, Roberts, & Lovegrove, 2013).

Other new styles of MOOCs are: Participatory Open Online Course (POOC) (Daniels, 2013); Big Open Online Course (BOOC) (Tattersall, 2013); and Distributed Open Collaborative Course (DOCC) (Jaschik, 2013).

Clark (2013) has distinguished eight types of MOOCs, these different classifications of MOOCs are done according to the varieties in pedagogies and assessment and their essential ideas about effective learning:

1) **TransferMOOCs**: in this type, the existing courses are engaged in the MOOCs platform. The theory of TransferMOOCs assumed the transfer of the information from the instructor, course content to the learner. Coursera mainly related to this MOOCs style.

2) **MadeMOOCs:** in this MOOCs type, the creation of materials, assignments, problem-solving, and the developed the interactive experiences are designed with more formal and quality-driven approach. The interaction between teachers and learners executed by peer work and peer assessment approaches. Udacity Coursera mostly related to this type of MOOCs.

3) **SynchMOOCs:** this MOOCs type tends to fix the starting and ending dates for submitting the homework, projects, and assessments. Udacity takes this approach.

4) **AsynchMOOCs**: this type of MOOCs can be taken anytime and anywhere. No fixed in starting/ending dates for assignments and assessments. Coursera can be classified under this MOOCs type which provides a fully open self-study option.

5) **AdaptiveMOOCs:** this type uses adaptive procedures to deliver personalized learning experiences. The learners perform personalized paths and accomplish dynamic assessment through learning via AdaptiveMOOCs. Cogbooks generally associated with this MOOCs style.

6) **GroupMOOCs**: GroupMOOCs aimed to increase learner retention by creating small, collaborative groups of learners.

7) **ConnectivistMOOCs**: this MOOCs style aimed to share knowledge that created by the participants rather than the fixed knowledge, ConnectivistMOOCs designing based on the interactions through a network rather than pre-defined content.

8) **MiniMOOCs**: this type focus on limiting the scope to short sequences of instruction that includes learning objects, activities, feedback, and assessment (Spector, 2014). MiniMOOCs is appropriate for specific fields that offer tasks with clear learning goals. MiniMOOCs provides great experiences that remain only for a limited period of time.

MOOCs platforms

The MOOCs is provided through a number of platforms. Some of them (i.e. Coursera, Udacity, Canvas, OpenLearning, and Course Builder) have general purposes, while others MOOCs platforms, such as edX jointly developed by Harvard and MIT and Class2Go developed by Stanford are institutions with specific purposes (Pappano, 2012). MOOCs initiatives are represented a change in the educational setting by developing the quality of learning outcome (Schuwer & Janssen, 2013; Yuan & Powell, 2013b). The majority of MOOCs share common characteristics: they are free to enroll in, they are delivered online, and anyone from anywhere can join the MOOCs anytime at their convenience.

Research suggested that edX, Coursera, Udacity, and FutureLearn are the MOOCs platforms that receiving the most public attention (Kernohan, 2015; Porter, 2015). In 2013, massive of participants have registered in MOOCs; Coursera and edX are the two top platforms that attracted together more than six million participants around the world (Fowler, 2013).

In 2016, over 23 million learners have signed up for a minimum one of MOOCs, taking the total number of learners to 58 million, the total number of MOOCs courses is 6,850 from over 700 universities (Shah, 2016). The following sections provide brief information about Coursera, Udacity, and edX, the most famous MOOCs platforms used by an enormous number of learners around the world.

Coursera (https://www.coursera.org/).

Coursera is an instructional technology institution established by Andrew and Koller professors from Stanford University. Coursera is a for-profit company which has a great collection of courses; Coursera is growing fast, it still has the highest total registered users with 1700+ active courses and 23 million users (Shah, 2016).

Coursera consists of reading materials, short video lectures, homework assignments, peer-graded assessments, quizzes and tests, and final exams. After every lesson, the learners have to pass the assignments or the tests. Commonly, every assignment or test has an exact deadline. The learners can collaborate with fellow class listeners on social media and discussion forums. Coursera is offering free online courses for interested learners to acquire the best education through accessing top universities and organizations worldwide.

Udacity (https://www.udacity.com/)

The Udacity purposes to provide cheap and effective HE to the huge number of participants around the world (Udacity Inc., 2016). Udacity is a private educational institution created by Thrun, Stavens, and Sokolsky that delivers MOOCs courses to a huge number of learners (Henn, 2012). Udacity attracted 4 million users registered until 2016 (Shah, 2016). Udacity consists of massive number of learning activities and video tutorials. Every course involves video lectures, exercises, interactive assignments, and quizzes. All courses have an indication of skill level that is required for a course, prerequisites, and information about what learners have to learn in the course. In Udacity, the learners' overall performance during the course and the final exam can determine the learners' final grade.

edX (https://www.edx.org/).

edX created by MIT and Harvard University to provide university-level MOOCs courses in diverse subjects and topics to massive participants worldwide. Currently, edX attracted more than 10 million learners registered in over 1300 online courses (Shah, 2016). edX aims to improve the HE teaching and learning both on campus and online mode by increasing access to the high-quality education (edX Inc., 2016). edX is an open source platform, edX code is available for everyone and for any institutions without restrictions by using edX code to generate their own classes.

This open source feature is the key difference between edX and its rivals such as Udacity and Coursera, edX is the only non-profit MOOCs platform that provides the open source.

Comparison between MOOCs platforms

Table 2.2 displays some of the widely-used MOOCs providers and the comparison between MOOCs initiatives.

Table 2.2

Comparison of MOOCs initiatives

MOOCs initiatives	Launch	Course structure	media	Taught by	Cost	Known for	Early critiques	Experience
Khan Academy www.khanacademy.org	2008	Fields of study Topics	Video	Khan and others	0	Video chunk library, analytics	Not interactive, lacks learner support	Screencasts, video, forums
Udacity www.udacity.com	2011	Courses Overview Syllabus Wiki Announcements	Video	Stanford professors	0-$ for certified exam	Stanford experiment turned startup, connect talent with companies	Robot graders, lack of active learning	Short videos, quiz, feedback
TED-Ed ed.ted.com	2012	Lessons Series Subjects	Video	TED presenters and other authors	0	TED quality, turning videos into lessons	Lack of interactivity	Video plus lesson plans, quizzes
Coursera coursera.org	2012	Course info Courseware Textbook Discussion Wiki Progress	Video Slides	Professors from big name schools	$ for certified exam	Andrew Ng's spinoff from MOOCs test at Stanford	Absence of active learning, long and boring videos	Videos, question ranking
edX edx.org	2012	Courses Course info Textbook Discussion Wiki Courseware	Video Textbooks	Harvard and MIT professors	$ for certified exam	edX open source delivery platform, research outcomes	Essay grading software	edX open source, videos

Source: Sonicfoundry website (2012) http://www.sonicfoundry.com/massive-list-of-mooc-resources-lit-and-literati/

Most of xMOOCs, such as Coursera, Udacity, and edX consist mainly of lecture videos, course materials; provide interactive activities, assignments, quizzes and essays to evaluate learners' knowledge and helping them to master the materials (Faviero, 2012). Other initiatives, such as Khan Academy explores another type of xMOOCs that focus on building reputation rather than performance, such as adding gamification features within their platforms.

All MOOCs initiatives developed around the classically structured courses, split into short lectures, except Khan Academy and TED-Ed platforms that established according to fields of study such as lessons and subjects. Most of MOOCs courses are totally free of charge except some platforms that grant certificates after given a small amount of payment.

There is a strong investment in video lectures as media types in all MOOCs initiatives. The majority of xMOOCs involve original videos (Glance, Forsey, & Riley, 2013; Kolowich, 2013). Video players used as the primary teaching and learning materials in MOOCs. The original videos are online recorded-lectures which allow students to watch videos multiple times at their own pace.

MOOCs platforms (e.g., Coursera, Khan Academy) can also offer video subtitles feature, in these initiatives; the learner can acquire any level of course materials in different language subtitles.

MOOCs initiatives improve the personal and professional communications by allowing the learners to use MOOCs site to participate in MOOCs tasks and engaging in many activities such as commenting and posting on discussion and watching videos (McAuley et al., 2010).

The pure programmed instruction of xMOOCs as traditional lectures serves as a means for imparting information (Schulmeister, 2014). Thus, the success of xMOOCs needs to be evaluated with respect to how efficient they are in imparting knowledge.

MOOCs Benefits

MOOCs are platforms for collaboration and communication to exchange information and enhance learner's knowledge (de Waard et al., 2014). MOOCs offer the courses in non-traditional ways and provide the opportunity for developing a new thinking and working (Fox, 2016). A study by the Higher Education Academy (HEA) demonstrates that MOOCs enables participants to engage in intellectual activities, such as making connections with previous knowledge, exploring knowledge actively, and develop critical thinking (Hayes, 2015). MOOCs has the potential to change the learning pathway in higher education institutions (Friedland, 2013).

Flexibility of MOOCs courses is considered one of the main MOOCs advantages. Learners do not have to spend much time listening to the lecture as in the traditional classrooms; they can learn from short duration videos that promote the active learning. Kushik, Yevtushenko, and Evtushenko (2016) indicated that learners are able to access knowledge through a MOOCs on condition availability of the internet connection. Participation in MOOCs can range from the completely informal method: where the learners can determine their own learning with autonomy and flexibility environment, to engage in a formal course where the learners have learning that looks like offline formal education (Conole, 2016). Learners also have the possibility to confirm their progress in a MOOCs course by gaining a certification for completing the course successfully. Yousef, Chatti, Wosnitza, and Schroeder (2015e) indicated that the major features that motivate the learners to participate in MOOCs are the flexibility and the openness of MOOCs.

Fasihuddin, Skinner, and Athauda (2013) indicated that MOOCs provides significant benefits:

Scalability: MOOCs is designed to involve unlimited number of participants (Yuan, Powell, & CETIS, 2013). MOOCs would help to reach massive number of learners around the world who does not have the opportunity to attain a good education (Bombardieri, 2013).

Accessibility: MOOCs gives opportunities to access learning resources easily and flexibly at low charge for any interested learner. MOOCs learners can share the knowledge and interact through forms of discussion. All courses are easily accessible to learning materials over the Internet (Yuan et al., 2013). The video lectures for the most existing MOOCs initiatives considered a source of high-quality content.

Openness: Famous and outstanding professors provide high-quality MOOCs courses to a huge number of students which is free of charge unless some payment to get certified by completing the course successfully. Most of MOOCs is free of charge, although some universities and platform companies charge a fee for earning a certificate or college credit (Kolowich, 2013c; Liyanagunawardena et al., 2013). However, the fee for gaining the credential, challenges the 'open' feature of MOOCs.

Self-organization: The learning in MOOCs is informal; the students take courses and organize the learning process at their own pace. MOOCs learners have the opportunities to make decisions regarding the course and can learn according to their interest and motivation.

MOOCs participants have not required registering in the host institutions to attend the courses; they can be working, share and discuss views through discussion forums. MOOCs learners have the ability to generate and share knowledge via blogs, concept maps, and podcasts (McAuley et al., 2010). The participant can select the learning resources independently and choose their participation in activities; they can also get instant feedback and obtain answers about the assignments submitted by other participants.

MOOCs in Higher Education

Introduction of MOOCs in the higher education (HE) has received an important attention due to the contribution of MOOCs in making HE more accessible and decreasing the costs of HE institutions (Carey, 2012; Lewin, 2012; Pence, 2012). Researchers indicate that MOOCs attracting the private investors that are planning to engage in the education market or intending to create their own brands (Yuan & Powell, 2013).

Some studies suggested that universities should consider the potential influence of MOOCs on improving knowledge, and grab the opportunities of MOOCs to build learners experience (Barber, Donnelly, & Rizvi, 2013). Lewis (2013) demonstrated that the ability of MOOCs to create connecting between learners and employers in a wide and general ways can convey MOOCs to true competition level with traditional HE.

MOOCs recently in growing and developing phase, thus there are disagreements among MOOCs' experts regarding whether MOOCs improve or hinder HE and to what extent MOOCs can make substantial changes in existing HE pedagogies.

Some MOOCs experts emphasized that MOOCs consider one of the most interesting and challenging transformations occurred in HE in years (Fonseca, 2014). MOOCs has the ability to enhance both the academic and the skill-based learning (Miller, Haller, Rytz, & Odersky, 2014) and provide the learners needed in keeping them up-to-date of their skills and achieving continued improvement (Liyanagunawardena, 2015). MOOCs is the best development in higher education in decades by providing free, high-quality classes to any interested participants anywhere around the world (Haynie, 2013). Thus, top universities around the world are rushing to provide free online courses for all via MOOCs systems such as Coursera, edX, Udacity, and FutureLearn which have increased the expansion, the importance, and popularity of MOOCs.

On the contrary, some authors indicated that MOOCs cannot yet completely replace higher education institutions. In a study by Ovaska (2013) revealed that so far there is only a few empirical evidences for the supposition that MOOCs leads to improved quality in higher education (Jung, 2016). Many studies highlighted that MOOCs cannot fully replace the traditional education (e.g. Bates, 2012); MOOCs rather has been different pathway. MOOCs is highly dependent learning, suitable for learners who already have the capability to learn independently and participate meaningfully in MOOCs activities (Bates, 2012).

Moreover, experts such as Bogost (2013); Bates (2014a) believes that MOOCs is not considered the type of learning needs in the 21st century. MOOCs is not conceptualized as revolutionary as they seem to be. MOOCs only contributed to change the form of learning without making improvement in the nature of learning. Some MOOCs researchers such as McGhee (2012) and Haggard (2013) highlighted some MOOCs challenges related to its scalability, sustainability, and educational quality, and indicated the lack of a workable business model as one of the biggest challenges.

Daniel (2012) also argued that the rushing of elite universities in delivering MOOCs is not proposed that they are particularly talented in online teaching. MOOCs has been criticized for issues related to limited learning scope, decreasing the human element role in learning processes, manipulating the knowledge acquired and restrictive the interaction with knowledge achievement (Cooper, 2013).

However, there is still some optimism indicated that MOOCs would provide revolutionary opportunities for online learning by developing a learner-centered pedagogy that allows students to learn from one another through the use of peer support and assignment strategies (Yuan & Powell, 2013). Thus, we need to be skeptical of the basic ideal of MOOCs as Veletsianos (2013) suggested that the learners' experiences achieved from open online learning are neither totally positive as optimists highlighted nor as poor as critics indicated.

MOOCs in Malaysia

Public and private universities in Malaysia have started experimenting in MOOCs which is considered a new phenomenon in online education. Most Malaysian learners perceived positive attitude toward MOOCs as they indicated that learning via MOOCs makes the learning more interesting and easier for them (Nordin, Embi, & Norman, 2016).

Review of MOOCs in Malaysia

In general, Malaysia has sufficient places for its citizens to attend HE institutions. The country has combined 20 public universities and 45 private universities as well as foreign university campuses (Khan, 2016).

In fact, the Malaysian Government has strategies to make a regional educational hub by attracting more international students to study in Malaysia. Thus, introducing MOOCs consider one of the significant and useful ways to achieve Malaysian government goals. It would be beneficial if Malaysian universities contribute to deliver high-quality MOOCs courses that reflect the standards of the HE (Ghaffar et al., 2016).

The Malaysian Education Blueprint for HE included MOOCs as a crucial initiative in Malaysian education from (2015 to 2025) (Ministry of Education Malaysia, 2014). The Blueprint declared that Malaysia plans to leverage on MOOCs as a way to improve learning quality and to expand the accessibility to HE learning (Ministry of Education Malaysia, 2014). Ministry of Education Malaysia is allocated budget of MYR500 million to improve this initiative under the forthcoming 11th Malaysia Plan (2016-2020) (The Star, 2014).

The blueprint (Ministry of Education Malaysia, 2014) introduced MOOCs as an online learning approach which has the capability to increase the levels of collaboration and the international interactions by offering more interactive and engaging in the learning process. MOOCs improves the international vision and promotes the accessibility of Malaysian expertise to engage in critical educational disciplines (e.g., Islamic Finance and Tropical Diseases) topics, and provide a good opportunity for Malaysian HE institutions to display and publish their research areas (Ministry of Education Malaysia, 2014).

In 2014, six (public and private) HE institutions were involved in MOOCs development in Malaysia: one private university (Taylor's University); one open university (Open University Malaysia (OUM)), and four public universities (i.e., Universiti Putra Malaysia (UPM); Universiti Teknologi Mara (UiTM); The National University of Malaysia (UKM); and Universiti Malaysia Sarawak (UNIMAS)) and total of 36 MOOCs offered by these six universities in Malaysia (Fadzil et al., 2015). A majority of the target audience of MOOCs are students involved in public and private HE institutions.

The Malaysian learners deliver MOOCs lessons in form of video lectures, PowerPoint slides or PDF and evaluate their work through several course activities (e.g., forums, discussions, and quizzes). Nordin, Norman, Embi, Mansor, and Idris (2016) conducted a study to understand the factors for developing MOOCs learning content in Asia context. The study highlighted that type of MOOCs and type of video lectures (i.e., animated videos and live action videos) were significant factors. The importance of MOOCs types (i.e., xMOOCs and cMOOCs) in development of MOOCs content is related to diverse pedagogical backgrounds and different set of skills and the abilities behind each type of MOOCs. MOOCs courses delivered by Taylor's University and OUM are mainly academic courses in addition to some informal courses (e.g. visual and culinary arts).

Introducing MOOCs in Malaysia is relatively new; thus, it is clear that there are several challenges and issues should be identified and gaps need to be covered in order to acquire the best ways to leverage on this innovation and get a fresh perspective regarding teaching and learning HE in Malaysia.

One of the key issues is that the six HE institutions cannot yet demonstrate the massive potential of MOOCs. Mansor, Woo, Mazlan, Fathinirna, and Nurhisyam (2014) indicated that courses from OUM have involved only a few hundred views on iTunes U while the first MOOCs offered by Udacity *Introduction to Artificial Intelligence* attracted more than one hundred sixty thousand learners from 190 countries around the world (Udacity, n.d.). This shows how truly massive MOOCs should be.

On the other hand, while all the four public universities in Malaysia are offering MOOCs that opened to anyone interested to enroll, MOOCs is considered compulsory core courses and restricted to the students at public universities which have to take these courses. Thus, this indicates that MOOCs is targeted to a limited group of potential learners and not opened to the general public (Fadzil et al., 2015). MOOCs should not be restricted only to Malaysian HE, but it should be expanded to include other aspects of learning such as lifelong learning, professional development and the training for improving the advantages of this new online learning style.

OpenLearning

The Malaysia MOOCs program was launched on 18th September 2014 by Dato' Seri Idris bin Jusoh, who announced that OpenLearning.com as the official MOOCs (Massive Open Online Course) platform for all public institutions and higher education in Malaysia (OpenLearning, n. d.). The OpenLearning initiative is a collaborative effort of various parties at all levels with the aim to expand and improve the access to Malaysian public university courses and the intentions to improve teaching and learning quality. All MOOCs courses delivered by the Malaysian universities are offered via "OpenLearning" a MOOCs platform created in Sydney, Australia.

OpenLearning courses have shown significant improvements in student performance, including, higher marks, lower failure rates, lower attrition rates and the identification of at-risk students for real-time intervention (OpenLearning, n. d.).

The first stage of the initiative began with four MOOCs courses developed successfully in the MOOCs platform; the four courses were launched for first-year undergraduate students, and developed by UPM, UKM, UiTM, and UNIMAS in collaboration with the Ministry of Education under the *Jabatan Pengajian Tinggi*. These four MOOCs courses have attracted a huge number of learners since its launch, where around 55,000 learners had participated in these courses (Nordin, Embi, & Norman, 2015). The first four MOOCs courses are:

- *Tamadun Islam dan Tamadun Asia* (TITAS)
- *Hubungan Etnik*
- Introduction to Entrepreneurship
- ICT Competency

The description for each of the main four courses provided by Malaysia MOOCs is displayed in Table 2.3.

Table 2.3

Descriptions for each of the main four courses provided by Malaysia MOOCs

The course	Developed by	Course objective
Tamadun Islam dan Tamadun Asia (TITAS)	UPM	It focuses on the knowledge role of civilization in building the Malaysian society based on the civilization principles to practice the spirit of mutual respect and interaction with various religious communities.
Hubungan Etnik	UKM	It covers the ethnic relations in Malaysia by focusing on the social cohesion.
ICT Competency	UNIMAS	This course is tailored to provide learners with the latest ICT skills and knowledge that enhance their competency.
Introduction to Entrepreneurship	UiTM	The central focus of the course is preparing the learners with the principle of entrepreneurship and business planning skills.

Source: Habibah Ab Jalil, Alyani Ismail, Norasiken Bakar & N. A. Kasma Azizan K. A. Nasir (2016). *Evaluation of Malaysia Pilot MOOCs* (Final Report). CADe UPM: Serdang.

These courses are hosted on OpenLearning platform with the aims for international branding as this platform was used by other universities worldwide. The initial 4 courses generated over 1,000,000 discussions. Figure 2.4 displays students and discussion in core MOOCs.

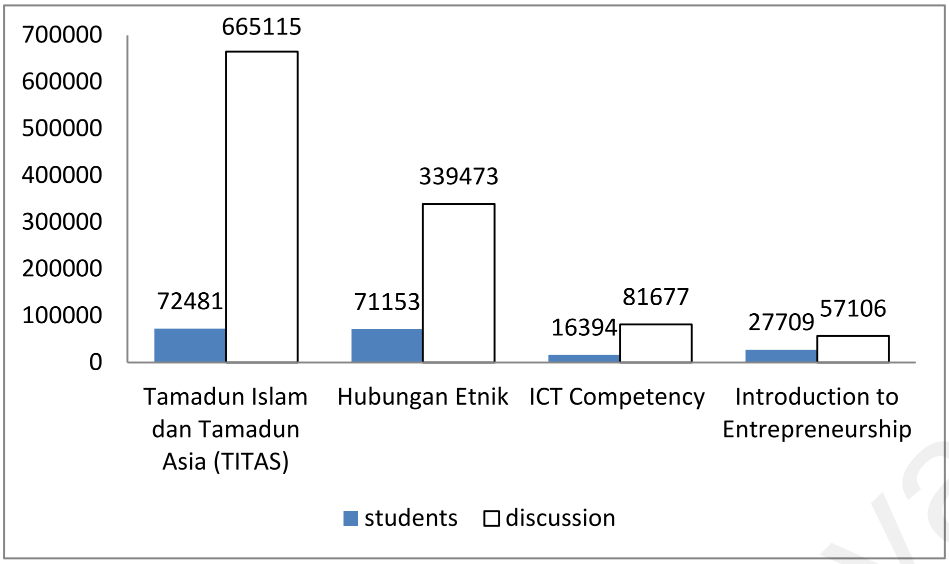

Figure 2.4. Students and discussion in core MOOCs
Source: OpenLearning blog (2016).
Available from *https://www.openlearning.com/blog/CompanyProgressReport201516*

In OpenLearning, all students need to watch all the recorded lectures and to do all the course activities, assignments, as well as complete the course project. OpenLearning delivers many social media components such as wikis, blog pages, and forums where the students can interact during learning by writing and receiving comments. OpenLearning has an interesting feature that aim to enhance learning and cooperation through the course. One of these features is "Kudos" or karma points that gained when a specific goal is achieved or when positive comments from peers obtained thus, receiving badges automatically.

Following the success of the first four MOOCs, the Ministry of Higher Education supported the public universities to develop further MOOCs courses. Now OpenLearning has broken into three categories: 1. University courses; 2. Skill-based courses; and 3. Lifestyle courses.

Currently, Malaysia's 20 public universities and 6 private universities run over 250 MOOCs on OpenLearning. Malaysia is the first country in the world that implement a national strategy to integrate MOOCs within on-campus university classes. Thus, Malaysia is considered the first country in the world in developing a national policy on credit recognition for MOOCs system, which would enable all interested learners from Malaysia and overseas to be registered into Malaysia's MOOCs system and be given credit (OpenLearning, n. d.). Total student enrollment in MOOCs from these 20 universities is displayed in Table 2.4.

Table 2.4

Total students' enrolments in MOOCs from 20 public universities

University	Total students enrolments
1. Universiti Putra Malaysia (UPM)	73842
2. Universiti Teknologi Malaysia (UTM)	6396
3. Universiti Kebangsaan Malaysia (UKM)	93259
4. Universiti Tun Hussein Onn Malaysia (UTHM)	970
5. Universiti Malaysia Sarawak (UNIMAS)	21352
6. Universiti Teknologi Mara (UiTM)	36177
7. Universiti Teknikal Malaysia Melaka (UTeM)	7317
8. Universiti Malaysia Terengganu (UMT)	4739
9. Universiti Malaysia Perlis (UniMAP)	656
10. Universiti Pendidikan Sultan Idris (UPSI)	2232
11. Universiti Malaya (UM)	930
12. Universiti Malaysia Pahang (UMP)	2826
13. Universiti Malaysia Sabah (UMS)	400
14. Universiti Sains Islam Malaysia (USIM)	3219
15. Universiti Sultan Zainal Abidin (UniSZA)	835
16. Universiti Malaysia Kelantan (UMK)	229
17. International Islamic University Malaysia (IIUM)	1165
18. Universiti Pertahanan Nasional Malaysia (UPNM)	645
19. Universiti Utara Malaysia (UUM)	3109
20. Universiti Sains Malaysia (USM)	284
Total No. of students	**260,582**

Note: The data obtained from OpenLearning website (https://www.openlearning.com/) in March 2017.

According to the company progress report in December 2016 for OpenLearning, the progress of OpenLearning is improved significantly (OpenLearning blog, 2016). Table 2.5 is displayed in the progress of OpenLearning:

Table 2.5

Progress Report for OpenLearning

Year	Student enrollments	New courses
2014	89,770	775
2015	184,002	1,851
2016	240,961	2,251
	Total: 604,503	**5,256**

Source: OpenLearning blog (2016).
Available from *https://www.openlearning.com/blog/CompanyProgressReport201516*

Between 2014 and 2016, the increment of enrollments in the OpenLearning platform was 573%, while the growth of developing new MOOCs courses was 810%. Additionally, 146 institutions joined OpenLearning from around the world (OpenLearning blog, 2016). The top 5 countries in using OpenLearning platform is displayed in figure 2.5.

Figure 2.5. Distribution using OpenLearning in countries.

Source: OpenLearning blog (2016).
Available from *https://www.openlearning.com/blog/CompanyProgressReport201516*

Other information related to OpenLearning is displayed in Table 2.6.

Table 2.6

Information Related to OpenLearning

Information	Number
Total student interactions	6,109,916
Total hours spent in OpenLearning	1,257,625
Total course completion rate	27.25%

Source: OpenLearning blog (2016).
Available from *https://www.openlearning.com/blog/CompanyProgressReport201516*

Obstacles of using MOOCs in Malaysia

The possible obstacles preventing learners from Malaysia from taking part in MOOCs are:

- Culture: Asia, in general, includes many diverse cultures. Cultural issue could be barrier learners to participating in MOOCs. Thus, many studies suggested that designing MOOCs systems should be included the diversity in cultural values (e.g., food, symbols, and daily items) (Jona & Naidu, 2014; Yousef et al., 2014b).

- Language: MOOCs learners in Malaysia are facing some problems related to the proficiency of language which can be considered as the main reason of the misinterpretation of the MOOCs videos and misunderstanding to the online learning activities in general. Thus, MOOCs providers should take this issue in their consideration when designing MOOCs systems and improve their skills on how to deliver the knowledge to non-native speakers (Hollands & Tirthali, 2014; Yousef et al., 2014b).

- Poor technology infrastructure: another challenge that reduces the participation in MOOCs is the technology and the internet connection issue, particularly for the participants from poor or rural areas. For example, Internet access in rural and isolated areas in Malaysia is still insufficient to participate in online learning activities (MCMC, 2013). This infrastructural obstacle diminishes expending MOOCs in this area.

- Lack of MOOCs quality: Yousef et al. (2015b) highlighted that MOOCs quality has a major effect on the satisfaction toward MOOCs and noted that the participants should be receiving a satisfactory technical support and high quality from the institutions. Freeman and Hancock (2013) and Hollands and Tirthali (2014) showed that MOOCs needs to provide specific features related to the quality such as social communication tools, learning analytics, gamification, recommendation systems, and assessment methodologies. However, not all MOOCs supported by organizations or even countries are able to provide these features to their participants.

Past Studies on MOOCs

MOOCs is a recent phenomenon; its development is still in initial stages and research on MOOCs is progressively growing. There is a small quantity of systematic scholarly writings related to MOOCs (Daniel, 2012). Few studies analyzed and accumulated academic studies about MOOCs:

- Bozkurt, Keskin and de Waard (2016) employed a systematic review approach and analyzed 51 theses/dissertations related to MOOCs published between (2008 – 2015) in order to understand MOOCs more comprehensively and to identify research trends from these academic documents. The results of this study exposed that MOOCs researches are generally derived from basic disciplines of study (e.g., education, engineering and computer science, information and communication technology). The most common methodologies used in these studies are qualitative and case study research. The study concluded that approximately 50% of the studies did not benefit from any theoretical/conceptual perspectives.

- Jung (2016) conducted a literature review of 33 research articles that included findings on MOOCs from qualitative, quantitative and mixed method research published between (2012 -2016) in order to understand the evolution of MOOCs, the role and the contributions of MOOCs to teaching and learning. The finding of this study exposed that MOOCs learners are diverse; they are from many countries across the globe, and from all cultural backgrounds. The study also indicated that prior knowledge with an active engagement is an important factor for the success in MOOCs learning. Reviewing MOOCs literature also exposed that no evidence was found to support the role of MOOCs in improving the quality in higher education.
- Veletsianos and Shepherdson (2016) aimed at identifying the gaps in the MOOCs literature by reviewing 183 empirical MOOCs paper published between 2013- 2015.

  The results of the study demonstrated that most of MOOCs literature (more than 80%) was published by researchers from North America and Europe areas. The finding also exposed that the common methodology employed to conduct MOOCs research was a quantitative approach while only a few studies done by qualitative research (e.g., interviews and observations). Most of studies adapted surveys and automated methods for collecting data. The study concluded that there is very little research investigated topics related to instructors, and limited research examined the learners' experience of learning via MOOCs.

- Raffaghelli, Cucchiara, and Persico (2015) conducted methodological approaches and examined 60 papers adopted from MOOCs literature published in the period 2008 - 2014. The authors reviewed the methodologies used in researching MOOCs and concluded that MOOCs currently at the very early stages, dominated by desk research and descriptive studies (qualitative and quantitative).
- Hayes (2015) reviewed MOOCs literature and presented different perspectives relating to the nature of MOOCs. The study examined the role of the learner and the instructor as stakeholders in order to explore their motivations in using MOOCs. The aims of the study were investigating the quality and the role of MOOCs in higher education (HE) and offering resources to support HE providers and others who interested in understanding the quality of MOOCs.
- Kennedy (2014) reviewed six peer reviewed research articles that have been conducted from 2009-2012. The study demonstrated MOOCs literature in informal and postsecondary online learning and described the characteristics associated to MOOCs. Three MOOCs characteristics of MOOCs investigated in Kennedy (2014) study: diverse explanations of openness, obstacles and persistence, and limitation of MOOCs pedagogical approaches (cMOOCs and xMOOCs).
- Hew and Cheung (2014) conducted a review of current MOOCs literature that investigated learner and instructor behavior toward MOOCs in order to identify the motivations and challenges of using MOOCs. The findings of this study highlighted learners' motivation toward participation and signing up in MOOCs systems such as: developing their knowledge, curious about this new

online learning style, gets a personal challenge, and collecting certificates. Findings also suggested the main challenges of teaching MOOCs which are: obstacles related to evaluating learners' work, lack of instant feedback, and absence of learners' participation in MOOCs activities.

- Khalil and Ebner (2014) conducted a literature review on 42 MOOCs from some MOOCs platform: Coursera, EdX, Udacity, MITx, and Moodle to analyze the course dropout rates, MOOCs content, and the discussions during MOOCs classes to determine the reasons behind the student dropout from MOOCs courses and to examine the interactivity in different MOOCs. The finding demonstrated some reasons of the high dropout rate of MOOCs which are: absence of motivation, the absence of interactions in MOOCs activities, lack of skills, and hidden costs.
- Yousef, Chatti, Schroeder, and Wosnitza (2014a) compiled and analyzed studies conducted on MOOCs during the period 2008 and 2013 to understand of the key concepts of MOOCs. The authors classified the research into seven categories (i.e., design, theories, case studies, concept, business model, assessment, and target groups). The study produced a map of MOOCs studies which provide a deep understanding of key concepts in MOOCs for readers who are interested in the MOOCs field.
- Sa'don, Alias, and Ohshima (2014) conducted a systematic literature review by examining 164 papers that are relevant to MOOCs research published from 2008 to 2014. The database included review MOOCs studies. Issues and stances on MOOCs were investigated.
- Liyanagunawardena et al. (2013) accumulated and analyzed 45 studies published from 2008-2012. The review classified the studies into eight

different categories (i.e., introductory, case studies, concept, theories, technology, participant, provider-focused, and other). Quantitative analysis was employed according to publication type, year, and contributors.

The above-mentioned studies revealed that MOOCs research topics are varied (Liyanagunawardena et al., 2013; Raffaghelli et al., 2015) and the trend of MOOCs studies are continually growing (Veletsianos & Shepherdson, 2016).

Researchers have systematically reviewed the use of MOOCs (e.g., Sinclair, Boyatt, Rocks, & Joy, 2015), most of these studies are focused on reviewing learners' motivations and their challenges toward using MOOCs (Hew & Cheung, 2014); however, only a few studies have been examined the factors that affecting MOOCs success. In view of this, reviewing of relevant MOOCs articles is necessary to better explore this phenomenon.

The systematic Review of MOOCs: Exploring critical factors influencing MOOCs success

Literature used the concept of Critical Success Factors (CSFs) to explore the link between the factors that have the highest impact on success of any given system. Bullen and Rockart (1981) identified CSF as a limited number of areas in which the results confirmed that the performance of the institutions, departments or even individuals is successful (Bullen & Rockart, 1981). Frimpon (2012) considered CSFs as the main required variables to achieve successful implementation stages in the organizations, where a successful implementation of any organization depends on these CSFs.

In order to recognize the critical factors that influencing the success of MOOCs in this study, the following four steps have been conducted:

(a) **Step 1: Systematic review of the significant studies in MOOCs literature**:

A systematic review covered journal articles, conference proceedings, theses and dissertations, articles in Web, magazines, and books. The inclusion of secondary sources of information such as websites, magazines, and books were added due to limited peer-reviewed research articles on MOOCs. Additionally, MOOCs has been broadly discussed in the major news media and have been getting increased attention in academic research (Kovanović, Joksimović, Gašević, Siemens, & Hatala, 2015).

The purpose of this part is collecting and analyzing relevant MOOCs literature that have been published between 2012 and 2016 to generate a deep understanding of the critical success factors of MOOCs platforms.

(b) **Step 2: Mapping the success factors, according to Biggs's (1993) 3P model**

Biggs's (1993) 3P model developed to comprehend the certain ecosystem (e.g., MOOCs). This model suggests breaking down the system into modules and examining how these modules relate to each other and how joining the modules effect forming the whole system. Biggs (1993) suggested dividing each learning system into three categories: (i.e., presage, process, and product). Presage is the input factors that related to teaching and learning process (such as learners, instructors, and motivation). Process refers to the environment that related to the presage factors (e.g., pedagogy, instructional design). Product indicates the outcomes of the educational processes (e.g., completion rate).

(c) Step 3: Mapping the success factors according to the current MOOCs classifications by Yousef et al. (2014b) and Hood and Littlejohn (2016) as a reference.

Yousef et al. (2014a) mapped MOOCs studies into seven categories (i.e. concept, design, business model, targets groups, learning theories, case studies, and assessment) while Hood and Littlejohn (2016) explored some of the challenges linked with MOOCs quality using Biggs's (1993) 3P model to determine a variety of factors that can be employed to examine MOOCs quality. These two studies have been used as references to test the reliability for choosing the critical factors that have the significant influence in measuring MOOCs success.

(d) Step 4: Application of Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) process:

In this phase, PRISMA process was employed to search. According to Moher, Liberati, Tetzlaff, and Altman (2009), PRISMA method uses to improve reporting of the systematic review through four phases: in *Identification* phase researching in the databases should be done to define number of articles that obtained according to the study keywords, the next step *Screening* is employed to screen the titles and abstracts for articles that appropriate to the purpose of research, *Eligibility* is used to evaluate all full-text articles for eligibility to be involved in the final review and withdraw the excluded articles, *Included* is the final phase that employed to define the articles included in the systematic review. The result of this phase exposed 102 MOOCs studies that were used for data analysis.

The Critical Success Factors of MOOCs

After conducting a systematic analysis of the relevant studies related to MOOCs success, Biggs's 3P Model (2003) was employed.

Biggs's 3P model

Research into student learning has been interested in establishing relationships between the teaching and learning contexts, learning processes, and learning outcomes. This has been formalized in various versions of the Presage, Process, Product (3P) model which has been adapted for this study. Biggs' (2003) model has three distinct stages that included learning-related factors. *Presage* is the first stage, which occurs before learning started, the second stage is *process* which executed during the learning process, and the third stage is the *product* which related to achieving the learning outcomes (Biggs, 2003). All three components are equally important as they act together in balance as a whole system.

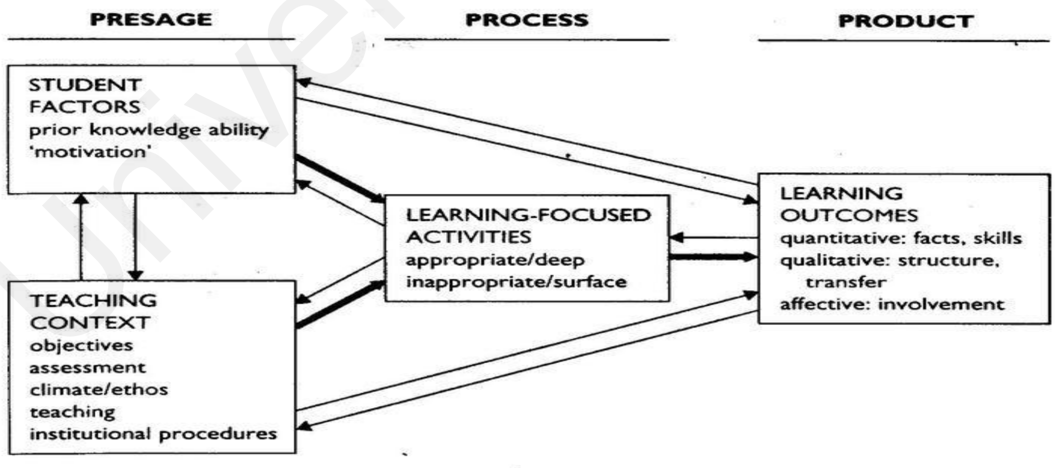

Figure 2.6. Biggs's 3P model

Source: Biggs, J. (2003). *Teaching for quality learning at university* (2 ed.). Berkshire, UK: Open University Press.

The 3P model highlighted the relations between the factors for all stages and indicated that achieving high quality learning outcomes done if the alignment among these factors in all stages occurred. In this model all these factors mutually interact in creating an active system of teaching and learning (Biggs, Kember, & Leung, 2001). Biggs's 3P model displays in Figure 2.6.

Justification of using Biggs' model

In HE context, many teaching and learning researchers are seeking to develop and improve theoretical frameworks for understanding of the learning process. Learning theory is used for designing learning experiences for students. Such a theory is 3P model (Biggs, 1993, 2003) that widely adopted in university learning and teaching programs.

Researchers in the field of HE teaching and learning such as Kandlbinder (2013) highlighted that Biggs model is considered one of the most common references for researchers in the HE fields. Biggs model has been adapted for structuring and organizing various quality measures relevant to HE context (Gibbs, 2010). This was the basis for the selection of this model (Biggs, 1993) in this research.

Biggs' model has been adapted for this current study as a guide for building a framework that measures the critical factors influencing the success of MOOCs in HE context.

In MOOCs context, Hood and Littlejohn (2016) employed Biggs (1993) model to identify the variables of MOOCs quality and the relationships between these variables to explore the measures that are related to MOOCs quality. Moreover, Pilli and Admiraal (2017) conducted a literature review associated with learning outcomes in MOOCs and adapted Biggs (2003) model to identify many proposals for designing open online courses.

Research into student learning has been interested in establishing relationships between the teaching and learning contexts, learning processes, and learning outcomes. This has been formalized in various versions of the Presage, Process, Product (3P) model which has been used for this study. Biggs' (1993) model includes three phases: the *presage* phase occurs before learning executed; the *process* phase happens during learning, and the *product* phase which relates to the learning outcomes (Biggs, 1993). All three components are equally important as they act together in the balance of a whole system.

Biggs' (1993) reveals the interaction between these various phases and indicate that high-quality learning outcomes can be best accomplished when there is alignment among these phases. All these phases and the factors included have jointly interacted to procedure one dynamic system of teaching and learning (Biggs et al., 2001).

In this study Biggs model has been adopted to map the factors influencing MOOCs success that contribute in describing the learning and teaching components that explaining MOOCs learning outcome and identifying the relationship between components.

Biggs's 3P model provides a comprehensive model that highlights how the key factors that selected from published studies are linked and interrelated to learning outcomes via MOOCs. Understanding the critical factors that connected to learning outcomes and the relationships between these factors is important issue in MOOCs context which promote designing of MOOCs effectively, enhance the pedagogical characteristics of MOOCs, as well as offer a strong perception for MOOCs (Glance et al., 2013; Perna et al., 2014).

The critical success factors of MOOCs are classified according to the Biggs's 3P Model which divided the learning system into three categories: presage, process and product as the following:

Presage Variables

Presage is the first phase in the Biggs's 3P Model which occurs before learning started. The presage is the input factors that related teaching and learning process. In the case of this study the presage variables are:

Learners' characteristics

Learner's characteristics are one the of the core factors that highlighted and debated in MOOCs literature. Reviewing MOOCs literature have shown three sub-factors for learners' characteristics which are: demographics, motivation, and interactivity.

Learner demographics

A numerous number of MOOCs studies investigated learner's demographics and indicated that diversity in demographics has a significant effect on learning outcomes.

Christensen et al. (2013) conducted a study in 2013 that included approximately 35,000 participants from 200 countries and 32 MOOCs courses from Coursera platform to examine the demographic backgrounds of MOOCs learners. The finding of this study revealed that the majority of participants had got a well-educated, more than 70% of the sample obtained a bachelor's degree or higher; 40% of the participants were below 30 years old, while less than 10% were above 60 years old. The number of males was significantly more than females, and over than half of learners were employed, while only a small ratio (13.4%) was unemployed or retired.

Ho et al. (2014) examined demographic backgrounds of edX learners, the results of the survey indicated that the majority of learners were male, acquired a higher education, and 27% of the participants lived in the U.S. Yet, the study found significant diversity among learners for certain courses.

The analysis of five MOOCs courses delivered by the FutureLearn platform in University of Leeds (Morris, Hotchkiss, & Swinnerton, 2015) indicated that participants' age has a strong influence on the degree of completion.

Literature related to MOOCs demographics revealed that MOOCs is not attracted the diverse learners as expected, most of MOOCs learners have higher education and acquired well educated, already employed, and from developed countries (Christensen et al., 2013; DeBoer et al., 2014; Ho et al., 2014; Liyanagunawardena, Lundqvist, & Williams, 2015; Morris, 2014). Table 2.7 displays the studies investigated learner demographics factor in MOOCs literature.

Table 2.7

The learner demographics factor in MOOCs literature

Factor	**Resources**
Learner demographics	(Christensen et al., 2013; DeBoer et al., 2014; Ho et al., 2014; Liyanagunawardena, et al., 2015; Morris, 2014; Morris et al., 2015).

Learner's motivation

Many researchers interested in investigating and understanding learners' motivations in MOOCs due to the importance of this factor in improving the online learning processes. Researchers have highlighted that promoting learners' motivations toward using MOOCs is a valuable area in MOOCs researches and should be examined (Liyanagunawardena et al., 2013), motivation toward MOOCs might vary from one course or discipline or even platform to another. Motivation has a significant effect on the learners' enrollment and continued participation in MOOCs systems. Wen, Yang, and Rose (2014) noted that high level of learners' motivation reduces the rate of dropout from MOOCs courses.

MOOCs literature widely examined why thousands of learners enroll MOOCs and indicated that learners have the motivation to enroll in MOOCs for several purposes. According to Davis, Dickens, Leon, del Mar Sanchez Ver, and White (2014), the common reasons for the motivation to register and enroll in MOOCs is that the learners are interested in the specific topic or discipline; they would like to get free learning opportunities, they desire for updating their knowledge, they would like to get the opportunity to enroll and take a class from famous university, or they are interested to collect certifications. Davis et al. (2014) highlighted that the learners are signing up in MOOCs due to their readiness to learn and acquire a new experience.

Hew and Cheung (2014) reported four reasons for signing up in MOOCs which are: a) the learners are interested in new online learning style, b) the learners would like to expand their current knowledge, c) the learners interested in collecting completion certificates, and d) the learners would like to enroll in MOOCs courses which consider as a personal challenge. Other learners are registered in MOOCs just because they are curious about MOOCs courses (Young, 2013).

Morris and Lambe (2014) identified four different kinds of MOOCs learners: *The University Learner* who is seeking to improve their experience, *the Professional Learner* who believe that MOOCs can contribute to their own professional development, *the Self- Directed Learner* who are interested in expanding their own practice, and the *Leisure Learner* who seek for promoting learning to general interest such as providing experiences and wisdom to the learning community.

Belanger and Thornton (2013) suggested four categories for learner motivations toward MOOCs: the learners interested in supporting lifelong learning, they register in MOOCs courses for fun and enjoyment, they find MOOCs courses convenience, and for exploring MOOCs as a new style of online learning. The study concluded that the large majority of learners indicated that they are signing up in MOOCs systems for fun and enjoyment.

Zheng, Rosson, Shih and Carroll (2015) have identified four types of students' motivation in using MOOCs which are: *fulfilling current needs*: some students feel that the courses content in a class do not meet their need; so, they take MOOCs as supplement to their learning, *preparing for the future*: some students signing up for MOOCs because they interested in extending their knowledge and get more information about new topics, other students are joining in MOOCs for *satisfying curiosity*, and *connecting with people*.

Abeer and Miri (2014) highlighted that the learning skills: (learners' linguistic skill in English, communication skills, prior knowledge in the subject matter, open-mindedness, and self-efficacy, and self-regulation) have a significant effect on learners' participation and motivation in learning via MOOCs. Table 2.8 displays the studies investigated motivation factor in MOOCs literature.

Table 2.8

The learner motivation factor in MOOCs literature

Factor	**Resources**
Learner's motivation	(Belanger & Thornton, 2013; Zheng, Rosson, Shih& Carroll, 2015; Abeer and Miri, 2014; Davis et al., 2014; Wen, Yang, and Rose, 2014; Hew & Cheung, 2014; Morris & Lambe, 2014).

Interactivity

Literature pointed out the significant role of interaction in online learning in general (e.g., Moallem, 2015) and specifically, in MOOCs environments. The successful in the MOOCs environment is depend on participants' interaction in MOOCs activities (Khalil & Ebner, 2014). Conole (2016) noted that understanding how the learners interact within the MOOCs environment should be investigated. Kolås, Nordseth, and Hoem (2016) indicated that interactivity in MOOCs enhances learner's engagement in the topic.

In MOOCs platforms the learning materials are often presented in high quality and in a more interactive way that allows the participants to interact with each other through short video lecturers and with thousands of online and discussions forums.

The main learning resource of using MOOCs is video lectures. Li, Verma, Skevi, Zufferey, and Dillenbourg (2014) tested the factors affect learners' perceptions toward video quality in MOOCs. The study indicated that learners' perception toward MOOCs quality positively influenced by synchronicity. Studies also found that learners' perceptions toward video content can be affected by shorter videos that integrated in instructor slides or video quizzes (Guo, Kim, & Rubin, 2014; Mamgain, Sharma, & Goyal, 2014); other study highlighted that the learners' perceptions of MOOCs videos content can be influenced by the ability to vary the video speed and the inclusion of subtitles (Mamgain et al., 2014).

Guo et al. (2014) investigated the effect of video on learners' engagement in MOOCs by analyzing 6.9 million video sessions on four platforms. The study focused on learners' performance in relation to video styles (e.g., if the video contains real audience, if the video was recorded in a live classroom). The finding revealed that shorter videos, talking-head videos for MOOCs instructors are key factors to improve learners' engagement in MOOCs environment.

Other researches explored the absence of learners' interaction in MOOCs video content (e.g., Grunewald et al., 2013). Grunewald et al. (2013) have suggested for incorporating more resources and multimedia content (e.g., visualizations, animations and synchronous communication) to increase students' interaction with videos in MOOCs environment. Table 2.9 displays the studies investigated video interaction factor in MOOCs literature.

Table 2.9

Video interaction factor in MOOCs literature

Factor	**Resources**
Video interaction	(Conole, 2016; Guo, Kim, & Rubin, 2014; Grunewald et al., 2013; Kolås, Nordseth& Hoem, 2016; Li, Verma, Skevi, Zufferey, & Dillenbourg, 2014; Mamgain et al., 2014).

Self-regulated learning in MOOCs

MOOCs is a platform for communication and collaboration where participants exchange information and enhance their knowledge (de Waard et al., 2014). Many MOOCs are designed to encourage learners to regulate their learning by themselves rather than depending on instructors' guidance. The learners in MOOCs can select the learning resources independently and choose their participation in activities (McAuley et al., 2010). This independence requires learners to regulate their learning while using MOOCs. MOOCs learners have to be self-motivated and acquire the ability to regulate their own learning process (García Espinosa, Tenorio Sepúlveda, & Ramírez Montoya, 2015).

Hood, Littlejohn, and Milligan (2015) surveyed 788 learners who took a *Data Science* on a Coursera MOOCs platform. The study focused on learner's self-regulation skills in MOOCs. The finding indicated that the learners who demonstrate high self-regulation skills have better cognitive, affective and behavioral reactions to learning via MOOCs than those showing low self-regulation. Consequently, to achieve MOOCs success, a high level of self-regulated learning (SRL) skills are required, however, at present not much research available on how to support self-regulated learning skills in a MOOCs environment (Onah & Sinclair, 2017).

In the e-learning environment, numerous studies have emphasized on the significant role of self-regulation (Liaw & Huang, 2013; Zhao, 2016) which is considered a key predictor for success in online courses. Barnard, Paton, and Lan (2008); Cho and Kim (2013) revealed a strong association between self-regulation learning and success in e-learning environments. In these studies, vital role of self-regulation on improving learners' behavior in online learning was highlighted. Student success in the e-learning domain needs effective use of the SRL strategies (Barnard-Brak, Paton, & Lan, 2010).

Instructor

Instructor factor has significant implications for learning in MOOCs environment. The experience of the instructors in developing and teaching MOOCs, their motivation toward MOOCs instruction, and the satisfaction of the instructor toward teaching MOOCs have been examined in many MOOCs studies (e.g., Evans & Myrick, 2015; Najafi, Rolheiser, Harrison, & Håklev, 2015). MOOCs instructors are actively contributed to support learners' engagement in the learning process (Hew, 2014). Instructor has a key role in enhancing learner retention in MOOCs (Adamopoulos, 2013). Many MOOCs studies have noted that the participation of instructors in MOOCs activities such as discussion forums contribute in supporting the learners actively and has impact on the learning outcomes positively. For example, Ross, Sinclair, Knox, and Macleod (2014) emphasized the importance of instructors' experiences in MOOCs environment and highlighted the influence of instructor in improving learners' engagement in MOOCs activities. Guo et al. (2014) found that recorded short videos and present of instructor talking head videos were the critical factors for enhancing student engagement in MOOCs.

Abeer and Miri (2014) exposed that learners' participation in MOOCs can be affected by features delivered by instructors which are: the clarity of instructors' explanations, offering the concepts in abstracting manner, instructors supporting and communication, and providing a diversity of assignments.

Adamopoulos (2013) examined 842 participants who registered in 133 courses from 30 universities across six MOOCs platforms to model the factors that predicted self-reported course progress. The analysis suggested that instructor factor had the major effect on the possibility of learner retention in MOOCs; assignments and course material are other factors influencing MOOCs retention.

Roles of MOOCs instructors also have been highlighted in the literature. MOOCs instructors have an active role in processing of teaching and learning; the instructors are accurate the course contents and encourage collaborative learning (Haavind & Sistek-Chandler, 2015). The roles of the instructors in a MOOCs are not as the same as in traditional online courses. In MOOCs, the instructors have to manage all the huge number of participants, cope with diverse cultures, deal with technical difficulties such as lacking technologies in some areas and improving learners interactive by using a variety of teaching methods (Abeer & Miri, 2014).

Ferguson and Whitelock (2014) analyzed six FutureLearn MOOCs courses and outlined the roles of instructors as a *member of the academic community*, *evaluator of students' work*, *course team member*, *emotionally engaged*, *evaluator:* who evaluates the course, *host*, *instructors:* who provide the instructions, *lead educator*, *outliner:* who summarizes the course, the *recommender: who* suggesting resources, course materials, and URLs, *explainer:* who justifies the course structure, and social media user.

Rodriguez (2012) also explored three types of instructors in MOOCs: academic celebrity lecturer, the organizer within a network, and the computerized processes that act as an alternative for lecturer or evaluator.

The role of the instructors in xMOOCs differs from their role in cMOOCs. In xMOOCs, the instructors structured the courses like in the traditional courses. Conversely, in xMOOCs the videos of lectures prepared by the instructors before the lessons, the courses are outlined for the content, the interactions and discussions done via online forums or chat rooms, the assignments commonly including auto-graded quizzes or essays (Belanger & Thornton, 2013).

In cMOOCs, the syllabus provided by instructors, however the course content and the actual course materials are determined by learners during the course (Rodriguez, 2012). The learners are created and developed their own personal learning and networks of peers (Conole, 2016). The cMOOCs instructor acts more like a discussion moderator while the instructor acts as a tutor in xMOOCs (Rodriguez, 2012). Table 2.10 displays the studies investigated the instructor factor in MOOCs literature.

Table 2.10

The instructor factor in MOOCs literature

Factor	**Resources**
Instructor	(Ferguson & Whitelock, 2014; Rodriguez, 2012; Adamopoulos, 2013; Ross et al., 2014; Haavind & Sistek-Chandler, 2015; Najafi, Rolheiser, Harrison & Håklev, 2015; Evans and Myrick, 2015).

Process Variables

In the process phase, the interaction of the process variables with the presage variables is identified, in the case of this study the process variables are:

Pedagogy

A host of studies investigated MOOCs pedagogy (e.g., Ferguson & Sharples, 2014; Toven-Lindsey, Rhoads & Lozano, 2015). Bayne and Ross (2014) determined three key issues related to MOOCs pedagogies which are: the instructors' role in learning via MOOCs, the participation of learners in MOOCs activities, and the evaluation process. Literature highlighted that designing MOOCs courses should be consistent, coherent with clear outline to the pedagogical approach involved (Istrate & Kestens, 2015).

MOOCs absolutely offer a new model in teaching and learning by developing the needed knowledge and skills for the learners in this digital era. It is assumed that the open and massive features of MOOCs offer significant outcomes for education from the learning perspective and social communications (Glance et al., 2013). MOOCs provide new opportunities for online learning to develop the learner-centered pedagogy that allows students to learn from one another through peer support and assignment strategies (Yuan & Powell, 2013). The patterns of engagement in MOOCs are influenced by the pedagogical decisions (Ferguson et al., 2015).

There are two main pedagogical styles in MOOCs: xMOOCs and cMOOCs. To distinguish between these pedagogies, extensive efforts have been made to understand how teaching and learning conducted on these two kinds of MOOCs. Bayne and Ross (2014) revealed that xMOOCs style is developed and supported by institutions, depend on video-lecture contents and automated assessment while the cMOOCs is classified from the social mode of learning. xMOOCs highlight the extension of an existing pedagogical model whereas cMOOCs focus on the connection between learners and the collaborative learning (Yuan & Powell, 2013). The underlying philosophy of cMOOCs indicated the role of learners in developing learning by promoting the interaction of the learners through peer learning process and developing course content, while xMOOCs focus on content consumption (Ahn et al., 2013).

Examining the two main types of MOOCs (cMOOCs and xMOOCs) have been diminished in recent MOOCs literature. Many studies started introducing micro levels of MOOCs due to the contrast between these basic two styles of MOOCs; therefore, some scholars such as Waite et al. (2013) have suggested the concept of 'hybrid MOOCs' to combine the advantages of both cMOOCs and xMOOCs and mediate the contrast between these MOOCs styles (Grunewald et al., 2013). Table 2.11 displays the studies investigated the pedagogy factor in MOOCs literature.

Table 2.11

The pedagogy factor in MOOCs literature

Factor	**Resources**
Pedagogy	(Ahn et al., 2013; Bayne, & Ross, 2014; Ferguson, Clow, Beale, Cooper, Morris, Bayne & Woodgate, 2015; Istrate & Kestens, 2015; Glance, Forsey & Riley, 2013; Toven-Lindsey, Rhoads, & Lozano, 2015; Yuan & Powell, 2013).

Instructional Design

Literature highlighted debates about MOOCs quality (Chen, 2014), and noted that creating effective instructional design require high-quality content resources and activities (Amo, 2013). Designing a MOOCs should be based on participatory that contribute significantly to enhance learning activities, helps in understanding learner diversity and aid to support different learning styles and needs (Margaryan et al., 2015). Designing MOOCs should enable distributing content effectively and supporting meaningful learner interactions (Downes, 2013) besides increasing opportunities for delivering high-quality teaching and learning to a huge number of participants.

Course quality is significant factor that motivate the learners to sign up and involve in MOOCs (Yousef et al., 2014b). Lin, Lin, and Hung (2015) indicated that the quality and richness of course content has a significant effect on accepting the knowledge. Learners have positive feelings toward the inclusion resources that associated with real-world, actual and practical examples (Littlejohn, Hood, Milligan, & Mustain, 2016).

Research recommends the use of quality measures to assess the content and resource design as well as learners' engagement. Munoz-Merino, Ruiperez-Valiente, Alario-Hoyos, Perez-Sanagustin, and Delgado Kloos (2015) for example, proposed applying the Precise Effectiveness Strategy (PES) to assess the effectiveness interactions of the learners with resources and educational activities in MOOCs environment.

Other studies suggested use frameworks to evaluate MOOCs course quality such as iNACOL: *http://www.inacol.org*, OpenUpEd: *http://www.openuped.eu/images/docs/OpenupEd_quality_label_-_Version1_0.pdf;* Quality Matters guide: *https://www.qualitymatters.org*. iNACOL for instance, is a framework that has been expanded to address MOOCs. It consists of numerous standards and rubrics to measure quality course design, programs, and instruction. Table 2.12 displays the studies investigated instructional design factor in MOOCs literature.

Table 2.12

The instructional design factor in MOOCs literature

Factor	**Resources**
Instructional design	(Amo, 2013; Munoz-Merino et al., 2015; Downes, 2013; Littlejohn et al., 2016; Lin et al., 2015; Chen, 2014).

Pattern of engagement

A host of studies has investigated learners' engagements in MOOCs (e.g. Phan, McNeil, & Robin, 2016). Active engagement in MOOCs is a key factor of the success completion of MOOCs (Jung, 2016). Engagement in MOOCs can be defined as the interaction of the learners in instructional materials (e.g., manuscripts, lectures, and assignments), where the data obtained from the interactions should be defined and analyzed through diverse approaches to recognize the trends and the patterns of engagement with materials (e.g. Kizilcec et al., 2013; Veletsianos, Collier, & Schneider, 2015).

Literature revealed that the high dropout rate in MOOCs can be influenced by the complexity and variety of MOOCs participants' perspectives and the patterns of engagement in MOOCs activities (Waite et al., 2013). Thus, understanding the patterns of engagement in MOOCs and participants' perspectives toward their participating in MOOCs activities should be investigated.

Hill (2013) investigated five patterns that represent learners participation in Coursera. The *No-Shows* pattern: where the vast majority of the participants signing up in MOOCs courses but never log into the course. Secondly, *Observers:* The *Observers* are the participants who enroll in the course for observing or interact in few activities at the most; they usually read the content or the discussions but they do not share or submit any assignments. The third pattern is *Drop-Ins:* those participants followed this pattern are participating within selected topics partially without attempting to do all the activities and complete the course. Fourthly, *Passive Participants:* this pattern represents the participants who view a course as content and they supposed to be taught, they take the course and do tests but they do not to actually participate in most of the activities or discussions. Fifthly, few participants followed the *Active Participants* pattern; those participants are fully participating in MOOCs discussions via discussion forums or other forms of discussions and social media. These participants are engaged in the MOOCs content, submitting assignments, and taking quizzes and exams.

Kizilcec et al. (2013) analyzed patterns of learners related to their engagement in MOOCs activities. The study revealed four patterns of engagement within Coursera courses*:* the first pattern is *completing learners which* represent the learners who accomplished most of the MOOCs activities and assessments; *auditing learners* include the learners who partially involved in the MOOCs activities, they watch most of the lecturer videos without completing all the assessment; the third pattern is *disengaging learners* this pattern include all the participants engaging in MOOCs at the beginning of the course and complete some assessments, then their engagement in the course activates reduced by time; and most of MOOCs participants follow *sampling learners* pattern that represent the learners who just explore some course videos without actual engagement.

Milligan et al. (2013) have recognized three distinct types of learner engagement in MOOCs. The *active participants* were highly motivated and actively engaged to continue the course, and have the ability to overcome the challenges. The *passive participation* learners showed their apparent frustration and dissatisfaction with the course, as they were unable to find how to connect with other participants. The third type of learner engagement in MOOCs that found the largest number of participants is *lurking* participants, who actively follow the course but they do not actively engage in connection and discussion with other participants, therefore, they did not contribute to the course and showed lack of confidence. These patterns of engagement were affected by confidence level, prior experiences, and motivation (Milligan et al., 2013).

Anderson, Huttenlocher, Kleinberg, and Leskovec (2014) highlighted five different patterns of engagement in MOOCs. The *Viewers* who primarily watch lectures and submitting few assignments and activities in MOOCs course, the second pattern is

Solvers which include the participants who view few video lectures and submit assignments for a grade. *All-rounders* pattern balance between the participants who watched the video lectures and the others who submitted the assignments. The *Collectors* pattern primarily represents the participants who download the video lectures, submitting few assignments, if any; however, these participants are unlike the *Viewers* as they may or may not be actually watching the video lectures. The last pattern is the *Bystanders* involve the participants who are signing up for the course but their actual engagement in MOOCs activities are rare and show a very low level of participation in MOOCs activates.

Hew (2014) studied the features that encourage students to engage in MOOCs from 965- courses, the students participated across three disciplines. The analysis of data proposed five features that encourage learners to actually engage in MOOCs: 1) the learners encourage engaging in courses that comprise problem-centric learning, 2) that include active learning, 3) that involve interactions with peers, 4) that use helpful course resources, and 5) that have the accessibility and passion of the instructors.

The CEO of FutureLearn, Simon Nelson (2014) has categorized the FutureLearn participants into the following six types: *joiners, learners, active learners, fully participating learners, returning learners, and social learners*. The *joiners* refer to all participants who sign up for the MOOCs course but may or may not complete the course. The *learners* are those who actually visit the course after they join it. The *active learners* are those who go through the course. The *returning learners*, who begin the course, continue to learn for some time, disappear after some time and come back after a week, and then follow the courses. The *fully participating learners* are those who complete the majority of steps and all of the assessment. Finally, the *social learners who* post the comments, view the comments, and learn from the comments.

Veletsianos et al. (2015) interviewed 13 individuals about their experiences in MOOCs to explore learners' experience in MOOCs and to understand the engagement in particular activities in the certain ways. Three activities have been explored: the first activity is *learner interactions in social networks outside of MOOCs platforms:* the learners tend to interact with the other learners before viewings and use social networks, and sometimes attend to study group sessions or interact face-to-face with learners. *Notetaking:* learners tend to take handwritten or digital notes while watching video lectures to be prepared for quizzes and assignments, and *consuming content:* learners use both concentrated time (e.g., when the family are asleep) and dispersed time (e.g., during lunch breaks). Ferguson and Clow (2015) examined four FutureLearn MOOCs and found seven patterns of learner engagement which are *keen completers* who completed all assignments and activity; *late completers, nearly there:* who partially participate in activities, *midway dropouts:* who withdraw from the course after watching some video lecturers; *returners; strong starters; and samplers*. These engagement patterns are influenced by the pedagogical decisions. Table 2.13 display the studies investigated the learner pattern of engagement factor in MOOCs literature.

Table 2.13

The learner pattern of engagement factor in MOOCs literature

Factor	Resources
Learner's pattern engagement	(Phan, McNeil and Robin, 2016; Waite, Mackness, Roberts, and Lovegrove, 2013; Hill, 2013; Anderson, Huttenlocher, Kleinberg & Leskovec, 2014; Kizilcec, Piech, & Schneider, 2013; Ferguson, & Clow, 2015; Nelson, 2014; Milligan, Littlejohn, & Margaryan, 2013; Veletsianos et al., 2015; Hew, 2014).

Assessment

Assessment is a crucial element for determining the future success of MOOCs systems (Yousef et al., 2014b). Evaluating enormous MOOCs learners is one of the key issues that should be highlighted (Sandeen, 2013a). MOOCs platforms often provide assessment models such as online quizzes and peer-assessment (Raposo-Rivas, Martinez-Figueira, & Campos, 2015).

The literature indicated three core types of assessment that are used in evaluating MOOCs learners which are: e-assessment, peer-assessment, and self-assessment.

E-assessment is the preferred assessment in xMOOCs, utilized to measure the performance of learners. The exams in this assessment usually include multiple choice questions grading automatically (Conrad, 2013). It is, however, difficult to use this kind of assessment in exams that involve higher critical thinking skills due to natural of these exams that depend on evaluating learner imagination and creativity (Sandeen, 2013a).

Peer-assessment often used in both cMOOCs and xMOOCs to evaluate learners' works such as (review essays, projects, and team assignments). In these assessments, instead of the automatic grading, the learners grade each other's work and provide suitable feedback. Peer assessment in MOOCs depends on rubrics method for fixed the grading. It is clearly observed that different types of assignments need different assessment rubrics (Sánchez-Vera & PrendesEspinosa, 2015).

Self-assessment is still not widely used in MOOCs. Reflection logs and diaries are some techniques related to self-assessment (Kulkarni et al., 2013). Sandeen (2013a) and Piech et al. (2013) highlighted new self-assessment methods which contain model as tools that allow the learners to access in the answer sheet to check if the marks they scored are following the answers established by the educators. This assessment allows the learners to self-reflect on their achievements.

Evaluation the quality of MOOCs assessments has been discussed by many studies (e.g., Admiraal, Huisman, & Van de Ven, 2014; Clarà & Barberà 2014; Yousef, Wahid, Chatti, Schroeder, & Wosnitza, 2015e). Admiraal, Huisman, and Pilli (2015) conducted a study in three MOOCs platforms to test the quality of the several assessment methods: (i.e., quizzes self-assessment and essay) as peer assessment to explore how these assessments related to the final exams. The finding revealed that completion of weekly quizzes is the core factor for expecting the final exams.

Reilly, Stafford, Williams, and Corliss (2014) highlighted some techniques that could be useful for e-assessment, peer-assessed, or essay-based assessments. The authors examined the assignments in two MOOCs using automated essay scoring (AES). Three groups were assessed: the automated essay scoring -holistic grades, the automated essay scoring -rubric grades and the instructor grades. The result revealed that the instructor grades gave high accurate assessments of the writing assignments when compared to the other two groups. Table 2.14 displays the studies investigated the assessment factor in MOOCs literature.

Table 2.14

The assessment factor in MOOCs literature

Factor	**Resources**
Assessment	(Admiraal, Huisman, & Pilli, 2015; Admiraal, Huisman, & Ven, van de, 2014; Clarà, & Barberà, 2014; Conrad, 2013; Kulkarni, Wei, Le, Chia, Papadopoulos, Cheng, Koller, & Klemmer, 2013; Piech, Huang, Chen, Do, Ng, & Koller, 2013; Raposo-Rivas, Martinez-Figueira, & Campos, 2015; Reilly, Stafford, Williams, and Corliss, 2014; Sandeen, 2013a; Sánchez-Vera & Prendes-Espinosa, 2015; Yousef, Wahid, Chatti, Schroeder, & Wosnitza, 2015e).

Credit

The effect of credit in the MOOCs environment has been investigated extensively in MOOCs literature (Kursun, 2016). Green (2013) noted that delivering credits for MOOCs courses in the universities contexts contribute in acceptance of MOOCs certificates in the real markets. Providing formal course credit can also decrease the dropout rate in MOOCs (El-Hmoudova, 2014).

MOOCs literature presented debate regarding the possibility and the ways that the universities can offer credit for MOOCs courses (Bruff, Fisher, McEwen, & Smith, 2013). The literature exposed that numerous MOOCs platforms offer badges or certificates for attendance or successfully completed the course; however, there is an absence of course credits in MOOCs (Shen & Kuo, 2015). Other studies indicated that the badges or certificates delivered by some MOOCs platforms have a slight value (Jiang et al., 2014); and the certificates for attendance or successful course completion are not accepted as an official credit by most universities (Billington & Fronmueller, 2013).

However, some efforts have recently been prepared to grant credits for MOOCs. For example, MOOCs courses provide credit including legislative proposals in Florida and California (Sandeen, 2013b). American Council on Education has also accepted delivering credit for some of MOOCs courses (Hollands & Tirthali, 2014). Table 2.15 display the studies investigated the credit factor in MOOCs literature.

Table 2.15

The credit factor in MOOCs literature

Factor	Resources
Credit	(Billington & Fronmueller, 2013; Bruff et al., 2013; El-Hmoudova, 2014; Hollands & Tirthali, 2014; Green, 2013; Jiang et al, 2014; Kursun, 2016; Shen& Kuo, 2015; Sandeen, 2013b; Schulze , 2014).

Plagiarism

Copyright has a significant influence on the future success of online learning, particularly in the MOOCs context (Marshall, 2014). The plagiarism has been investigated in many MOOCs studies (e.g., North, Richardson, & North, 2014). Online learning is facing challenges regarding preventing plagiarism and validating the learners' original work. It is important to verify the identity of the participants to ensure that the learner who registered in the course and who participated in the exams is the same person. Further research has developed some techniques that could be used in online learning to check and confirm the personal identity (Sandeen, 2013a) and other technologies to ensure fairness of testing conditions thus, preventing the cheating in MOOCs context (Meyer & Zhu, 2013).

Two approaches are used to prevent the plagiarism and cheating in MOOCs:

Signature Track: this method is used to check and confirm from learner's identity in online tests. Two biometric identity techniques are mainly used in signature track (i.e., face photo and typing patterns). Face photo process required submitting a webcam photo for the participant to compare this photo with the photo obtained from the participant's ID (e.g. passport photo).

On the other hand, the typing patterns method required the participants to create a typing pattern profile by typing a short paragraph to confirm that the participant who submitted the quiz/ assignment is the same participant who registered in signature track. This pattern profile can be used throughout the course (Maas et al., 2014). As stated by Eisenberg (2013), some software can be used in MOOCs to track: mouse clicks, monitors the computer screens and webcams, and analyzes typing patterns. This approach is suitable to be used in MOOCs platforms that include huge participants.

Test centers: The purpose of creating the test centers is to confirm from the reliability of the test. Some MOOCs has created partnerships with test centers to verify learners' identity and to ensure that the learners who enrolled in MOOCs are the same who joined the tests. For example, in 2012 Udacity platforms established a partnership with Pearson VUE in order to increase the test possibilities that permit the learners to join the tests on their international network of test centers (Udacity Blog, 2012). Table 2.16 displays the studies investigated the plagiarism factor in MOOCs literature.

Table 2.16

The plagiarism factor in MOOCs literature

Factor	**Resources**
plagiarism	(Marshall, 2014; Meyer & Zhu, 2013; Maas et al, 2014; Eisenberg, 2013; North, Richardson & North, 2014).

Learning Analytics

According to Hood and Littlejohn (2016), learning analytics provide individual and general information for supporting the learning experiences that encourage the learners and instructors to collaborate and engage in MOOCs activities.

Several studies suggested applying learning analytics tools that contribute in personalizing and fitting MOOCs to learners effectively (Daradoumis, Bassi, Xhafa, & Caballé, 2013; Lackner, Ebner, & Khalil, 2015; Tabba & Medouri, 2013) and to improve the learning experience (Yousef et al., 2014b). Ebben and Murphy (2014) conducted a study that highlighted the growth of learning analytics and its effect on delivering MOOCs to learners. Kay, Reimann, Diebold, and Kummerfeld (2013) recommended that learning analytics create the knowledge and help to understand the learning processes in MOOCs, while Chandrasekaran, Ragupathi, Kan, and Tan (2015) suggested using automated methods to help instructors for providing instant feedback for learners' questions. Table 2.17 displays the studies investigated the learning analytics factor in MOOCs literature.

Table 2.17

The learning analytics factor in MOOCs literature

Factor	Resources
Learning analytics	(Chandrasekaran, Ragupathi, Kan, & Tan, 2015; Daradoumis, Bassi, Xhafa, & Caballe, 2013; Kay, Reimann, Diebold, & Kummerfeld, 2013; Lackner, Ebner & Khalil, 2015; Tabba & Medouri, 2013).

Sustainability

Although MOOCs are providing free courses, creating or supporting MOOCs courses are not free. For example, the cost of developing and delivering each MOOCs course created from the University of Edinburgh -the first UK institution to join the Coursera platform- was approximately 45,000 USD (Parr, 2013); thus, this demonstrates that creating and delivering MOOCs courses are certainly not free. Therefore, it is important to find out methods for generated incomes that cover these costs and solutions for moving MOOCs to become economically sustainable.

Literature indicated that it is the true time to create possible initiatives that could be contributed to build the sustainability of MOOCs. Many studies developed models that would support MOOCs systems. Aparicio, Bacao, and Oliveira (2014) suggested sponsorship and platform data that considered as the key resource of revenue for MOOCs. Burd, Smith, and Reisman (2014) have recommended some approaches that could be appropriated for developing business models for MOOCs such as charging a fee for certification, charging a fee for connecting students with employers, and charging a fee for extra services. Kalman (2014) examined the impact of MOOCs on the business models for universities through variable costs minimization (VCM) method. VCM aimed to allow minor learners to pay for premium services. Dellarocas and van Alstyne (2013) suggested money model for MOOCs. The authors explored the groups who should be paid for MOOCs (e.g., students, sponsors, employers, and other platforms). Table 2.18 displays the studies investigated the sustainability factor in MOOCs literature.

Table 2.18

The sustainability factor in MOOCs literature

Factor	**Resources**
Sustainability	(Parr, 2013; Aparicio, Bacao and Oliveira, 2014; Burd et al., 2014; Kalman, 2014; Dellarocas and van Alstyne, 2013).

Product Variables

The product phase represents the outputs or outcomes variables that form the educational process. In this study the product variables are:

Student completion rate

MOOCs completion is an active area in MOOCs literature; there is a significant volume of published research on this issue (e.g., Fischer, 2014). Studies indicated that MOOCs is facing high dropout rates issue (Alraimi et al., 2015; Clow, 2013) where only about 3-10% of students successfully completing the MOOCs (Jordan, 2014). The dropout rate has often represented the ration obtained from dividing number of the learners who got a certificate by number of learners who registered in a specific course, this formula works for both academic institutions and MOOCs environments.

According to Clow (2013), learners pass through the four stages of dropout in MOOCs which associated with a funnel of participation. The stages are: awareness, registration, activity, and progress. *Awareness* occurs when potential participants learn about the MOOCs. A small fraction of these potential participants then enters the phase of *registration* to signing up and take the course. A small fraction of registrants then engages in the *activity* phase where the participants actively participating in the MOOCs. Finally, only a small fraction of active participants makes *progress* and complete MOOCs courses.

Many studies examined the reasons behind the low retention rates. Zheng et al. (2015) have found many factors related to dropout from MOOCs: some of these factors related to MOOCs course (e.g. difficulty of the course content, heavy workload for submitting all required assignments, extensive course start-up), and other general factors (e.g. lack of time, absence of the stress, deficiency of sense of community, social influence, and learning on demand). Mackness et al. (2013) explored that the direct factors influencing completion of MOOCs are autonomy and learner involvement. Greene, Oswald, and Pomerantz (2015) also investigated participants' characteristics within MOOCs and the factors affecting learner retention. The finding revealed that prior experience of MOOCs and the commitment to finish the course successfully were the most predictors of learner retention.

Khalil and Ebner (2014) conducted a literature review of 42 MOOCs platforms such as Coursera, Edx, and Udacity. The study analyzed the completion rates, documents, content, and class discussions to determine the reasons for student dropout in the MOOCs environment. The study indicated that learners' motivation is the key factor that may influence MOOCs completion. Lack of time to complete homework assignments and quizzes, feelings of isolation and the absence of the interaction in MOOCs are other factors causing student attrition.

Many of MOOCs research studies were examined the reasons of the low retention rates, others conducted case studies by focusing on a single MOOCs (e.g., Freitas, Morgan, & Gibson, 2015), while others looked at the impact of MOOCs upon course completion. Some of these studies revealed that interactions with peers (Jordan, 2014) correlated positively with completion levels. Engle, Mankoff, and Carbrey (2015) studied the link between demographics and social network participation and course completion. Reich (2014) examined the intention of learner toward actual completion of MOOCs courses from nine HarvardX courses. The finding revealed that earning a certificate is a stronger predictor of MOOCs completion (Khalil & Ebner, 2014).

Hone and El Said (2016) conducted a survey on 379 learners who signed up in MOOCs to explore factors affecting MOOCs retention. The study proposed model included constructs related to learners (e.g., perceived effectiveness) course (e.g., course structure), and instructors (e.g., instructor support). The findings revealed that MOOCs course content and interaction with the MOOCs instructor factors were the significant predictors of MOOCs retention. Table 2.19 displays the studies investigated the dropout factor in MOOCs literature.

Table 2.19

The student dropout factor in MOOCs literature

Factor	Resources
Student dropout	(Clow, 2013; Jordan, 2014; Greene, Oswald, & Pomerantz, 2015; Khalil & Ebner, 2014; Hone, & El Said, 2016; Engle, Mankoff, & Carbrey, 2015; Reich, 2014; Freitas, Morgan, & Gibson, 2015; Fischer, 2014; Alraimi et al., 2015; Mackness, Waite, Roberts, & Lovegrove, 2013).

MOOCs quality

Many researchers argued the development of MOOCs issue by investigating of the main factors influencing MOOCs success such as completion rate factor (e.g., Jordan, 2014), assessment factor (e.g., Admiraal et al., 2014), sustainability factor (e.g., Yuan, Powell, & Olivier, 2014) and less studies focused on quality of MOOCs (e.g., Margaryan et al., 2015). MOOCs quality has not yet been clearly defined and needs more investigation (Yousef et al., 2014b). There is a rare of studies that focused on measuring MOOCs quality (Hood & Littlejohn, 2016) and rare are studies examining the critical success factors of MOOCs (Gamage et al., 2015).

MOOCs literature examined MOOCs quality by assessing retention, completion and credit variables. Research literature has indicated the effect of these variable on MOOCs learning, however, other research suggests that focusing on these variable (e.g. completion) are not always the goals of individual learners and not compatible with satisfaction or learners' perceptions of successful learning in MOOCs environment (Littlejohn et al., 2016), thus, the continuous examining only on these factors may be not appropriate for understanding the quality of learning.

Evaluating MOOCs learning needs new methods for measuring the success and the quality (e.g., participants' diversity and their intentions) (Bayne & Ross, 2014).

Measuring MOOCs quality can be achieved in various ways and by examining many constructs. DeBoer, Ho, Stump, and Breslow (2104) suggested that evaluating participation and achievement in MOOCs should be highlighted the various motivations, goal orientations and activities of participants. Other research indicated that measuring of MOOCs quality should be tested through examining the diversity in designs, pedagogies, purposes, roles of instructors, and learner motivations, expectations, and behaviors present in MOOCs (Milligan et al., 2013), thus identifying the dimensions of MOOCs quality (Hood & Littlejohn, 2016). From this view, some studies conducted to measures MOOCs quality that identifies the diversity of learners (Butcher, Hoosen, Uvalić-Trumbić, & Daniel, 2013).

Jansen et al. (2016) suggested that MOOCs quality can be measured from four dimensions: *learner perspective*, *pedagogical framework*, *input elements* (such as content and resources, and assessment), and *outcome measures* (such as attain the certification). For the learner perspective dimension, the literature suggested examining learner satisfaction toward MOOCs (Jansen et al., 2016) and their motivation for joining in a exact MOOCs course (e.g., Hill, 2013).

Hood and Littlejohn (2016) explored the variety of variables that could be valuable in measuring MOOCs quality. The authors adopted Biggs's (1993) 3P model to identify the variables and the relationships between them to explore measures related to MOOCs quality. In the Biggs model, MOOCs is divided into three categories: presage (input factors such as the learners, instructors and platform provider), process (actions factors related to the presage such as instructional design, pedagogies, and learning materials), and product (including the outcomes factors of the educational processes). Table 2.20 displays the studies investigated the MOOCs quality factor in MOOCs literature.

Table 2.20

The MOOCs quality factor in MOOCs literature

Factor	Resources
MOOCs quality	(Butcher et al, 2013; Gamage, Fernando & Perera, 2015; Hood & Littlejohn, 2016; Jansen et al, 2016; Margaryan, Bianco, and Littlejohn, 2015; Yousef et al., 2014b).

Analysis of selected studies

The final result of the systematic review is a set of 102 publications which fit the criteria. The analysis of the studies revealed that 14 critical factors influencing MOOCs success which are: learner demographics, learner motivation, Interactivity, Instructor, Pedagogy, Instructional design, Pattern of engagement, Assessment, Credit, Plagiarism, Learning analytics, Sustainability, Dropout rates, and MOOCs quality. The classification map of factors influencing MOOCs success is displayed in Figure 2.7.

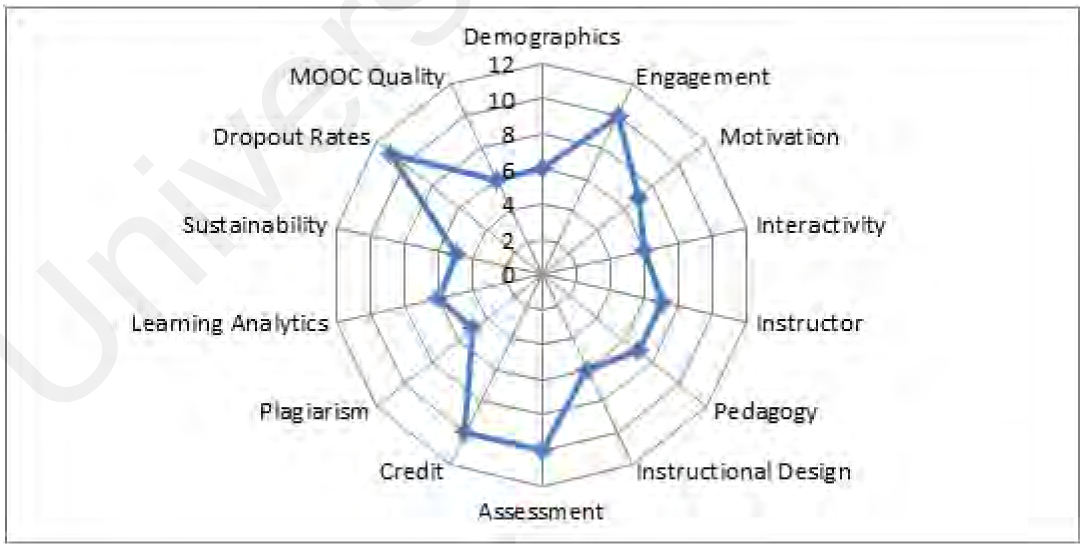

Figure 2.7. Classification Map of factors influencing MOOCs success.

This analysis was conducted from the year 2012 to 2016, MOOCs papers by publication year are shown in Table 2.21.

Table 2.21

MOOCs papers by publication year

	2012	2013	2014	2015	2016
No. of publication	1	32	37	25	7

A total of 102 publications were found in 5 databases, namely: Web of Science, Scopus, Google Scholar, ERIC, and Open Access Journals Search Engine (OAJSE). From this analysis, it is observed that, from 2012 to 2016, Web of Science was the top journal that involved the highest number of publications in relation to MOOCs success (43%), followed by Scopus (21%). ERIC (17%) and Google Scholar (13%) were in third and fourth places, and OAJSE (6%) published the lowest number of publications relating to MOOCs systems success. Figure 2.8 displays distribution of publications by databases.

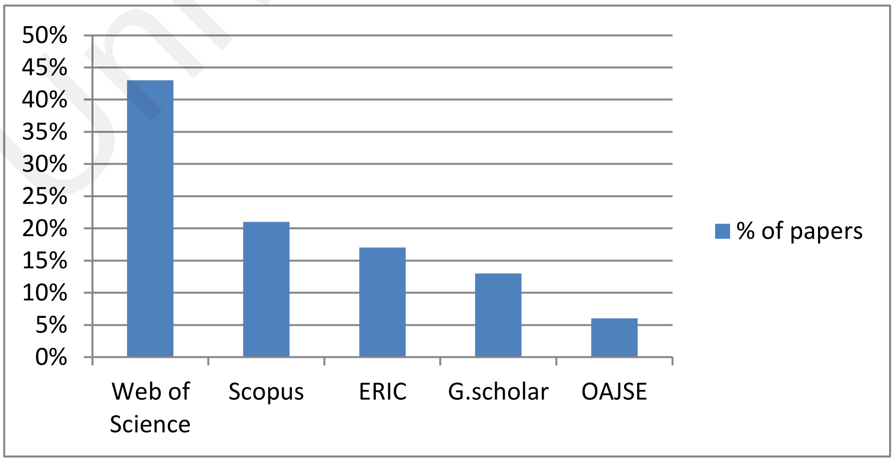

Figure 2.8. Distribution of publications by databases.

From this analysis, it is observed that the top 5 journals in publishing articles related to MOOCs success are: *IRRODL journal, Computers & Education, Distance Education, BJET, and Journal of Online Learning and Teaching.*

The 102 publication papers that included in this study comprised 54 journal articles, 30 conferences, 12 articles in Web magazines, 5 books, and 1 dissertation. Figure 2.9 displays distribution of publications by type of papers which were found to be relevant for this study.

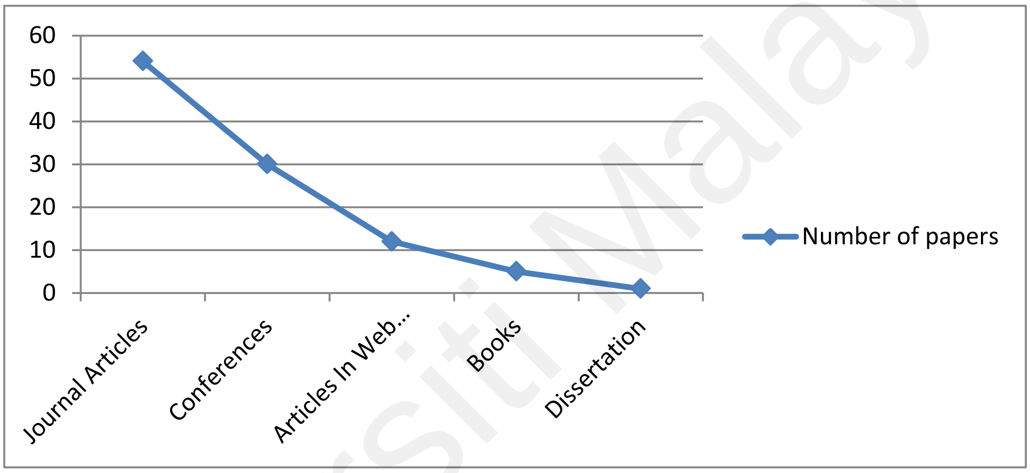

Figure 2.9. Distribution of type of papers that relevant to MOOCs.

Gap in Research

Recently, many MOOCs publications have shown a dramatic increase, however, there is still a large gap in MOOCs research (Loizzo, 2015; Mendoza et al., 2017; Sinclair et al., 2014).

The following gaps have been explored during this review of MOOCs literature.

Lack of studies on students' satisfaction toward MOOCs in higher education

Despite the college students seemingly the large population who affected by the widespread implementation of MOOCs in higher education, and even though ongoing discussions over using MOOCs in higher education (Bates, 2014; Fonseca, 2014), debates rarely pay attention on current college students' satisfaction toward MOOCs. Khalil and Ebner (2013) investigated students' satisfaction toward MOOCs by focusing on the interactions of learners with MOOCs activities. Although learners' interactivity is important factor in MOOCs, examining other significant factors that also could be influenced learners' satisfaction should be investigated. More studies need to be examined for exploring the factors influencing student satisfaction toward MOOCs.

Lack of studies related to the quality of MOOCs

Research on MOOCs during the last years have been focusing on issues such as potential, social, institutional, and marketing while only a few studies highlighted the quality of MOOCs (Yousef et al., 2014b). In particular, rare studies investigated the quality of MOOCs issue (e.g., Margaryan et al., 2015); thus, the factors that influencing MOOCs quality and MOOCs success is not highlighted sufficiently in MOOCs literature (Gamage et al., 2015). Grimmelmann (2014) further suggested that MOOCs studies should be investigated the quality of learning and learners' engagement in MOOCs.

Ehlers, Ossiannilsson and Creelman (2013) suggested that MOOCs quality is a predictor factor for the successful implementation of MOOCs. Despite the importance of quality of course, rare of studies provided generalization finding or measurement items for MOOCs quality. Few studies provided answers regarding how quality should be measured in MOOCs (Hood & Littlejohn, 2016). The quality of MOOCs and the critical success factors influencing MOOCs should be investigated to ensure the success of MOOCs.

Lack of studies related to self-regulated learning (SRL) in MOOCs

In the setting of MOOCs, as other online learning environments, improving SRL skills is significant. The learners need to engage in the online activities independently and actively, they have to identify the effective ways to learn via MOOCs by determining the learning objectives and observing the progress toward achieving these objectives (Kizilcec, Pérez-Sanagustín, & Maldonado, 2016). However, not much research investigated how to support SRL skills in MOOCs success (Onah & Sinclair, 2017). Therefore, this study evaluates the influence of SRL on MOOCs success.

Lack of framework proposed for MOOCs systems success

Several attempts have been made to develop and validate models for examining the success of e-learning systems. For example, the validity of DeLone and McLean's Information System success model has been investigated in many studies in e-learning context (e.g. Lee & Lee, 2008; Ramayah & Lee, 2012). However, there were rare studies involving models or frameworks proposed for MOOCs systems success (Gamage et al., 2015). Thus, there is a need to develop a conceptual framework in MOOCs context for better understanding MOOCs success and identifying the factors that contribute to the success of MOOCs systems.

Lack of studies related to MOOCs in the Malaysia context

MOOCs is new and universal phenomenon that attracted much attention worldwide, especially in areas such as Australia, China, and India (Kovanovic et al., 2015), however, most of MOOCs research activities is still dominated by researchers from North America (Siemens, Gašević, & Dawson, 2015). Thus, future studies should be conducted by other regions, cultures, and institutions for improving MOOCs research from different viewpoints.

Additionally, most studies exposed that the majority of participants in MOOCs were from North America and Europe. Waldrop (2013) conducted a study included 2.9 million learners from 220 countries around the world who signed up in Coursera; the findings revealed that few participants were from Asia and Africa (Clow, 2013; Liyanagunawardena et al., 2013; Stine, 2013). More studies are needed to conduct to explore the participation of MOOCs learners from other countries such as Malaysia.

Five success factors influencing MOOCs success: SQ, IQ, SRQ, CQ and AT

Many of educational institutions that adapted e-learning failed to achieve the best quality criteria which cause the failure of these systems (Bates, 2011). Quality factors (i.e., SQ, IQ, SRQ) have a vital role in increasing the success of e-learning systems (Musa & Othman, 2012). Malik (2010) indicated that quality of the infrastructure and technological tools contribute to increase learners' satisfaction toward the e-learning systems. Grimmelmann (2014) further noted that more studies should be examined the quality of learning and engagement in MOOCs.

Students' characteristic is another factor that improve satisfaction and contribute in successful implementation of e-learning systems (Taha, 2014). Studies indicated that the success in online courses is positively influenced by students' attitudes (e.g., Hammoud, 2010; Presley &Presley, 2009). However, the debates and critiques about using MOOCs in higher education seldom pay attention on how college students view MOOCs as a source of learning and to what degree their perceptions toward using MOOCs influence the learning process (Cole & Timmerman, 2015). Much studies investigated students' participation in MOOCs (e.g. Kizilcec et al., 2013;

Veletsianos, Collier, & Schneider, 2015); but they did not provide evidence regarding how students actually interact with MOOCs.

On the other hand, course quality is considered as one of the main factors that influence adoption and implementation technologies in e-learning systems (Taha, 2014). The growing demands on the flexible education programs have introduced recently; hence, the expectations toward the quality of the instruction and the effectiveness of the educational outcomes in e-learning has been increased (Gandema & Brown, 2012). However, Cole and Timmerman (2015) indicated that many students feel that the information available in MOOCs is not as the same quality as the traditional college course. Other studies noted that the actual students' collaboration and participation in the MOOCs courses is insufficient (e.g. Ardis & Henderson, 2012; Hew & Cheung, 2014). Adamopoulos (2013) for example, highlighted that course material has a significant impact on MOOCs retention, however, the direct measure for MOOCs content could not be provided. Rai and Chunrao (2016) also argued that quality of course is considered a critical success factor in MOOCs. Therefore, examining the influence of course quality factor on MOOCs success is important.

In sum, the impact of MOOCs on learners is unclear, which represents a gap in research data that needs to be filled (Claffey, 2015). Therefore, the influence of the 5-success factors on learning using MOOCs should be examined

The relationship between the 5-success factors and learners' satisfaction

The 5-success factors are important for predicting successful implementation of MOOCs (e.g. Ehlers et al., 2013). However, debates around MOOCs during the last years have been highlighted issues related to institutions, marketing, relevance and potential of MOOCs while few discussions conducted to examine the quality of designing MOOCs (Yousef, Chatti, Schroeder, & Wosnitza, 2014b). The research that measures the quality of MOOCs is rare (Hood & Littlejohn, 2016). Gamage et al. (2015) for example, examined 4745 peer-reviewed papers conducted from 2012 to 2015 to determine the factors that impact MOOCs quality. The results of this systematic review revealed that only 26 publications were high relevance to the quality of MOOCs. Of these 26 only 7 papers provided models for the factors influencing the quality of MOOCs and three publications only provided empirical evidence regarding evaluate MOOCs quality. Therefore, there is a need to examine how the quality factors influence the successful implementation of MOOCs by examining the relationships between system quality, information quality, service quality and satisfaction.

Several e-learning studies suggest that systems quality has an impact on users' satisfaction (e.g. Adeyinka & Mutula, 2010; Ramayah & Lee, 2012). If learners find that MOOC provide access to the contents in an easy way, that MOOCs platform are well structured, and that they can easily navigate in the MOOCs, their satisfaction toward MOOCs will be increased, thus this study hypothesizes that system quality influences satisfaction significantly.

Further, when learners perceive that the quality of the information provided via MOOCs are accuracy, relevance, and sufficiency then their satisfaction will be improved. Information quality is studied by several e-learning studies that reported significant relationships between information quality and satisfaction (e.g. Lee & Lee, 2008; Ramayah & Lee, 2012). This study also hypothesizes that service quality influences satisfaction significantly (Petter & Fruhling, 2011; Ramayah & Lee, 2012).

On the other hand, the current study assumed that positive attitude toward using MOOCs lead to high satisfaction. E-learning literature supported this hypothesis that found that attitude has significantly affects satisfaction ((Malik, 2010) thus, successful implementation of e-learning system is influenced by their attitude toward e-learning (Hammoud, 2010).

The relationship between course quality and satisfaction is also investigated. Course quality is represented as the reliability of the available contents. MOOC contents (e.g. videos, slides, forums, links) should be understandable and adequate to learners 'needs. Thus, this study supposed that course quality influence satisfaction positively as supported by e-learning studies (e.g. Owens & Price, 2010).

The relationship between satisfaction and SRL

MOOCs are a platform for collaboration where learners can exchange information and improve their learning experience (de Waard et al., 2014). MOOCs are intended to promote learners to regulate their learning rather than depending on the guidance of instructors. The learners in MOOCs can choice the learning resources and participate in activities independently (McAuley et al., 2010). This independence requires learners to regulate their learning while using MOOCs. MOOCs learners have to be self-motivated and acquire the ability to regulate their own learning process (Albelbisi & Yusop, 2019; García Espinosa, Tenorio Sepúlveda, & Ramírez Montoya, 2015).

Hood, Littlejohn, and Milligan (2015) surveyed 788 learners who took a *Data Science* on a Coursera MOOCs platform. The study focused on learner's self-regulation skills in MOOCs. The finding indicated that the learners who demonstrate high self-regulation skills have better cognitive, affective and behavioral reactions to learning via MOOCs than those showing low self-regulation. Consequently, to achieve MOOCs success, a high level of SRL skills is required, however, currently not much study conducted on supporting SRL skills in a MOOCs environment (Albelbisi, 2019; Onah & Sinclair, 2017). Thus, this study investigates the relationship between satisfaction and SRL, and hypothesizes that high satisfaction lead to improve SRL skills in MOOCs environment.

The relationship between the 5-success factors and SRL

In the e-learning environment, numerous studies have emphasized on the significant role of self-regulation (Liaw & Huang, 2013; Zhao, 2016) which is considered a key predictor for success in online courses. Cho and Kim (2013); Barnard, Paton, and Lan (2008) revealed a strong association between self-regulation learning and success in e-learning environments. In these studies, vital role of self-regulation on improving learners' behavior in online learning was highlighted.

Success in e-learning needs active use to the SRL strategies (Barnard-Brak, Paton, & Lan, 2010). Unfortunately, research has shown that participants who involved in online learning settings have lack of SRL skills (Harrell, 2008; Hu & Gramling, 2009). Many MOOCs learners are struggling for regulating their learning while using MOOCs (Milligan et al., 2013) and not all of them have the motivation to regulate their learning effectively in an online learning context. Thus, those low SRL skills learners do not have the capability to manage their learning and usually they face difficulties throughout regulate their own online learning and thus, they fail in online learning (Hsu, Ching, Mathews, & Carr Chellman, 2009; Li & Irby 2008; Thomas & Gadbois, 2007). You and Kang (2014) for example, indicated that lack of SRL skills in e-learning environment has many disadvantages such as consume more time to complete assignments which cause late in delivering coursework. Additional, Harrell

(2008) noted that low levels of SRL lead to increase in withdrawal and frustration in online learning settings, therefore lead to poor learners' academic performance.

Literature indicated the significance of SRL skills for success in the e-learning field. Online courses found to be favorable to students who have high levels of SRL skills (You & Kang, 2014). Thus, this study tries to fill the gap in literature by determining the influence of the 5-success factors on SRL skills. Due to the importance of SRL skill in e-learning system success, this study examines SRL as the dependent variable and highlight the relationships between (SQ, IQ, SRQ, CQ, AT, SAT) factors and SRL in MOOCs environment.

Satisfaction of using MOOC mediates relationship between the 5-success factor. The research highlighted that vital role of satisfaction in predicting e-learning system success (DeLone & McLean model, 1992; Wu, Tennyson, & Hsia, 2010) and success of MOOCs (Kituyi & Tusubira, 2013). Most empirical e-learning studies have demonstrated that system quality, information quality, and service quality system was strong indicators of satisfaction, for this reason, lead to system success (Liaw & Huang, 2013). In MOOCs literature, many studies suggested examining learner satisfaction toward MOOCs for evaluating MOOCs quality (e.g. Jansen, Rosewell, & Kear, 2016).

In this study, satisfaction is examined based on learners' positive experiences toward the use of MOOC. This study examines learners' satisfaction as a central factor to understand MOOCs success by testing the direct relationships between the 5 success factors (system quality, information quality, service quality, attitude, course quality) and satisfaction as supported by previous e-learning and MOOCs studies (e.g. Liaw & Huang, 2013; Zhao, 2016). Satisfaction plays as mediation role between the 5 success factors and SRL. Satisfaction is studied as a predictor of individual outcomes of SRL skills (Zhao, 2016).

Summary

Chapter 2 highlighted the literature review related to MOOCs systems success. An unstructured review followed by systematic review highlighted the most significant studies in this area, this review used as a basis for classifying the critical factors influencing MOOCs success. The analysis revealed seven critical factors influencing MOOCs success which are: System quality, information quality, service quality, student attitude, course quality, self-regulated learning, and satisfaction. System quality factor represents the desirable performance characteristics of a MOOCs. Information quality factor represents the quality and relevance of the information offered by MOOCs. Service quality represents the guidelines or the supporting documents delivered by MOOCs. Attitude measures by a set of beliefs that indicate whether MOOCs is good or bad. Satisfaction represents the user's level of expectation toward using of MOOCs. While self-regulated learning (SRL) represents the way that the learners participate in the activities and make decisions about their learning in MOOCs. The relationships between these factors were also highlighted.

CHAPTER 3

THEORETICAL FRAMEWORK AND MODEL DEVELOPMENT

Introduction

This chapter investigates the procedure for developing the proposed model for measuring MOOCs system success. Discussions on the approaches in examining the success of e-learning will be presented, followed by discussions on the theoretical frameworks adapted of this study. Finally, the proposed model for examining MOOCs success is presented and further explained.

Approaches in Examining the Success of E-Learning System

Evaluation the success of e-learning systems has been classified into four main approaches:

1. User or learner satisfaction approach;
2. The DeLone and McLean approach;
3. Self-regulated learning approach; and
4. E-learning quality approach (Ozkan & Koseler, 2009).

The following sections highlight the approaches used for assessing e-learning systems success:

Learner's Satisfaction Approach

Satisfaction factor has been examined in many studies related to online learning outcomes (e.g., Gunawardena, Linder-VanBerschot, LaPointe, & Rao, 2010). This factor has been received a significant attention and considered as the main predictor for measuring the success of the e-learning (Alsabawy et al., 2012; Wu et al., 2010). Many information system studies also accepted satisfaction as a key factor for assessing the success of these systems, (e.g., Gudigantala, Song, & Jones, 2010; Ilias, Abd Razak, Rahman, & Yasoa, 2009; Liaw, 2008). The literature justified the use of satisfaction factor in gauging systems success by highlighting the high degree of validity and reliability measurement for this factor, and the low quality of the other measures (DeLone & McLean, 1992).

Satisfaction is considered as the critical factor that contributes in developing the e-learning experience and e-learning success. Many researches aimed to examine learner satisfaction as main factor and tried to identify the factors influencing its effect (for example, Aparicio, Bacao, & Oliveira, 2016; Chang, Liu, & Hwang, 2011; Lin & Chen, 2012; Weng, Tsai, & Weng, 2015; Zhao, 2016).

DeLone and McLean (D & M) IS Success Model Approach

Researchers have shown strong interest in the D & M model, as it has been cited in more than 300 publications that investigated the information system success (Petter et al., 2008). Reviewing of literature on IS success exposed the significant role of D&M model in IS success domain particularly (Petter et al., 2008) and across a broad range of contexts (Petter & McLean, 2009).

D & M success model is believed to be one of the most IS models that can be employed to measure the success of e-learning systems (Alsabawy et al., 2011). Numerous studies emphasized that the D & M model (or specific factors) is reliable and valid to examine the success of e-learning (e.g., Alsabawy et al., 2011; Freeze et al., 2010; Hassanzadeh et al., 2012; Masrek, Jamaludin, & Mukhtar, 2010; Tella, 2011; Wang & Chiu, 2011).

Self-regulated learning (SRL) Approach

In the e-learning context, there are numerous studies conducted to identify the key factors improve the success of e-learning systems. Among the factors examined, SRL factor has achieved a great attention in online learning literature (Barnard et al., 2008; Cho & Kim, 2013; Zhao, 2016).

Many studies indicated the influence of self-regulation on promoting the online learning success and confirmed that self-regulation is the most important factor that affects e-learning success (Liaw & Huang, 2013; Zhao, 2016). SRL skills have the ability to support engagement in online learning context and help to improve the learning strategies. SRL skills also enhance learners' capability to manage the time efficiently, explore aid from instructors or peers, and require the necessacery skills that reflect their own learning (You & Kang, 2014).

Literature also revealed that the learners who have the level of high SRL skills are more independent learners in adaptable their learning thus, their chance to succeed in learning online is larger (Hsu et al., 2009; Li & Irby, 2008)

In MOOCs literature indicated that MOOCs has significant ability to support SRL skills (Littlejohn et al., 2016). MOOCs learners with high SRL skills are showed more ability to engage in learning via MOOC as they can set the learning objectives individually, identify the effective learning techniques, and monitor the processes to achieve their objectives (Kizilcec, et al., 2016). MOOCs learners with high SRL skills are independent and active participants in the learning process.

E-learning Quality Approach

Despite the significant growth in using e-learning systems and the extensive spread of acceptance and implementation of these systems in many educational institutions and organizations, e-learning quality is still being considered as one of the crucial challenges that influence the use and adoption of e-learning effectively (Jung, Latchem, & Herrington, 2012; Ossiannilsson, 2012). Thus, introducing proposed frameworks related to e-learning quality and providing methods and criteria for examining of e-learning quality is considered a critical issue in e-learning systems success.

For example, Abdellatief, Sultan, Jabar, and Abdullah (2011) proposed a new method for evaluating e-learning system. This technique examines the developer's perspective toward e-learning systems to explore the main characteristics that could be effective in measuring e-learning quality. The study revealed that service content, information technology, and system functionality are the key factors for measuring e-learning quality. Moreover, Selim (2007) highlighted the importance of service quality factor in measuring learner acceptance and usage of e-learning systems.

Theoretical Frameworks

This current study attempts to identify the critical factors that influencing MOOCs success in higher education and intends to propose valid and reliable model to measure its success. The following theoretical frameworks, that are: (1) DeLone and McLean (D & M) IS success model, (2) Self-regulated learning theory, and (3) Perceived e-learner satisfaction model. There frameworks have become the main references in the identification and development of the proposed model.

DeLone and McLean (D & M) IS Success Model

D & M model is believed to be one of the main models for evaluating the success of e-learning models.

DeLone and McLean model (D & M) (1992)

The initial D & M model (1992) highlighted that IS success include different dimensions that affect each other. IS success often measure the degree of learners' acceptance and usage of the system which reflects the system success (DeLone & McLean, 1992). Developing D & M (1992) model was based on a taxonomy that includes many measures that have been employed to gauge IS system success (Pérez-Mira, 2010).

Five main factors and the relationships between these factors have been incorporated into the D&M model (1992). The factors include processing system quality, information system quality, system users, user satisfaction, and the effect of the system on learners or organizations. The model highlighted the positive effect of SQ and IQ on satisfaction and system user, these relations have affected the individual impact which finally influence the organizational impact.

DeLone & McLean model (2003)

Revised the D & M (1992) model has been added service quality factor to the model and replaced the individual impact and organizational impact dimensions with the net benefits dimension thus, the model has been updated and D & M (2003) model has been introduced. The model hypothesized that the information quality, system quality, and service quality factors have positive effect on user satisfaction and systems use/intention to use. Evaluating system success using D&M model is not limited to measure the existing IS model only; the updated version expanded the use of the model to include all new and developing systems. Figure 3.1 displays D & M (2003) model.

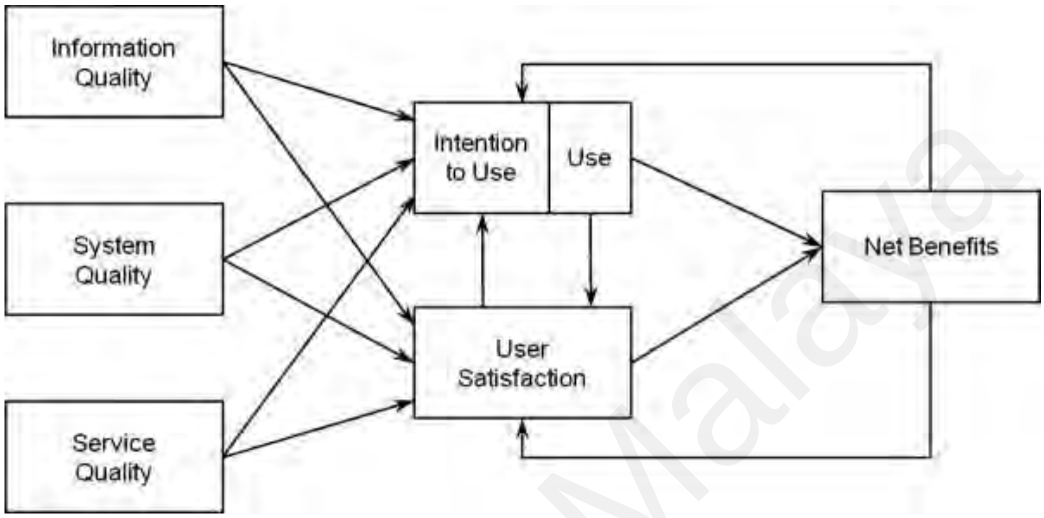

Figure 3.1. DeLone & McLean (2003) model.

Source: DeLone, W. H., & McLean, E. R. (2003). The DeLone and McLean model of information systems success: A ten-year update. *Journal of Management Information Systems, 19*(4), 9-30.

In Malaysia context, Ramayah and Lee (2012) proposed a model based on D&M (2003) to examine learner perspective of 250 undergraduate students from a public university in Penang, Malaysia, to explore e-learning system success issue. Ramayah and Lee (2012) study used the same factors of D&M model (2003) however; the items of each factor have been modified to be relevant to e-learning context. The criteria of model validity were achieved.

Test of the Validity of DeLone and McLean (D & M) Model

Literature indicated that serious efforts have been done and many studies have been conducted to check the reliability and the validity of D & M model (e.g., Lee & Lee, 2008; Ramayah & Lee, 2012; Raspopovic, Jankulovic, Runic, & Lucic, 2014).

Most of these studies contributed in testing the validity of D & M model (e.g. Freeze, Alshare, Lane, & Wen, 2010; Hassanzadeh, Kanaani, & Elahi, 2012; Tella, 2011; Wang & Chiu, 2011). Some studies such as Ramayah and Lee (2012) adopted full D & M model, while other such as Chiu, Chiu, and Chang (2007) extended the D& M model by adding other external factors for deep understanding the system's success.

Yi, Liao, Huang, and Hwang, (2009) developed a model based on D&M (2003) model to examine mobile learning systems success. Some amendments have been conducted on the D & M model such as replacing user system factor with perceived value. Net benefits factor also has been replaced by user intention to reuse the mobile learning systems. Testing of the model revealed that user satisfaction is positively influenced by information quality and intention to reuse mobile learning systems is determined by perceived value and user satisfaction. However, the finding indicated that there is non-significant relationship found between (system quality and perceived value factors) and satisfaction.

Further, some studies extended the D &M model (2003) by incorporating different factors that could be affected user satisfaction and the intention of using e-learning systems. For instance, Chiu et al. (2007) proposed a model by adapting the D & M model and integrated fairness characteristics (e.g., distributed fairness, procedural fairness, and interactional fairness). The model hypothesized that all of the three fairness factors significantly influence both satisfaction and continuance intention to use the e-learning system. The validity of the model has been achieved; the measurement and structural model were satisfactory.

Klobas and McGill (2010) also expanded the D & M model by adding new factors to determine the effect of involvement factor on the Learning Management System (LMS) success. The new proposed model included two factors: the role of learners and the role of instructors involved on the e-learning system. The findings of Klobas and McGill (2010) study revealed that students' perceptions toward LMS quality predicted their satisfaction. The study concluded that introducing quality factors and individual characteristics to the model can improve the significant correlation between involvement and user satisfaction.

Self-regulated Learning Theory

Self-regulation is the ability of learners to manage and assess their own learning methods (Matuga, 2009). Zimmerman and Moylan (2009) noted that SRL theory refers to learners' performing in the learning process that comprises three phases; forethought, performance, and self- reflection.

Figure 3.2 displays Zimmerman's (2009) cyclical model of self-regulated learning that explain how these stages of self-regulation interact with each other.

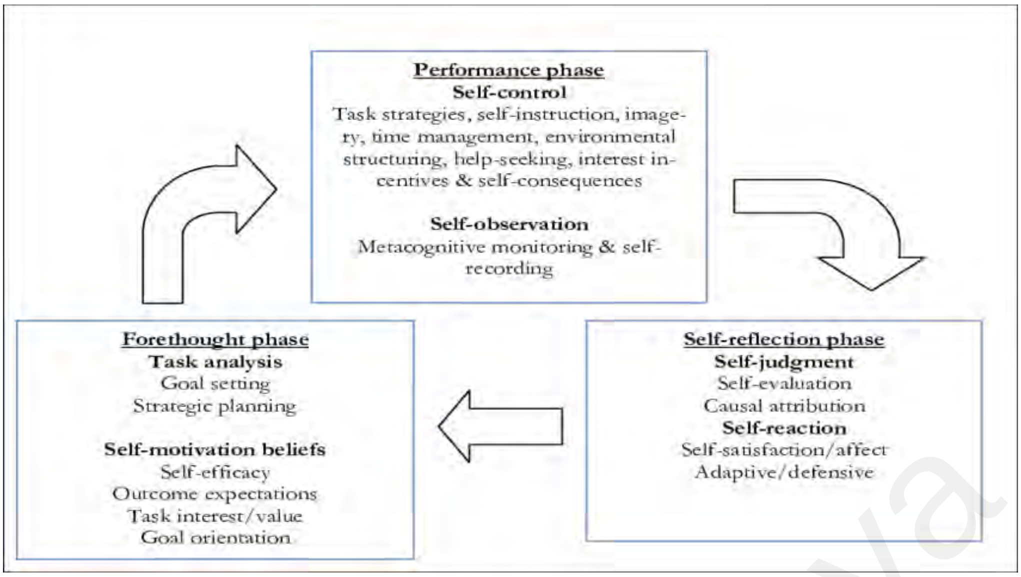

Figure 3.2. Zimmerman's cyclical model of self-regulated learning

Source: Zimmerman, B. J., & Moylan, A. R. (2009). Self-regulation: Where metacognition and motivation intersect. *Handbook of metacognition in education*, 299-315.

In the *forethought* phase, the learners set learning goals, analyze the tasks, and plan how to activate the learning strategies. In the *performance* phase, the learners execute the tasks via monitoring learning progress, and use of the self-control strategies to be more engaged in achieving the tasks (such as taking notes while viewing videos). Finally, in the *self-reflection* phase, learners actually evaluate how they have performed the task, making acknowledgments about their success or failure in their learning. These acknowledgments make self-reactions that can positively or negatively affect how the learners approach the task in advanced performances.

According to Fontana, Milligan, Littlejohn, and Margaryan (2015), the sub-processes of SRL theory are range from cognitive factors (e.g., motivation, self-reflection, and self-evaluation) to behavioral factors (e.g., learning strategies, goal-setting) to cognitive factors.

Researchers suggested that use advanced SRL strategies through learning process such as (organize learning materials, manage study time, use mnemonics, and self-evaluation) have an important effect on creating knowledge for meaning learning and accomplishing a deep processing of materials (Jairam & Kiewra, 2010; Matuga, 2009).

Moreover, multiple studies have shown that higher self-regulation level help students to apply metacognitive and resource management strategies that contribute to improve the academic achievement in online environments (Bannert & Mengelkamp, 2013; Taub, Azevedo, Bouchet, & Khosravifar, 2014).

Three main self-regulated earning skills that the learners should have in e-learning settings which are (1) motivation: that related to self-efficacy and goal orientation; (2) time and environment management; and (3) help-seeking (Sharma, Dick, Chin, & Land, 2007).

Improving SRL skills and other abilities such as task strategies, environment structuring, and self-evaluation (Barnard et al., 2009) promotes deep learning process and activates generating knowledge that influences e-learning outcomes and increases the percentage of system success.

Due to the importance of SRL skills in supporting e-learning success, current study adopted the SRL factor with the following sub-factors of SRL: (goal setting, time management, task strategies, environment structuring, self-evaluation, and help-seeking). All these sub-factors of SRL have a substantial influence on evaluating learners' SRL in a MOOCs context (Onah & Sinclair, 2017).

Perceived E-Learner Satisfaction Model

The e-learner satisfaction framework was developed by Sun et al. (2008) as an essential model for evaluating e-learner satisfaction. The model aimed to determine the key factors that influencing satisfaction of learners in e-learning domain thus, exploring the successful design and operation of e-learning. Perceived e-learner satisfaction model developed by Sun et al. (2008) is contributed in providing information that explaining the significance of the critical success factors (CSFs) in the e-learning field. Accordingly, the model is established based on the six dimensions and thirteen sub-dimensions:

(1) Learner dimension with three sub-dimensions such as learner attitude,

(2) Instructor dimension with two sub-dimensions such as instructor attitude,

(3) Course dimension with two sub-dimensions such as course quality,

(4) Technology dimension with two sub-dimensions such as internet quality,

(5) Design dimension with two sub-dimensions such as perceived ease of use, and

(6) Environment dimension with two sub-dimensions such as perceived interaction with others.

The significance of the e-learner satisfaction model by Sun et al. (2008) is the contribution in developing a holistic model that combined the critical factors that determine the success of e-learning and highlighted the relationship between these factors to examine e-learning success. The model also highlighted the role of e-learning institutions in supporting learner satisfaction. Figure3.3 displays the Sun et al. (2008) framework.

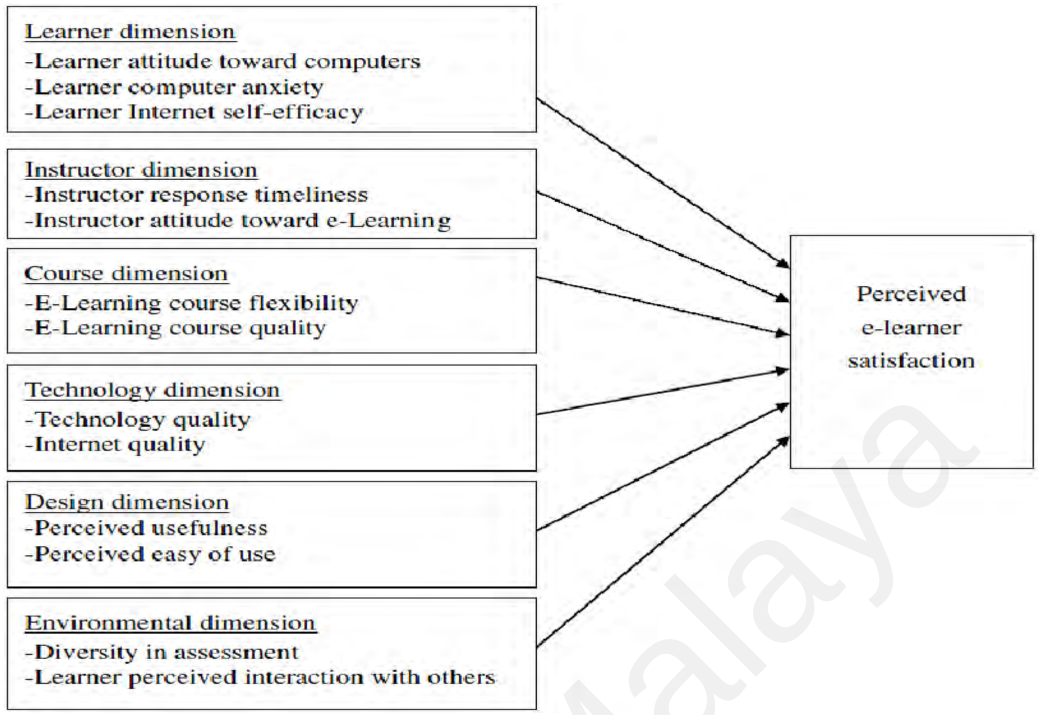

Figure 3.3. Perceived e-learner satisfaction model (Sun et al., 2008)

Source: Sun, P., Tasi, R. J., Finger, G., & Chen, Y. (2008). What drives a successful e- Learning? An empirical investigation of the critical factors influencing learner satisfaction. *Computers & Education, 50*(4), 1183-1202.

The validity of the e-learner satisfaction framework developed by Sun et al. (2008) had been established by interviewed various experienced learners who enrolled in the e-learning environment. Then the learners' interview comments used to develop the research questionnaire. The findings revealed seven key factors affected students' satisfaction in e-learning which are: instructor attitude toward e-learning, learner computer anxiety, e-learning course flexibility and course quality, the diversity in assessments, and perceived ease of use and usefulness.

Taha (2014) has been proposed a framework to investigate the key factors affected the implementation and development of e-learning. Taha (2014) model integrated the factors that have a significant impact on the success of e-learning. The study examined the influence of the student and instructor characteristics, technology, design and content factors. The findings exposed that the student attitudes and quality of content are the most important factors influencing the success of e-learning in addition to other factors such as instructors' and students' perceptions.

In this study, two key factors have been added to the study proposed model: learner attitude and course quality factors. The importance of these factors has been confirmed in previous e-learning studies such as (Sun et al., 2008; Taha, 2014).

To summarize, all the above-mentioned frameworks have the significant contribution in determining the factors that affecting e-learning success in educational settings thus, these studies and frameworks have been utilized as a base and guide for identifying the factors that influencing MOOCs success and consequently, developing a framework based on these factors.

The Link between D&M IS Model and Learning Quality

Many studies that investigated the quality and the success of e-learning have been adopted D & M (2003) IS model as the main framework to identify the factors that influencing e-learning success. Most of these studies examined the success of the e-learning systems based on D & M (2003) factors such as information quality, system quality, service quality, use/intention to use, user satisfaction, and net benefits. However, the features of e-learning are not the same as IS and e-commerce systems, in addition, evaluating e-learning success focusing only on these factors maybe not suitable to understand e-learning system success issue.

In the e-learning environment, some factors -are what educators concerned about- that related to the educational effects (i.e., learner performance) should be considered as main dimensions when examining e-learning system success (Tella, 2011; Zhao, 2016). One of the main factors that could be affecting learner performance is self-regulation. Zimmerman (2008) indicated that host of studies on learning and performance provided evidence about the significant role of SRL skills in promoting any learning context whether it traditional or online studies. It has been known that the learners with high SRL skills in online context have a significant ability to achieve better academic performance compared to the learners who exhibit less or non-ability to regulate their learning (Barnard-Brak et al., 2010). Students who showed high self-regulated learning ability are performing effectively in online courses (You & Kang, 2014).

Consequently, some dimensions of the D&M (2003) model success should be reformed, and some factors within the model should be revised. Some relations between the factors also must be renewed to improve the model to be suitable and relevant to evaluate the success of e-learning systems.

Therefore, in the current study which aims to examine the critical factors influencing MOOCs system; some modification has been done into D&M (2003) model to reflect the educational settings. The major changing is adding three factors which are: students ‘attitude, course quality and self-regulated learning to assess learner perspective toward MOOCs and evaluate the influence of these factors on MOOCs success.

The evaluation of D&M model is mainly based on technical perspectives, thus adding some factors such as self-regulated learning, student attitude, and course quality factors which come from educational views are important to highlight the viewpoints of educational and social psychologies. Consequently, the D& M model with the three learning factors: (attitude, course quality, and self-regulated learning) enhance and complement each other as basics for creating a holistic framework to gauge the factors influencing MOOCs success in the HE context.

The proposed Model

The proposed model of this study has been developed based on previously mentioned models and theories. The model aims to evaluate the MOOCs system success. In more specific, the proposed model is established to determine the key factors that have the significant influence in examining the success of MOOCs systems in the higher education context.

Procedures for Developing the Proposed Model

Developing conceptual framework for measuring the critical factors that influencing of MOOCs systems success in high education is based on the following stages:

Step 1: Review for MOOCs Research

As mentioned earlier, this study reviewed the literature on MOOCs studies systematically. This review aimed to provide a comprehensive overview of the critical factors influencing MOOCs systems success. Chapter 2 displays details of the systematic review of MOOCs research within the period of 2012 and 2016. Relevant studies have been analyzed and accumulated to explore the key success factors of MOOCs in HE context.

Moreover, this study conducted an unstructured review of the literature related to the factors influencing the success of MOOCs and e-learning. We expanded our review to include factors from studies with empirical evidence that explored system success from e-learning context (e.g., Zhao, 2016) due to scant research on critical success factors affecting MOOCs context.

For example, McGill, Klobas, and Renzi (2014) reviewed 74 studies (64 projects) to determine the factors that influencing the development and implementing of e-learning and understanding the continuation of e-learning in universities context. This review revealed many common factors considered crucial for measuring the success of implementation e-learning systems; these factors are satisfaction, service qualities, content quality, and the effectiveness of the technology.

As a result, reviewing the literature related to MOOCs and e-learning success revealed that the key factors for measuring MOOCs system success are:

1) Learners' attitude,
2) Course quality,
3) Learners' satisfaction,
4) Self-regulated learning (SRL),
5) System quality,
6) Information quality, and
7) Service quality.

Step2: MOOCs and E-Learning Studies Supportive of the Proposed Model Factors

Developing of the proposed model for evaluating MOOCs success and choosing of the success factors were based on the significant role of these factors in assessing the success of the system in literature related to MOOCs and in e-learning literature. The previous studies that investigated the factors that have significant influence in gauging the success of the e-learning and MOOCs systems are displayed in table 3.1.

Table 3.1

The factors and supportive studies of the study model

Factors	Sources
System Quality	Ozkan & Koseler (2009); Wang & Wang (2009); Ramayah, Ahmad & Lo (2010); Tella (2011); Islam (2012); Ramayah & Lee (2012).
Information Quality	Wang & Wang (2009); Ramayah et al. (2010); Ramayah & Lee (2012).
Service Quality	Lee & Lee (2008); Wang & Wang (2009); Ramayah et al. (2010); Teo (2011); Hassanzadeh et al. (2012); Cheng (2012); Ramayah & Lee (2012).
User Satisfaction	Sun et al. (2008), Adeyinka & Mutula (2010); Wu et al. (2010); Ramayah & Lee (2012).
Students' Attitude	Sun et al. (2008); Presley & Presley (2009); Hammoud (2010); Zewayed, Maynard, & Murray (2011); Taha (2014).
Course quality	Selim (2007); Al-Ammari & Hamad (2008); Shee & Wang (2008); Sun et al. (2008); Goi & Ng (2008); Owen & Price (2010); Hassanzadeh et al. (2012); Taha (2014).
Self-regulated learning	Chen (2009); Liaw & Huang (2013); Littlejohn, Hood, Milligan, & Mustain (2016); Tella (2011); Zhao (2016); Onah & Sinclair (2017).

The selected of these key factors was done according to its effect on examining e-learning system success and MOOCs success. Though, reviewing the literature indicated that there are no any studies combined all of the proposed model factors (SQ, IQ, SRQ, CQ, AT, SAT, and SRL) together in one model to measure MOOCs success.

The study model also expanded the effect of the proposed model factors by examining the direct relationships as well as the mediation effects of the satisfaction on the study factors (see figure 3.4).

Step3: Identify the Stakeholders in the Implementation of MOOCs Systems

Identifying the key roles of stakeholders when implementing e-learning systems such as MOOCs can lead to the success of the systems (Kituyi & Tusubira, 2013). Daradoumis et al. (2013) noted the main four stakeholders in MOOCs settings which are (learners, course designers, managers, and tutors).

The *Designer* is the person who creates the course framework. The *Manager* is the person who designs the MOOCs platform's settings. *Tutor* (instructor) is the person who designs the contents of the course. The stakeholder in this study is the learners (students) who are taking the course.

In order to implement MOOCs successfully, it is important to understand the stakeholder responsibilities and their roles in the MOOCs environment. The key role of the learners in MOOCs settings is developing the necessary skills to obtain new knowledge independently and building learners experience. The learners also have to require the commitment and the motivation to take initiative in developing and identifying different sources of information. Further, the role of learners in MOOCs is communicating and collaborating with peers through groups and discussion forums. In the e-learning environment in general, the responsibilities of the learners are required the ability to regulated learning independently, organized and reflective their learning (Craig, Goold, Coldwell, & Mustard, 2008).

MOOCs Success Model

A review of MOOCs literature reveals that research had generally avoided using of information systems (IS) theories or models for testing MOOCs success, however, IS literature might be significant to understand MOOCs design, delivery, and the success measures of MOOCs. MOOCs systems technically are not considered information systems (IS), yet, it facilitated by the use of specialized IS. In light of this, exploring the IS theories apply to the e-learning context such as MOOCs is needed (Alsabawy et al., 2012).

The most acknowledged model of IS success is D & M (2003) model. D & M model has been adopted broadly in vast studies to measure the success of ISs for more than 20 years (DeLone & McLean, 2003). Numerous studies also emphasized that the D & M model (or specific factors) is reliable and valid to examine the success of e-learning (e.g., Alsabawy et al., 2011; Freeze et al., 2010; Hassanzadeh et al., 2012; Masrek, Jamaludin, & Mukhtar, 2010; Tella, 2011; Wang & Chiu, 2011).

The D & M (2003) model involves six interconnected factors which are: system quality, information quality, service quality, intention to use/use, user satisfaction, and net benefits. The current study proposed a model by updating the version of the D&M (2003) model and incorporating additional factors that reflect aspects of teaching and learning quality (i.e., course quality, students' attitude, and SRL) to create MOOCs success model.

This study attempts to develop a model of the factors that measure MOOCs success in order to enhance utilizing MOOCs systems. Thus, the purpose of this section is establishing a proposed framework according to the procedures investigated above for examining the success of the MOOCs systems.

Samarasinghe (2012) indicated that the factors of D & M (2003) model that used to measure information system success (e.g., SQ, IQ, SRQ) do not enough to cover all of the significant features of e-learning and insufficient to achieve the success of e-learning systems, thus, other important factors that related to learner characteristics and course should be added to reflect the success and the quality of the e-learning systems in education settings.

Additionally, the “net benefit” factor that has been added in the updated D & M (2003) model suggested that this factor can be changed according to the contexts. In other words, “net benefit” should be decided by asking the question “benefit for whom?” (DeLone & McLean, 2003, p. 22). Thus, in MOOCs environment, MOOCs is designed for learners to learn; consequently, when measuring MOOCs success, students’ benefits should be considered. So far, few studies conducted to measure system success by taking students’ benefits into account. Thus, the goal of this research is developing a framework based on D & M model that measures system success from a student benefit perspective.

Existing e-learning research (e.g., Alsabawy et al. 2012; Samarasinghe, 2012; Taha, 2014) have examined the effect of important factors such as students’ characteristics (e.g. attitude), technology (e.g. system quality), and content (e.g., course quality) on e-learning system success, however, the influence of the SRL factor is not investigated in the above-mentioned studies.

For the present study, the conceptual framework has been established by combining the D & M model (2003) with three factors (students ‘attitude, course quality, and self-regulated learning) which have been added to reflect the educational perspective for measuring the critical factors affecting MOOCs systems success in higher education. Figure 3.4 displays the study model.

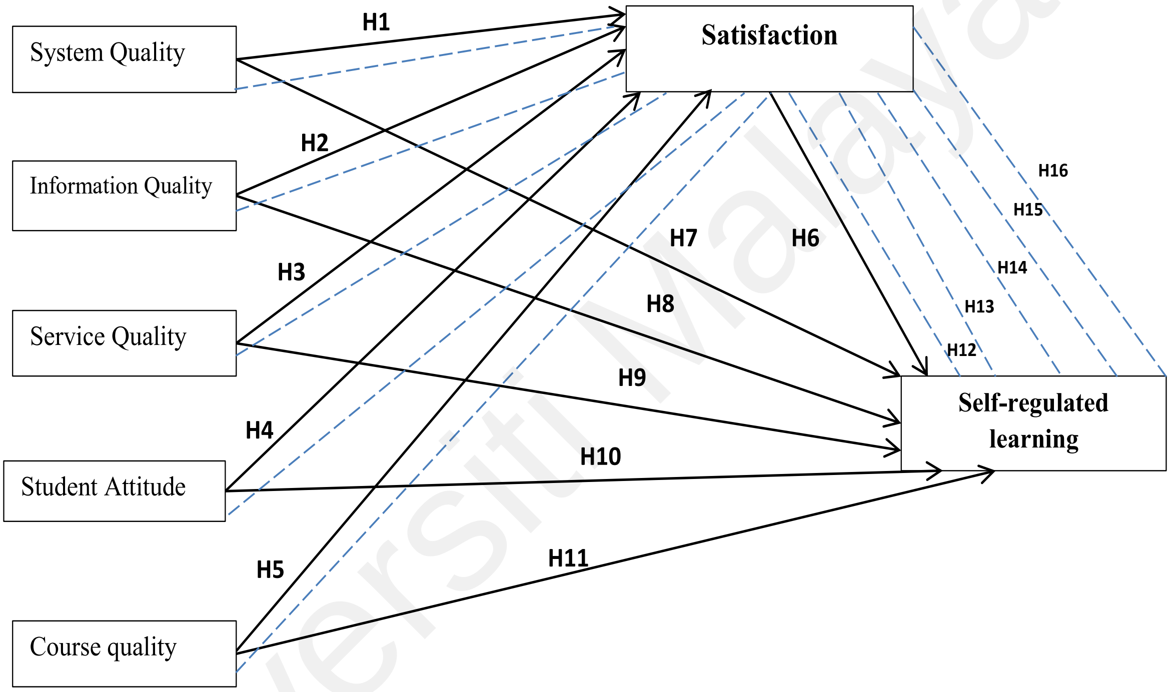

Figure 3.4. The proposed model.

Factors Affecting the Success of MOOCs Systems:

System Quality

System quality factor is believed to be one of the main and studied factors for evaluating the success of information systems and e-learning. Researchers who used the D & M (2003) for examining e-learning systems success posited system quality as a predictor of user satisfaction (Adeyinka & Mutula, 2010; Ramayah & Lee, 2012). System quality factor refers to the quality of the features of the system. It operationalized based on aspects such as: ease of use and learn the system, features, accuracy, flexibility, and integrity of the system (Alsabawy et al., 2012; Karaman & Bölen, 2015).

In this study, system quality factor is expected to be a significant predictor of learner satisfaction toward MOOCs. Thus, the proposed model tests the research hypothesis ***H1:*** *MOOCs' system quality has a significant influence on learners' satisfaction.*

Information Quality

Information quality refers to measure the quality and relevance of the information the system produced; it is the measurement of system output (Petter et al., 2008). Information quality measures by aspects such as: importance, availability, usability, understandability, and conciseness (Alsabawy et al., 2012; Karaman & Bölen, 2015).

A host of e-learning studies highlighted that the information system predicts learner satisfaction (Adeyinka & Mutula, 2010; Chiu et al., 2007; Lee & Lee, 2008; Ramayah & Lee, 2012). In this study, information quality is proposed to be a significant factor in demonstrating learner satisfaction toward MOOCs. Thus, the proposed model tests the research hypothesis ***H2:*** *MOOCs' information quality has a significant influence on learners' satisfaction.*

Service Quality

Service quality is referring to the ways in which the services are providing by providers of the system or information system sector (DeLone & McLean, 2003). The significance of the service quality factor is confirmed that the different types of the system are successful and established well (Cenfetelli, Benbasat, & Al-Natour, 2008).

Due to the important role of service quality factor, DeLone and McLean (2003) has been added and examined the service quality as the main factor in measuring of systems success. In e-learning studies, Selim (2007) highlighted that service quality is a vital factor for determining the acceptance and usage of e-learning systems.

Some studies are considered service quality as an important factor for evaluating the reliability of the system, the technical ability, and the capability to operate the personnel stuffs (Petter et al., 2008). Ozkan, Koseler, and Baykal (2009) employed service quality factor to represent the instructor and institutional support. This study adopted Petter et al. (2008) and Ozkan et al. (2009) view and considered service quality factor to reflect the instructors and institutional support.

Many studies indicated that service quality significantly impacts user satisfaction (Hsieh & Cho, 2011; Klobas & McGill, 2010; Petter & Fruhling, 2011; Ramayah & Lee, 2012). In these studies, service quality is expected to be significant predictor of learner satisfaction toward MOOCs. Thus, the proposed model tests the research hypothesis ***H3:*** *MOOCs' service quality has a significant influence on learners' satisfaction.*

Student Attitude

Literature highlighted the vital role of students' characteristics and indicated the importance and influence of this factor in adoption and implementation of e-learning systems and other technologies (Chokri, 2012; Hammoud, 2010; Presley & Presley, 2009; Taha, 2014). Students' characteristics also considered as a key factor in the MOOCs context (Pilli & Admiraal, 2017). In the current study, students' characteristics examine through students' attitudes factor. Attitude predicts learner satisfaction and the acceptance of e-learning; high level of learner attitude toward introducing technology lead to enhance learners experience which eventually influences learner satisfaction degrees positively (Malik, 2010; Zewayed et al., 2011).

Many researchers noted that the successful implementation of e-learning system is influencing by their attitude toward e-learning (such as Presley & Presley, 2009; Hammoud, 2010). Zewayed et al. (2011) indicated that attitude of the learners in e-learning settings contribute significantly in the acceptance of e-learning systems.

In this study, student attitude expected to be a significant predictor to students' satisfaction toward MOOCs. Thus, the proposed model tests the research hypothesis ***H4:*** *Student attitude has a significant influence on learners' satisfaction.*

Course Quality

The quality of e-learning content is a key factor that contributes positively to improve learner satisfaction toward using the system and promotes e-learning system success. Content is considered as a significant factor affecting the success of e-learning systems (Hassanzadeh et al., 2012; Musa & Othman, 2012; Zewayed et al., 2011). Course quality refers to the extent to which a learner believes that using a specific system would be providing quality of material (content) (Sun et al., 2008). Content quality can be measured by aspects such as: ease of understanding the course, accuracy, timeliness and completeness of the course, and the quality of material content (Malik, 2010; Selim, 2007; Sun et al., 2008).

The quality of the content and its effect on the success of e-learning settings has been highlighted in several e-learning studies (Hassanzadeh et al., 2012; Owens & Price, 2010; Sun et al., 2008). All these studies found that quality of content significantly affected learning experience and learner satisfaction. Sun et al. (2008) for instance, noted that course quality contributes significantly to e-learning environment and indicated that a good delivery process of the content and providing learner with suitable assistance that meets their requirements have improved learner confidence toward using e-learning systems. Hassanzadeh et al. (2012) also highlighted that the relationship between the quality of content and learner satisfaction toward using e-learning systems is significant.

Al-Ammari and Hamad (2008) examined the factors that influencing the acceptance and usage of the e-learning system. The findings revealed a direct impact of the content quality factor on usage and success of e-learning system. The study also indicated that the content quality factor influence learner satisfaction significantly (Hassanzadeh et al., 2012; Owens & Price, 2010; Sun et al., 2008).

In this study, course quality is expected to predict students' satisfaction toward MOOCs. Thus, the proposed model tests the research hypothesis ***H5:*** *MOOCs' course quality has a significant influence on learners' satisfaction.*

Self-regulated learning (SRL)

SRL is defined as voluntary behaviors on the individual to measure the success in the learning field (Barnard-Brak et al., 2010). Literature showed that learners with high SRL level are more engaged within e-learning and have more possibility to success in e-learning environment (Zhao, 2016).

Kitsantas and Dabbagh (2010) emphasized the vital role of SRL skill in enhancing the e-learning settings. Liaw and Huang (2013) also noted that SRL can be affected by an interactive learning environment. Chen (2009) stated some functionality that promotes e-learning systems to be influential self-regulation tools, such as editing and sharing the content, and regeneration.

In MOOCs literature, Onah and Sinclair (2017) noted that MOOCs enable the learners to be active participants by regulating their learning processes individually, developing learning objectives, managing the time of study effectively. Researchers have also discussed how MOOCs can support SRL skills (e.g., Littlejohn et al., 2016).

Literature indicated that user satisfaction is significantly determining SRL in the e-learning field (Liaw & Huang, 2013; Roca & Gagne, 2008). Zhao (2016) indicated that the success factors (i.e. satisfaction, system quality, service quality, and information quality) affect positively in improving SRL in the e-learning 2.0 environment. Thus, for educational practice, supporting SRL skills and increasing learners' satisfaction toward using e-learning systems should be generated effectively. Therefore, the following hypotheses have been examined:

H6: *Learners' satisfaction has a significant influence on learners' self-regulated learning.*

H7: *MOOCs' system quality has a significant influence on learners' self-regulated learning.*

H8: *MOOCs' information quality has a significant influence on learners' self-regulated learning.*

H9: *MOOCs' service quality has a significant influence on learners' self-regulated learning.*

H10: *Student attitude has a significant influence on learners' self-regulated learning.*

H11: *MOOCs' course quality has a significant influence on learners' self-regulated learning.*

Satisfaction

Petter, DeLone and McLean (2013) stated that satisfaction refers to users' level of gratification with the information systems. Many studies assumed user satisfaction as the main predictor for measuring the e-learning systems success (Lee & Lee, 2008; Lin, Lin, & Laffey, 2008; Ramayah & Lee, 2012; Sun et al., 2008; Wu et al., 2010). The literature highlighted the main role of learner satisfaction in measuring the e-learning environments (Ferguson & DeFelice, 2010; Paechter, Maier, & Macher, 2010; Palmer & Holt, 2009).

Previous studies explored that the system success factors (i.e., SQ, IQ, SRQ) in D&M model (2003) predict user satisfaction significantly (Liaw & Huang, 2013; Sun et al., 2008; Wang & Chiu, 2011; Zhao, 2016). Literature also noted that a high level of learner satisfaction can increase their SRL skills in e-learning environment (Liaw & Huang, 2013).

In the current study, satisfaction factor was chosen to be a central factor. The study model examined the direct effects of satisfaction as well as its meditation role. In regarding of the mediation effect, the present study highlighted the influence of satisfaction on enhancing the relationship between (SQ, IQ, SRQ, At, CQ) and learners' SRL skills. The mediation role of satisfaction indicated in many studies (e.g. Song, 2010). Liaw and Huang (2013); Zhao (2016) noted that enhancing user satisfaction toward e-learning has a significant role in promoting their self-regulation ability towards e-learning. Thus, the mediation effects of satisfaction have revealed five hypotheses. The following indirect hypotheses were proposed:

H12: Learners' satisfaction has a significant influence on mediating the relationship between system quality and self-regulated learning. User satisfaction is assumed to enhance the relationship between system quality and self-regulated learning.

H13: Learners' satisfaction has a significant influence on mediating the relationship between information quality and self-regulated learning. User satisfaction is assumed to enhance the relationship between information quality and self-regulated learning.

H14: Learners' satisfaction has a significant influence on mediating the relationship between service quality and self-regulated learning. User satisfaction is assumed to enhance the relationship between service quality and self-regulated learning.

H15: Learners' satisfaction has a significant influence on mediating the relationship between student attitude and self-regulated learning. User satisfaction is assumed to enhance the relationship between student's attitude and self-regulated learning.

H16: Learners' satisfaction has a significant influence on mediating the relationship between course quality and self-regulated learning. User satisfaction is assumed to enhance the relationship between course quality and self-regulated learning.

Summary

The review of this chapter combined factors influencing the success of e-learning success (system quality, information quality, and service quality) which based on D & M (2003) model with other factors linked to teaching and learning quality which are: students 'attitude, course quality and self-regulated learning to present a model of MOOCs success in higher education. The justifications for selecting the factors in the proposed model and the relationships between these factors were highlighted. based on e-learning and MOOCs literature.

CHAPTER 4

METHODOLOGY

Introduction

This chapter describes the methodological procedures adapted to explore the factors that influencing MOOCs system success. The chapter started with investigation of the general research approach and providing a rationale for using a quantitative research method. Next, the participants for the study are defined. Then, procedures for adapting the questionnaire are debated. Then, data collection and data analysis methods are discussed. Finally, the pilot study was investigated. This chapter also described the ethical safeguards adopted in this research.

Research Paradigm

Research paradigm is defined as set of beliefs about nature of the knowledge and the agreements about how understanding and addressing the research problem (Collis & Hussey, 2013). Two main research philosophies highlighted in the literature. Positivism and inter-positivism approaches, yet, neither of these two paradigms are superior to other (e.g. Collis & Hussey, 2009). Though, selecting the correct research philosophy is important step due to its effect on the implications for deciding of the research approach and methods (Collis & Hussey, 2009).

Positivist Paradigm

The positivist paradigm is established by formulating the hypotheses that can be examined using quantitative methods and then providing the objectives for understandings of the specific phenomena (Orlikowski & Baroudi, 1991). Orlikowski and Baroudi (1991) stated the positivist study delivers formal hypotheses, measures the variables, tests hypotheses, and interprets the phenomenon from the study sample.

Conversely, the interpretivist paradigm shows how the individual understands of the social reality, where the scholars interpret the human reality in the context of particular situations. This approach is concern about the subjective characteristics of human activity and focuses more on the meaning of social phenomena instead of the measurement approach (Saunder, Thorn, & Lewis, 2007). The interpretivist studies have not made any interested about the generalizability of study findings to specific populations.

This study adopts the positivism approach. The reason for adopting this paradigm research was based on the aim of this study to generalize the results for a specific situation. Additionally, research questions suggested examining research hypotheses that formulated to understand of the specific phenomena. The research hypotheses developed to determine whether the factors identified from the literature are significant for measuring MOOCs systems success issue. Thus, this proposes using the positivist research paradigm.

Quantitative Approach

The positivist research paradigm is generally executed using the quantitative method. The quantitative approach aims to measure the social world accurately by testing the theory and examining the hypotheses. Creswell (2002) stated that quantitative approach is an efficient method that tries to test the theory and explore the factors that impact the study results. The procedures of this approach are collecting and analyzing the data, then interpreting and writing the results of a study (Creswell, 2002).

Quantitative approach is usually conducting using numbers then the statistical methods to employ to analyze the study data. Quantitative research examines the relationships between factors using statistical techniques such as correlations, frequencies, and means. These statistics are used for accepting or rejecting specific hypotheses.

Justification for Using the Quantitative Approach

Adopting quantitative approach has been done according to the following justifications that supporting the selection of this technique:

First, most of the empirical studies that investigated e-learning system success issue have been conducted using quantitative approach. This method has been used to explore the expected relationships that might be developed through the interaction between the study variables. A quantitative research method is selected for this study because it has been adopted in several studies examining e-learning system success (e.g., Al-Debei, Jalal & Al-Lozi, 2013; Freeze et al., 2010; Taha, 2014).

Second, the quantitative approach enables to generalize the findings of the study to be made beyond the sample (Collis & Hussey, 2013).

Third, contributions for practice from research those use quantitative method to understand the factors that influencing the success of MOOCs might to be useful to practitioners making decisions. Practitioners expected to accept the study results if the findings derived from quantitative research that relying on the positivist paradigm where the practitioners can confirm and ensured that the study objectives achieved without any biased issues in the study. Consequently, the quantitative research that depends on formulating and examining research hypotheses and then providing objectives for understandings of the phenomena is a more suitable method for this research.

Explanatory Research

The social research studies are generally carried out either as explanatory or exploratory (Sekaran, 2006). The exploratory research is conducted to generate the initial understanding about a specific phenomenon. In exploratory research there is only little data given about the phenomena or the data about the phenomena is unclear to explore the possible relationships between the study variables. Conversely, explanatory research executed when well-known knowledge exists about the specific phenomena and the relationships between the study variables is known; thus, examining the hypothesized relationships between the variables is possible.

The review of the literature in chapter 2 has been revealed important evidence concerning the critical factors that influencing the success of MOOCs and indicated the explanation of the relationships between these factors. Hence, this research is considering mainly explanatory research. Moreover, research question one (What are the factors that influence the success of MOOCs?) has been formulated based on determining the appropriate factors for measuring MOOCs system success from prior the literature thus developing a conceptual framework. Research questions two to five have been developed to examine the hypotheses related to the relationships between the factors influencing MOOCs system success that formulated based on the relevant literature. Therefore, this research is mainly explanatory.

Research Method

The research method is the selection of the suitable procedures for carrying out the research study. Conducting research usually done through various strategies, there are many similarities and overlays among these methods (Zulu, 2007). The research matrix in Table 4.1 summarizes the research questions, research objectives, data sources, and data analyses techniques utilized in this study.

Table 4.1

Research Matrix

№	R Objectives	Hypotheses	Data Sources	Analysis Procedure
	RQ1: What are the factors that influence the success of MOOCs?			
1	To determine-factors that influence the success of MOOCs.	-	1.e-learning and MOOCs literature review. 2. Survey items.	1. Systematic review of the literature. 2.Factor analysis (EFA and CFA).
RQ2: To what extent the 5 success factors (i.e. SQ, IQ, SRQ, AT, CQ) significantly influence learners' satisfaction?				
2	To determine the significant influence of the 5 success factors (i.e. SQ, IQ, SRQ, AT, CQ) on learners' satisfaction.	**H1:** MOOCs' system quality has a significant influence on learners' satisfaction. **H2:** MOOCs' information quality has a significant influence on learners' satisfaction. **H3:** MOOCs' service quality has a significant influence on learners' satisfaction. **H4:** Student attitude has a significant influence on learners' satisfaction. **H5:** MOOCs' course quality has a significant influence on learners' satisfaction.	Survey items.	1. Pearson correlation coefficient (*r*). 2. PLS-SEM analysis through the measurement and the structural model.
RQ3: To what extent learners' satisfaction significantly influences learners' self-regulated learning?				
3	To determine the significant influence of satisfaction on learners' self-regulated learning.	**H6**: Learners' satisfaction has a significant influence on learners' self-regulated learning.	Survey items	1. Pearson correlation coefficient (*r*). 2. PLS-SEM analysis through the measurement and the structural model.

RQ4: To what extent the 5 success factors (i.e. SQ, IQ, SRQ, AT, CQ) significantly influence learners' self-regulated learning?				
4	To determine the significant influence of the 5 success factors (i.e. SQ, IQ, SRQ, AT, CQ) on learners' self-regulated learning.	**H7:** MOOCs' system quality has a significant influence on learners' self-regulated learning. **H8:** MOOCs' information quality has a significant influence on learners' self-regulated learning. **H9:** MOOCs' service quality has a significant influence on learners' self-regulated learning. **H10:** Student attitude has a significant influence on learners' self-regulated learning. **H11:** MOOCs' course quality has a significant influence on learners' self-regulated learning.	Survey items.	1. Pearson correlation coefficient (*r*). 2. PLS-SEM analysis through the measurement and the structural model.
RQ5: To what extent the influence of learners' satisfaction mediates the relationship between the five success factors (i.e. SQ, IQ, SRQ, AT, CQ) and self-regulated learning?				
5	To determine the significant influence of learners' satisfaction in mediating the relationship between the five success factors (i.e. SQ, IQ, SRQ, AT, CQ) and self-regulated learning.	**H12:** Learners' satisfaction has a significant influence on mediating the relationship between system quality and self-regulated learning. **H13:** Learners' satisfaction has a significant influence on mediating the relationship between information quality and self-regulated learning. **H14**: Learners' satisfaction has a significant influence on mediating the relationship between service quality and self-regulated learning. **H15:** Learners' satisfaction has a significant influence on mediating the relationship between student attitude and self-regulated learning. **H16:** Learners' satisfaction has a significant influence on mediating the relationship between course quality and self-regulated learning.	Survey items.	Preacher and Hayes (2008) technique using PLS-SEM.
RQ6: Is the proposed model in the present study valid and reliable to measure MOOCs success?				
6	To establish the validity and reliability of the MOOCs success model.	-	Survey items.	The reliability measured by Cronbach alpha (α) The validity established using (PLS-SEM) technique.

Research design: Correlation Study

Research design used in this study is correlational design. The correlational design is studied the mathematical association between two variables which generated without highlighting the causes for this relationship (Sekaran, 2006).

The research questions for the current study examine the critical factors influencing the success of MOOCs and thus, establishing a proposed model based on these factors is required. Specifically, research question two to five of this research (e.g., RQ2: To what extent the 5 success factors (i.e. SQ, IQ, SRQ, AT, CQ) significantly influence learners' satisfaction? proposed that this research is correlational, as the focus of these questions are exploring the factors that may affect MOOCs systems success and to examine the relationship between them.

Correlation design refers to the statistical method used to define the pattern or tendency for the two or more variables or sets of data (Creswell, 2012). A quantitative correlation is believed to be one of the most effective methods that offering a non-obtrusive approach to identify the possible relationships between the study variables (Creswell, 2009).

The correlation design is selected in this study because it is appropriate method for providing quantitative responses according to the data collected from the questionnaire. In particular, the study questionnaire delivered data for determining to what degree the relationship between two or more quantifiable variables are existing (Gay, 1992). For this study, questionnaire responses can be used for exploring, identifying, and examining the critical factors influencing MOOCs success.

Quantitative approach supplied the study with relevant statistical data that support the existence literature gap related to the critical factors influencing MOOCs success. Correlational research design is suitable for the researchers who interest in examining the association between two variables or more, in which the changes in one variable will be reflected in changes in the other variable (Creswell, 2009).

The main reason for using correlational research approach is the ability of this method to provide information that can be used to address the study objectives and research questions. The correlation study is an effective process used to evaluate the critical factors influencing MOOCs success issue in higher education. The correlation approach is not appropriated to explore the cause and affects between the study variables instead its focus on measuring the degree of the relationships between variables (Creswell, 2005).

Correlation research comprises the following procedures: (1) identifying the sample of the study, (2) determining the variables measures, (3) collecting and analyzing the data by examining the directions and the strengths of the relationships between variables, and (4) finally interpret the results and establishing conclusions (Creswell, 2005). Correlations between variables can be positive, negative, or non-significant (Bradley & Lang, 2000). A positive correlation between two variables is determined when one variable value increased or decreased then the other variable value do the same. Whereas when one variable goes up the other goes down then a negative correlation between two variables is generated (Bradley & Lang, 2000).

Justification for Using Correlation Study

In sum, the justifications that supported selecting the correlation method in this study are as the following:

- The correlation approach used in the current study is suitable and fit to examine the study variables. Correlation method is contributed to identify the nature of the study, the significance and the effect of the relationships between study variables. This method also provides the researcher with significant explanations about the relationships between variables.

- Using correlation method enables the researcher to collect an extensive data in a short time frame (Stangor, 2011). The sample of this study is students who use MOOCs systems; thus, employing any other methods for collecting data instead of correlation from this stakeholder may need more time because of the huge number of participants who using MOOCs.

- The generalized to the population can be obtained for the studies that use the correlation method. The current study investigates the use of MOOCs systems in Malaysian educational institutions and aims to obtain results that can be generalized thus, promote the success of MOOCs.

Generally, the correlation approach is considered a suitable method for gathering data to examine the critical factors influencing MOOCs success, and thus achieve the research objectives.

The Time Horizon of the Research

In regarding to understand how the study situation develops over time, and to acquire a relation to a time horizon, a research study can be longitudinal or cross-sectional (Sekaran, 2006). The longitudinal study defines when the same of the study participants are available for many settings of data collection, and the measurement should be done at more than one point in time (Sekaran, 2006).

Although the deep investigations that can be obtained from examining the phenomena using longitudinal study and the true evidence that can be achieved form testing the relationships between the study factors using this method, there are some limitations linked to longitudinal studies such as attrition of participants and non-feasible which considered as the main limitations of this kind of studies.

On the other hand, when all of the study data are collected at the same time and in one setting then the cross-sectional study has occurred. Consequently, due to financial issue and time constraint for the researcher of this study, the cross-sectional study is adopted, this approach is believed to be feasible and sufficient method to address the research questions.

Cross-sectional survey design has been used in this study because of its ability to produce a large amount of information through a single questionnaire administered to many participants. The cross-sectional method provides examination of the relationship between the factors influencing MOOCs success in the context of Malaysian universities seeking to identify the critical factors influencing MOOCs success. The choice of this design is done according to the nature of the study variables.

Research Hypotheses

Research hypotheses can be either null or alternative hypotheses. These two hypotheses types highlight the natural relationship between the study variables. Saunders, Lewis, and Thornhill (2012) highlighted that the null hypothesis can predict that the relationship between the variables is not existed, while the alternative hypothesis predicts some effecting or difference between the variables.

There are two forms of alternative hypotheses: two-tailed and one-tailed alternative hypotheses (Sharpe, De Veaux, & Velleman, 2010). Sharpe et al. (2010) noted that in the two-tailed alternative hypothesis, each direction has the proportion deviation from 50%, while in one-tailed alternative hypothesis the proportion deviation is focused only in one direction. This study adopted two-tailed alternative form for examining study hypotheses.

The justification for selecting two-tailed form is that the study confirmed that the positivist paradigm is the suitable research approach for investigating the critical factors influencing MOOCs success. The positivist paradigm established based on formulating the hypotheses that include prior fixed relationships between the variables that supported by previous studies from the e-learning and MOOCs literature. In this regard, this study assumed the significant relationships between the study variables as indicated by previous literature.

Hypotheses of Direct Effect

The proposed study model suggested eleven hypotheses with direct effects between the variables. The direct effect hypotheses use to identify the power and the nature of the relationships between the study variables (see Figure 3.4). The hypotheses are numbered from H1 to H11. The relationships between variables of the hypotheses of direct effects were discussed in chapter 3.

Hypotheses of the Mediation Effect

The proposed model in this study adopted satisfaction factor to play as a mediation role between study variables as examined and confirmed by prior studies (e.g., Song, 2010). Accordingly, employing this factor as mediation (hypotheses 12, 13, 14, 15, and 16) should be important for clarification and understanding how satisfaction toward using MOOCs factor affects the relationships between other study factors.

Mediator factor offers a better explanation about how external factors have significant effect on internal psychology (Baron & Kenny, 1986). Hair, Black, Babin, and Anderson (2010) noted that the mediating effect reflects the influence of intervening in third variable on the other two related variables. The mediating effect is displayed in figure 4.1.

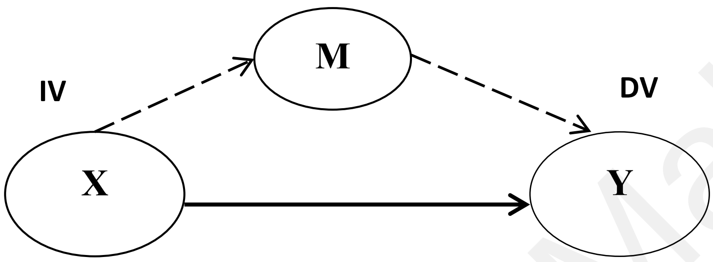

Figure 4.1. Mediating Effect (Preacher & Hayes, 2008)

Note: IV: independent variables, DV: dependent variables

Test the mediation effect has achieved by adopting Preacher and Hayes (2008) technique as the following:

- The indirect effect should be significant: this means that the relationship between the independent variable (X) and the dependent variable (Y) through the mediator variable (M) should be significant where p-value less than 0.05.
- A mediation effect is considered significant if the confidence interval (CI) is either positive or negative, in other words, the CI should not include zero value.

Research Instrument

In this study, the research instrument involves two sections. Section1 included demographic information, where the participants have to provide information related to their gender, age, ethnicity, mode of study (on campus or distance), previous MOOCs experience, and the name of the university. Table 4.2 shows the demographic information of the study.

Table 4.2

The demographic info of the study

Gender	Age groups	Ethnicity	Mode of study	Previous MOOC experience	I am currently studying at
Male; Female; Not specified.	Less than 20 years; 20-30 Years; 31-40 Years.	Malay; Chinese; Indian; Others.	On campus; Distance.	Limited to current course; 1-2 courses; 3-4 courses; More than 4; courses.	Name of the university.

Section 2 includes set of questions adapted to represent the critical factors influencing the success of MOOCs system. Designing the questionnaire investigates in the following sections:

Adaption of the Questionnaire

This study developed based on the relationships between the following factors: system quality, information quality, service quality, student attitude, course quality, satisfaction, and self-regulated learning. These seven factors were determined and operationalized after deep and intensive reviewing of applicable literature in the fields of e-learning and MOOCs studies. The selected items were used to measure study factors then utilized to design the survey questionnaire to achieve the purpose of this study.

Adaption of the questionnaire has been conducted through (1) Define the factors used in the study, (2) Determine the studies that employed to develop the research instrument, and (3) Provide the first draft of the research instrument:

Definitions of Factors Used in the Study

Determine the factors that used in the study and provide definitions that supporting these factors from relevant literature related to e-learning and MOOCs is the first key step in creating the research instrument. Table 4.3 displays the definitions of the factors used in the research model.

Table 4.3

Definitions of the factors used in the study

Factor	Definition	References
System quality	Refers to desirable performance characteristics of a MOOCs. It is measured by (1) easiness to use the MOOCs; (2) easiness to learn and operate the MOOCs system; (3) contains the necessary features and functions.	Alsabawy et al. (2012); Karaman and Bölen (2015).
Information Quality	Refers to the quality and relevance of the information offered by the system. It measures by aspects such as: usability, importance, availability, and understandability of the system.	Alsabawy et al. (2012); Karaman and Bölen (2015).
Service Quality	Refers to the guidelines or support documents delivered by the system. It measures by aspects such as: instructional design tools, course management, knowledgeability, and security of the system.	Karaman and Bölen (2015); Ozkan, Koseler, and Baykal (2009)
Satisfaction	Satisfaction in this study represents the user's level of expectation toward using of MOOCs. It measures by aspects such as: system performance, system experience, satisfaction with the decision, and student's needs of the system.	Al-Debei, Jalal, & Al-Lozi (2013); Alsabawy et al. (2012); Karaman and Bölen (2015).
Attitude	Refers to the impression of participant toward system activities (Sun et al., 2009). It measures by a set of beliefs that indicate the object is either good or bad.	Rhema and Miliszewska (2014); Taha (2014).
Course Quality	Refers to the extent to which a learner believes that using a specific system would be providing quality of material (content). It measures by aspects such as: ease of understanding of course, accuracy, timeliness, and completeness of the course.	Samarasinghe (2012); Sun et al. (2008).
SRL	It refers to the way that the learners participate and take decisions regarding their learning. It measures by: goal settings help-seeking, and self-evaluation, task strategies, time management, and environment structuring.	Barnard-Brak, Paton, & Lan, (2010); Onah & Sinclair (2017).

Studies Employed to Develop the Research Instrument

The items of the study survey adapted from e-learning and MOOCs studies. Most of these studies employed the whole D&M model for conducting their research while other studies used some constructs of D & M model to examine system success. These studies are:

1. Alsabawy et al. (2012)

Alsabawy et al. (2012) adapted D & M (2003) model for evaluating the success of e-learning systems. The data collected from the study sample has been included different points of view in the university context. The sample involved 720 students, 22 ICT staff, and 110 academic staff who enrolled in the e-learning system. The quantitative method has been used to analyze the data. The findings showed that the reliabilities of the constructs are higher than 0.7 and AVE are more than 0.50 which meeting the standards of validation and reliability. Thirteen items were adopted from Alsabawy et al. (2012) study. Five items for information quality, 8 items are adopted for system quality.

2. Samarasinghe (2012)

Samarasinghe (2012) adapted D & M (2003) to develop a model for evaluating the success of e-learning in the organizational setting. The multidimensional model included learners and instructors' viewpoints to examine the success of e-learning systems. The sample used to measure the learners' viewpoint included 189 students who have experience in using e-learning. The validity and the reliability of the model were confirmed. Forty-three experts have approved the content validity of the measurement instruments. Five items for course quality are adopted from Samarasinghe (2012).

3. Sun et al. (2008)

Sun et al. (2008) developed a framework to measure learner satisfaction toward e-learning and to examine the factors influencing satisfaction factor, thus improve the understanding of e-learning success. The framework was developed based on six factors (i.e., instructor, learner, course, design, technology, and environmental dimension), all of these factors included 13 items to confirm the success, design, and operation of e-learning systems. Cronbach's alpha of the model was tested and the validity achieved. Several experts had been checked the questionnaire and confirmed the face and content validity. Nine items are used to measure satisfaction toward MOOCs adopted from Sun et al. (2008) model.

4. Ozkan, Koseler, and Baykal (2009)

Ozkan, Koseler, and Baykal (2009) adapted D&M IS research model to develop their framework. Survey method has been employed to validate their model. The study indicated the need of learning management system (LMS) to examine the success of e-learning systems in HE context. The researchers referred to 10 experts from the information systems and educational technology fields to check the validity of the survey instrument. The findings confirmed that the reliability and the validity of the research instrument were achieved from the learner perspective. Eight items for service quality are adopted from Ozkan et al. (2009).

5. Rhema and Miliszewska (2014)

Rhema and Miliszewska (2014) examined student experiences and their perceptions toward e-learning system. The study investigated the factors influencing student attitudes towards e-learning such as (demographic features, access to the system, use of the system, skill in the system, and satisfaction). An empirical study involving 348 subjects and the correlation method was conducted to assess the relationship between factors. Eight items were adapted to measure students' attitude factor in the current study.

6. Onah and Sinclair (2017)

Onah and Sinclair (2017) presented the overall explanation of SRL in MOOCs environment and explored the dimensions used to represent the learners' skills related to SRL such as goal settings and help-seeking. The study developed a questionnaire called MOOCs OSLQ (MOSLQ) with a 19-item to measure SRL in MOOCs by modifying the online self-regulated learning questionnaire (OSLQ) (Barnard et al., 2009). MOSLQ is more relevant questionnaire to MOOCs context. Self-regulated learning questionnaire included 5 sub-factors which are: *Goal settings* (GS): is the process for setting and achieving goals. *Task strategies* (TS): is the ability to plan and strategize the way to achieve the goals. *Time management* (TM): is skill of management the time during study. *Environment structuring* (ES): is deciding an appropriate location for the study. *Help seeking* (HS): is requesting for help while studying online. *Self-evaluation* (SE): is reflecting the learners' study, with the aim of understanding the areas where the learners have achieved their goals (Barnard et al., 2009). The reliability of all the above subscales were examined using

Cronbach alpha (α) which ranged from (0.87 to 0.96) > 0.7 indicating sufficient internal consistency.

First Draft of the Research Instrument

Some wording changes were made for the questionnaire items to be more suitable for this research that examining the success of the MOOCs system. Table 4.4 provides some examples of the modification done on some items for the study factors.

Table 4.4

Examples of the modification on questionnaire items

Factor	Original items	Modified items
System Quality	The e-learning system is easy for me to learn.	For me, the MOOC system is easy to learn.
Information Quality	The LMS provides sufficient information.	I believe that MOOC provides sufficient information.
Service Quality	Instructor's attitudes are friendly to learners.	In learning through MOOC, I think that instructor's attitudes are friendly to learners.
Attitude	I believe that e-learning provides me the opportunity to obtain new knowledge.	I believe that MOOC gives me the opportunity to acquire new knowledge.
Satisfaction	I am satisfied about my decision to engage in this course by the Internet.	I am satisfied with my decision to take this course via MOOC.
Self-regulated learning	I know what I am going to attain in this course.	I know what I am going to achieve in this MOOC course.

Table 4.5 review the information related to the research instrument. The number of items in the first draft is 62 items.

Table 4.5

First draft of the research instrument

Satisfaction	**Adopte d from**	**(α)**	**AVE**
1. I am satisfied with my decision to take this course via MOOC. 2. If I had an opportunity to take another course via MOOC, I would gladly do so. 3. My choice to take this course via MOOC was a wise one. 4. I was very satisfied with the MOOC course. 5. I feel that this MOOC course served my needs well. 6. I will take as many courses via MOOC as I can. 7. I was satisfied with the way this MOOC course worked out. 8. If I had it to do over, I would not take this course via MOOC. 9. Conducting the course via MOOC made it easier than other courses I have taken.	Sun et al. (2008)	0.93	Validity achieved (by experts)
System Quality	**Adopte d from**	**(α)**	**AVE**
1. For me, the MOOC system is easy to use. 2. For me, The MOOC system is easy to learn. 3. For me, MOOC system meets my requirements. 4. For me, MOOC system includes necessary features and functions for my study. 5. For me, MOOC system does what it should. 6. For me, the MOOC user interface can be easily adapted to one's personal approach. 7. For me, MOOC system requires only the minimum number of fields and screens to achieve a task. 8. For me, all data within MOOC system is fully integrated and consistent.	ALsaba wy et al. (2012)	0.82	0.546
Information Quality	**Adopte d from**	**(α)**	**AVE**
1. I believe that MOOC system provides me with the outputs that I need. 2. I believe that information needed from the MOOC system is always available for me. 3. I believe that information from the MOOC system is in a form that is readily usable. 4. I believe that, MOOC system provides information that is easy to understand. 5. I believe that information from the MOOC system is concise.	Alsabaw y et al. (2012)	0.819	0.601

Table 4.5 continued

Service Quality	Adopted from	(α)	AVE
1. In learning through MOOC, I think that instructor's attitudes are good to learners. 2. In learning through MOOC, I think that instructor's attitudes are friendly to learners. 3. In learning through MOOC, I think that instructor is knowledgeable enough about content. 4. In learning through MOOC, I think that the service supported by the university is good enough. 5. In learning through MOOC, I think that I can contact with the instructor via mail or phone or fax. 6. In learning through MOOC, I do not encounter any problems during communicating with university administration and help desk. 7. In learning through MOOC, I do not experience any problems during registrations. 8. In learning through MOOC, I can easily solve a problem during admission to a module in registrations.	Ozkan, Koseler, and Baykal (2009)	0.91	Validity achieved (by experts)
Course quality			
1. In MOOC, students are provided with information about the course that outlines course objectives, concepts, and main ideas. 2. In MOOC, learning outcomes for the course are summarized in clearly written, straightforward statements. 3. In MOOC, courses are designed to encourage learners to work together utilizing problem-solving activities to develop topic understanding. 4. In MOOC, the course content is communicated well. 5. In MOOC, the courses content is up-to-date.	Samarasinghe (2012)	0.80	0.50
Attitude	**Adopted from**	**(α)**	**AVE**
1. I feel confident in using MOOC. 2. I enjoy using MOOC for my studies 3. I believe that MOOC gives me the opportunity to acquire new knowledge. 4. I believe that MOOC enhances my learning experience. 5. I believe that convenience is an important feature of MOOC. 6. I believe that MOOC increases the quality of learning because it integrates all forms of media. 7. I believe that adopting MOOC allows for increased student satisfaction. 8. I believe that studying courses that use MOOC is interesting.	Rhema and Miliszewska (2014)	0.86	Validity achieved

Table 4.5 continued

Self-regulated learning	Adopted from	(α)	AVE
1. I know what I am going to achieve in this course. 2. I have set aside time to study the course. 3. I have high standards for my work on this course. 4. I have set targets for all I want to achieve in this course. 5. I do not see my engagement in the course as less important solely because it is an online course. 6. I have written down the goals I plan to achieve by the end of this course. 7. I work strategically to prioritise tasks to help me achieve my learning goals. 8. I prepare for my online study by reading the suggested background learning materials beforehand. 9. I set out my study agenda before engaging with the online resources. 10. I am prepared to tackle any challenging aspects of the work in this course. 11. I have planned ahead in order to devote the necessary time to my online studies. 12. I find a good time to study when I won't be distracted. 13. I choose my study location in order to avoid distractions. 14. I find a comfortable place to study. 15. I choose an appropriate place to work in order to study effectively. 16. I plan to use the interactive communication channels provided to gain support from peers and tutors. 17. I plan to participate in the course discussion forums in order to get the most out of the course. 18. While engaging in this course, I will reflect on my study in each module. 19. I will be proactive in engaging and reviewing progress in the learning path I select.	Barnard, Lan, To, Paton, and Lai (2009); Onah and Sinclair (2017).	0.92	Validity achieved (by construct validity)

Scale of measurement

This study adopted Likert scale for measuring learner satisfaction and their perspective toward MOOCs. Likert scale is believed to be a common scale for examining the individual beliefs and their perceptions toward particular topics (Stangor, 2011). Likert scale is established based on a range with numbers allocated to show the degree of modifications in the characteristics or features ordered from high to low (Rao, 2002).

Likert scale has been commonly used in education studies due to its relevant features that enable the individual to answer the questions in an easy and quick way; it also does not need much space, as well as it has the ability to employ variety of statistical methods (Sekaran, 2006). Elmore and Beggs (1975) stated that a 5-point Likert scale is just satisfied enough, and increasing the level from 5 to 7 or 9-points Likert does not enhance the rating reliability (e.g., Sekaran, 2006). The justification for adopting Likert scale in the current study is the appropriate of using this scale for evaluating MOOCs system success. Many studies adopted five-point Likert scale for measuring the success of information systems (e.g. Selim, 2007), e-learning success (e.g., Taha, 2014) and MOOCs (e.g., Hone & El Said, 2016). In this regard, a 5-point Likert is a suitable scale for measuring learner perspective toward MOOCs and the system success.

In this study, the 5-point Likert scale is used in the research instrument depending on a scale of: 1= strongly disagree; 2= disagree; 3= neutral; 4= agree; 5=strongly agree.

Research Sampling

The study sample should be defining accurately due to its implications for accomplishing the study objectives and its influence on answering the research questions of the study (Brace, 2008).

The following sections investigate the sampling procedure, sample size, and data collection method that employed in the current study.

Sampling procedure

Due to constraints on the researcher's time and the difficulty to reach to all Malaysian universities, the population of the study was determined as the most active universities in using "OpenLearning" in Malaysia. OpenLearning is the MOOCs platform which can adequately demonstrate the Malaysian educational institutions and universities that adopt MOOCs systems in Malaysia.

Evaluating OpenLearning platform is significant to confirm succeed of MOOCs system in Malaysia. The Ministry of Higher Education's strategy is planning to increase MOOCs quality and its accessibility to all higher education and educational institutions within the country. The government aimed at putting 15% of public university courses online as MOOCs by 2015 and then increasing this to 30% of all university courses by 2020. Assessing MOOCs system can be beneficial in determining the most vital factors that influencing MOOCs system success and the factors that impacting learner satisfaction and SRL skills in the MOOCs system.

According to OpenLearning website, UKM, UPM, UiTM, UNIMAS, and UTeM universities are the top active universities in using MOOCs in Malaysia. The sampling frame was all the undergraduate students who participated in Malaysian

MOOCs "OpenLearning" from these five public universities in Malaysia. Thus, the population size is about 63,621 obtained from universities websites.

Sample Size

Balnaves and Caputi (2001) noted that the sample size for any study should be large and sufficient to achieve the needs of the study and show confidence in generalizing the results. This study employed Finite Population formula (Yamane, 1967) for calculating the sample size. For 0.95 confidence interval, e = 0.03 and population is 63,621, then the sample size was determined as 1000 units of undergraduate students.

The sample size 1000 is clearly greater than 200 cases, thus, the statistical analysis such as SEM can be tested without problems. This view is consistent with Schumacker and Lomax (2004) who emphasized that selecting a large sample size is significant for ensuring the confidence with the data.

Clustered Sampling

To ensure that the sample is chosen fairly and represents the population, clustered sampling method has been employed. Cluster sampling technique is used when the study population is dispersed across a widespread geographic area (such as counties, territories, or other boundaries) where the researchers have to divide the population into clusters and then select the clusters randomly (Ahmed, 2009). Then the researcher would independently select the participants from those clusters using a random sampling technique, in this case, each unit has the same chance to be selected from the sample.

The study used a clustered sampling design in which the research context is divided into five groups (i.e., UKM, UPM, UiTM, UNIMAS, and UTeM universities) which have been identified and analyzed to represent the whole scenario. This study used the probability-proportionate-to-size (PPS) sampling in order to get an equal representation of students from each university and then a systematic random sampling technique used for choosing the respondents randomly from each cluster.

For calculation, each university undergraduate size was multiplied by the sample size and divided by the total population size (Hunt & Tyrrell, 2001).

The details of calculation the cluster size of each university is display in Table 4.6 while the formula used for calculating the cluster size is as the following.

$$\text{Cluster size of the university} = \frac{\text{Uni undergraduate size} \times \text{Target sample size}}{\text{Total population size}}$$

Table 4.6

The probability-proportionate-to-size (PPS) sampling procedure

Universities	**No. of undergraduate students**	**PPS sampling**	
		Target N	**%**
UKM	12,897	203	20%
UPM	14,063	221	22%
UiTM	13,671	215	22%
UNIMAS	13,011	204	20%
UTeM	9,979	157	16%
Total	63,621	1000	100%

For example: cluster size of UKM university = $\frac{12{,}897 \times 1000}{63{,}621} = 203$

Online Survey

This study has employed the online survey method to collect data from the study sample. Online survey is considering the most appropriate method for this study. The justifications for selecting this technique are as the following:

- The purpose of the current study is examining MOOCs system success from undergraduate learners at universities context. MOOCs is considered one common technique of the online learning systems and the learners have to use computers and internet to engage in MOOCs activities. Thus, MOOCs users are familiar with using online systems and filling out the online survey is easy and suitable for them.
- The sample selected for this study is learners from different universities in Malaysia. Due to disperse of learners in a wide geographical area, it is hard to collect data from the sample using face to face methods. In this regard, the online survey is considered the appropriate way to overwhelm the difficulties in the geographic distribution for MOOCs learners.
- Collecting data from the sample does not need the availability of researchers, thus consume the researcher's time and efforts (Beins & McCarthy, 2012).
- In online survey, the data transfer automatically to software package (such as Google document) instead of inserts it manually (Stangor, 2011). Entering the data automatically can avoid the mistakes that could be happened when entering the data by hand.
- The respondent for the online survey is quick, low cost, and observe automatic and speed communications than the traditional approaches (Griffis, Goldsby, & Cooper, 2011).

However, many researchers facing obstacle through gathering data using online survey method which is low repose rate. The main difficulty of collecting data by online survey is a low response rate (Fan & Yan, 2010).

This study adopted the online survey technique to collect data and applied a volunteer participation in answering the research instrument. Consequently, two strategies have been used to reduce the low response rate issue:

- Involve the allocation of prizes to motivate students to participate in this study.
- Sending a reminder to the participants to promote them answering the survey.

Data Collection

Data collection was executed over a two-month period, specifically in September and October 2017. Study participants had to be qualifying in MOOCs for a minimum two weeks within the last four years; these specifications were intended to refine the sample and to ensure that the success factors discussed reflected the participants' MOOCs experience. Thus, the sample of this research was selected to be undergraduate participants from the five chosen universities who enrolled in the "OpenLearning" MOOCs platform in Malaysia.

The study included 25 MOOCs courses chosen according to its popularity (highest number of enrollments in these courses in OpenLearning) from the five universities (i.e., UKM, UPM, UiTM, UNIMAS, and UTeM universities). These courses have been selected from five categories chosen randomly which are: Arts and Design, Computers and Technology, Education, Business and Economies, and Humanities. Examples of the MOOCs courses chosen in this study are shown in Table 4.7.

Table 4.7

Examples of courses selected for the study

Course	Universit y	Categories	No. of enrollment
Rethinking Teaching Redesigning Learning.	UKM	Education	5812
Introduction to Graphic Design on Canva.	UiTM	Business an Economies	30811
Multimedia Technology and Design.	UNIMAS	Computers and Technology	3194

The initial request for accessing the online survey with a web link (Appendix A) together with the information sheet (Appendix B) were sent to the participants of the MOOCs courses which selected from OplenLearning platform to invite the learners to participate in the study survey (Appendix E). The invitation to participate in the study was sent through direct contact with the students via Chat feature in MOOCs platform "OpenLearning" and by collaborating with MOOCs courses organizers (see appendix H). It is worth to mention that the researcher of this study was provided to MOOCs organizers an official letter for collecting data from University Malaya (appendix F). The participants have been completed answering the survey within around 15 minutes.

After two weeks, a reminder letter with the link of the questionnaire has been sent to the MOOCs participants by Chat feature in OpenLearning to encourage them answering the survey (see Appendix C).

Ethical Considerations

Ethics is believed to be one of the critical issues that should be taken in consideration when conducting research studies. The ethical considerations have to encounter by researchers due to the extensive range of research values and little agreement about these values (Neuman, 2007). The first stage in data collection involved accomplishing ethical agreement for conducting the survey. The approval of the survey has been obtained from The University of Malaya Research Ethics Committee (UMREC) (Appendix G).

To conduct a research ethically, the researchers have to gather important data without interfering in others' lives and privacy (Neuman, 2007). Thus, in the cover letter of the study survey, a link of the information sheet has been embedded that define the purpose of the study, the method used, and the ethical values engaged. It also indicated that all MOOCs students who participated in the study survey are fully volunteers and there is no any pressure has been applied for answering the survey. Finally, the researchers confirmed that the data has been treated confidentially and stored securely (see Appendix B).

Data Analysis

To examine the factors of the study and to test the hypotheses, different statistical methods have been used:

1. The demographic data for the MOOCs learners has been tested by the descriptive method. The mean (M) and standard deviation (SD) have been measured for gender, age, ethnicity, the mode of study, previous MOOCs

experience, and the name of the university. SPSS 21 software has been employed in this data analysis.

2. To determine the association between the study factors, correlation coefficient analysis has been utilized using SPSS 21.
3. Factor analysis method using SPSS has been employed. In the first phase, exploratory factor analysis (EFA) technique has been used to highlight the most effective factors in measuring MOOCs success. In the later stage, testing the model fitness has been done using confirmatory factor analysis (CFA) method.
4. The research model has been analyzed using Partial Least Squares (PLS-SEM) technique using the SmartPLS 3.0 software (Ringle, Wende, & Becker, 2015). Examining the model has been conducted through two phases. First, examining the measurement model, and then measuring the relationships and research hypotheses in the structural model phase (Anderson & Gerbing, 1988).

Partial Least Squares Structural Equation Modeling (PLS-SEM)

Structural Equation Modeling (SEM) is the key method applied to examine the study model and to test the research hypotheses. Schumacker and Lomax (2004) noted that the SEM is a suitable multivariate technique for exploring the relationships between factors and for testing the various types of theoretical models. Many social sciences studies have adopted SEM method for analyzing data. SEM is used in e-learning studies (i.e., Taha, 2014) and MOOCs research (i.e., Hone & El Said, 2016).

The selection of SEM method for analyzing the study data was based on the SEM features that use effectively to measure a complex model of multiple associations between the variables (Chin, 2010). SEM is a suitable method for the developing and testing models (Hair, Sarstedt, Ringle, & Mena, 2012).

Hair et al. (2012) conducted a study to identify the reasons for using PLS-SEM by reviewing 204 journals. The findings revealed three significant areas that explained using PLS-SEM technique: 102 studies (50%) indicated that PLS-SEM was used for non-normal data, 94 studies (46.8%) highlighted that PLS-SEM was suitable for small sample size studies, and 67 studies (32.84%) confirmed that PLS-SEM appropriate for the formative measurement of latent variables.

Additionally, literature indicated the ability of PLS-SEM method for testing the non-normality data and measuring studies samples with a small to medium number of participations (Chin, Marcolin, & Newsted, 2003).

Other Advantages for Using PLS Technique:

- The aptitude of PLS method to evaluate the reliability and validity indicators such as convergent and discriminant validity (Hulland, 1999).
- PLS has a high statistical efficiency, it works effectively with a large number of parameters and with data from small sample sizes; PLS is flexible and multipurpose analysis effective for solving problems (Boulesteix & Strimmer, 2007).
- PLS-SEM is a causal model method has the ability to maximize the variance of the dependent latent variables (Hair et al., 2012).

Justification of using PLS-SEM approach in this study

Gefen, Rigdon, and Straub (2011) suggested the prediction-oriented analyses, complex models, and big data motivate the use of PLS-SEM. PLS-SEM is a useful technique for testing mediator models (Nitzl, Roldan, & Cepeda, 2016), non-linear models (Rigdon, Ringle, & Sarstedt, 2010), a better understanding of single-item constructs (Sarstedt, Diamantopoulos, & Salzberger, 2016); common method variance analysis (Chin, Thatcher, Wright, & Steel, 2013) (*see chapter 5- Common method bias*);the heterotraitemonotrait ratio of correlations (HTMT) (Henseler, Ringle, & Sarstedt, 2015 (*see chapter 5- Table 5.18*); and the importance-performance map analysis (Ringle & Sarstedt, 2016) (*see chapter 5- Figure 5.9*) .

Thus, the justifications of using PLS-SEM approach in this study are:

Fist, the proposed model is relatively complex model with multiple relationships between the factor. Wold (2006) notes that in large and complex models with latent variables, PLS-SEM is the suitable technique for analyzing data without competition. In this research the proposed model includes 7 factors, 11 direct relationships and 5 indirect relationships. To analyze the relationships between the different dimensions of MOOCs success SEM-PLS utilized instead of other regression analysis because the model has two stage relationships (independent factors and satisfaction, then satisfaction to SRL), then, testing the mediation effect that would have been complicated to analyze with regression. **The proposed model has not been verified in the literature.** In this regard, PLS-SEM is seen to be appropriate method for predicting the multiple relationships in a complicated model with large variables such as the current study. PLS is a suitable for testing new models (Henseler, Ringle, & Sinkovics, 2009). PLS-SEM is an appropriate technique for testing the models with measures that are not designed well and to predict new phenomena (Chin & Newsted, 1999).

Second, in particular, this study tries to find out the answer of the main questions: what are the factors that influencing MOOCs success? and what are the significant relationships between the study factors? The answer of these questions would be achieved by building a conceptual model by including MOOCs success factors (i.e. SQ, IQ, SRQ, AT, CQ) as exogenous latent constructs, SRL as the endogenous latent construct, and satisfaction as center factor and testing this model by using smart-PLS. Based on earlier literature, PLS is a very effective method for examining the relationships between examining the relationships between the factors in e-learning studies (e.g. Raaij & Schepers, 2008) and in MOOCs studies (for example, Alraimi et al., 2015; Hone & El Said, 2016; Wu & Chen, 2017). The hypotheses in the conceptual model that analyzed using SEM-PLS technique have advantages over other regression-based methods in evaluating several latent constructs with various manifest variables (Gefen, Straub, & Boudreau, 2000). In general, SEM permits several relationships to be tested at once in a single model with various relationships instead of examining each relationship individually.

Third, the current study is mainly quantitative. The most commonly used application for PLS-SEM in current era is more suitable for the analysis of quantitative data (e.g. Hussain, Fangwei, Siddiqi, Ali, & Shabbir, 2018).

Fourth, PLS-SEM is currently known and selected within social sciences studies as a technique that is the best appropriate method for a multivariate analysis (Hair et al 2012), therefore, this study examines the factors affecting MOOCs success by using latest technique -PLS- SEM- to examine and validate the conceptual model.

In sum, current study confirmed that the PLS-SEM is the appropriate technique for analyzing the study data and testing the proposed mode to achieve the purpose of this study. The main objective of using PLS-SEM analysis is acquiring the accurate study model.

Data analysis methods used in this study

Correlation data analysis. Correlation method using SPSS software has been employed to identify the associations between any two continues variable such as the independent and dependent variables. Measuring the strength of a linear association between two variables has been conducted using Pearson correlation factor. Pearson correlation coefficient (r) tries to show a line of best fit through the data of two variables, it demonstrates the distance between all the data points to get the line of best fit.

Factor analysis. Factor analysis is adopted to detect the factors that expected to influence MOOCs success. Accordingly, Exploratory Factor Analysis (EFA) has been applied in the first phase to explore the most effective factors on MOOCs success and their scales, and in a later stage Confirmatory Factor Analysis (CFA) is applied to test the fitness of the model identified by EFA.

EFA technique is used to reduce the number of factors influencing MOOCs success and to group the factors that have the same characteristics together in order to identify which factors have the most impact on MOOCs success phenomena and remain it in the model, and which factors have little or no impact on MOOCs success so can be eliminated from the model, and accordingly obtain a model of the most effective factors influencing MOOCs success.

Confirmatory factor analysis (CFA) then conducted to test the fitness of the obtained model. It examines the measurement model that supposes each item is only loaded on its expected latent variable. The model could only be significant if it satisfies some statistical conditions such as RMSEA and CFI (Byrne, 2001).

PLS-SEM method. PLS-SEM technique (Hair et al., 2012) developed based on confirmatory trend analysis that contribute in analyzing the construct measurement of the model, testing the moderating effects, examining the non-linear effects, and measuring the complex component models. PLS-SEM method has been executed through two main stages: evaluating the measurement model first then testing the structural model (Hair, Ringle, & Sarstedt, 2011). Implementing these two stages are important to obtain the accurate model of the study (Mohammad & Afthanorhan, 2013).

Measurement model aims to confirm the reliability of the instrument and to ensure that the survey items are measuring the correct factors that intended to measure. Measurement model can be achieved by evaluating the convergent and discriminant validity.

Convergent validity is believed to be a significant method for examining the research instrument. Convergent validity highlighted that the association between two measures of constructs that should be connected theoretically are in fact correlated (Hair et al., 2011). This analysis aims to evaluate the relationships between the study variables (Schumacker & Lomax, 2004).

Discriminant validity utilized to confirm from the results of structural paths that hypothesized. Discriminant validity used to check whether the inconsistencies statistical results is existing (Farrell, 2010).

The second stage is testing the structural model. Structural model designed to show the model validity (Schumacker & Lomax, 2004). The structural model used to test the relations between the variables of the model and aims to provide clear evidence about confirming or rejecting the study hypotheses. Validating the structural model helps to check how the study data can support the hypotheses of the structural model (Urbach & Ahlemann, 2010).

Validity and Reliability

Testing the validity and reliability of the instrument is significant for verifying the capability of the research instrument to examine the study factors. Reliability is focused on measuring the consistency of the instrument, while validity aims to ensure that the researchers are examining the factors that proposed to evaluate (Myrtveit & Stensrud, 2012).

The quality of the study data gathered by researchers is significantly affected the validity and reliability analysis (Pallant, 2011). The validity and reliability have an important effect on the research outcomes and recommendations.

The indicators that have been used to gauge the reliability and validity of the research instrument are as the following:

Validity

Validity is believed to be one of the main analyses in social studies domain. Validity is employed to confirm that the items used in measuring the study factors are valid. Validity refers to the ability of the items to gauge the factors they are intended to gauge (Hair et al., 2010). In the SEM analysis, the measurement model is conducted first, and then testing the structural model is executed.

In the present study, two common types of validity have been implemented to ensure the validity of the instrument: construct validity and content validity. These types are investigated in the following sections:

Construct Validity

Construct validity is an inclusive measurement of the instrument validity. Construct validity defined as the degree to which the items of the study factors measure what researchers proposed to measure (Bagozzi &Yi, 2012). There is a number of measures that can be possessed to see evidence of validity. In this research, convergent validity and discriminant validity are evaluated to provide confirmation of the validity of the measures. Gefen and Straub (2005) have claimed that construct validity can be achieved by testing the convergent and discriminant validity which considered key components of construct validity. The good fit of the model can be utilized to assess the construct validity (Holmes-Smith, 2011).

Content Validity Study

Content validity refers to the degree to which a set of items is appropriate and relevant to the domain content (Cronbach, 1984). The content validity for this study was conducted to confirm the validity of the measurement items in the study survey.

In this study, three stages have been conducted to establish the content validity of the measurement instrument as displayed in Figure 4.2.

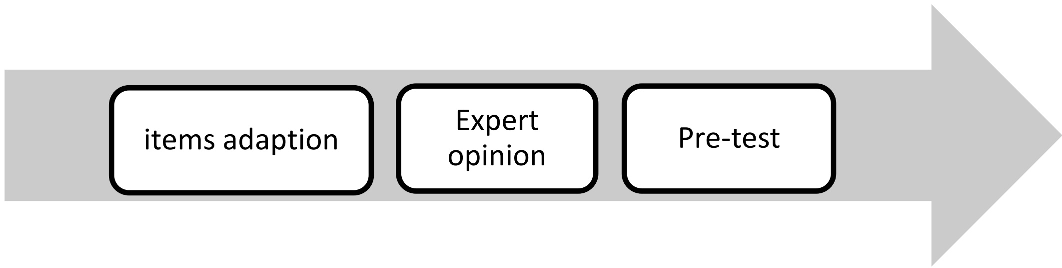

*Figure 4.2.*The three stages of content validity procedures conducted in this study

Adaption of the research instrument should be included in different phases to avoid any type of bias (Gjersing, Caplehorn, &Clausen, 2010). In the current study, item adaption has been accomplished based on three steps:

(1) Conducting an extensive literature review for MOOCs and e-learning studies to identify the critical factors influencing the success of MOOCs.

(2) Supporting this review with feedback from MOOCs experts (Walker & Fraser, 2005) to confirm that the items for each factor represent MOOCs success properly. The quantitative procedure was conducted to screen the items and determining that the items relevant to the content domain of the study factor (Lawshe, 1975). The responses of the experts were examined and the Content Validity Ratio (CVR) was computed for each item in the research instrument.

(3) Confirming the accuracy and the clarity design of the questionnaire instrument by conducting a pre-test.

Consequently, each item adapted has been represented each factor from previous studies correctly.

Stage 1: Item adaption.

The purpose of this stage is formatting the measurement items for the factors influencing MOOCs success. This stage of adapting the research items is based on reviewing the MOOCs and e-learning system success literature. Each item of the instrument should be represented the content of the study factors properly, and all items should be represented the content of all study factors. This stage has been achieved in research instrument section (see Table 4.5): First draft of research instrument).

Stage 2: Experts opinion.

The purpose of this stage is attaining the experts' opinions regarding the instrument and to confirm that the instrument is suitable for measuring the factors influencing MOOCs success in Malaysia context. An expert is purposefully selected depending on his/her domain knowledge, availability and experience with the topics.

In this study, 25 experts were identified. They were 14 MOOCs lecturers who were listed in OpenLearning.com and another 11 experts were MOOCs researchers identified from the WoS database. From 25 experts, only 9 responses received, thus, the response rate is 36%. The experts were asked to fill in an instrument validation questionnaire. In addition, they were asked to contribute in suggestions for enhancements to the research instrument.

Useful comments and suggestions were including from experts contributed in improving the content clarification and helped in correcting grammars for some items. The comments and suggestions taken from MOOCs experts were shown in Table 4.8.

Table 4.8

Experts Comments and suggestions for the research instrument

Factor	Comments and suggestion	Action taken
System quality	●The statement "For me, MOOC system meets my requirements." The word requirements should be changed.	● It was changed to "For me, MOOC system meets my expectations."
Information quality	● "I believe that information from the MOOC system is in a form that is readily usable." the word information is not clear.	● It was changed to "I believe that information (i.e. learning materials) from the MOOC system is in a form that is readily usable".
Service quality	● "In learning through MOOC, I think that I can contact with the instructor via mail or phone or fax." The statement includes grammar mistakes.	● It was changed to "In my MOOC learning experiences, the instructors are available via e-mail, phone or fax.

Validation of items was performed using Lawshe's (1975) Content Validity Ratio (CVR) method. This method has been widely used to achieve and measure content validity of research instruments in various fields of study such as education, organizational development, personnel psychology, market research, and healthcare (Wilson, Pan, & Schumsky, 2012) as well as in e-learning studies (e.g. Kawachi, 2014; Mishra & Panda, 2007; Samarasinghe, 2012).

The CVR suggested by Lawshe (1975) is represented the transform in the proportional level of agreement on how many experts within a panel rating an item "essential". In which, three-point scale was used to rate the instrument items: (1 = not relevant, 2 = important, but not essential, and 3 = essential).

The CVR value is calculated via the following formula:

$$\text{CVR}=\frac{n_e - N_{/2}}{N_{/2}}$$

Where n_e= the number of experts who agreed on the relevance, and N= total members of the panel of expert judges.

Table 4.9 shows the CVR scores of questionnaire items from the 9 experts.

Table 4.9

The CVR scores of questionnaire items

Questionnaire items	CVR
Satisfaction	
1. I am satisfied with my decision to take this course via MOOC.	1
2. If I had an opportunity to take another course via MOOC, I would gladly do so.	1
3. My choice to take this course via MOOC was a wise one.	1
4. I was very satisfied with the MOOC course.	1
5. I feel that this MOOC course served my needs well.	1
6. I will take as many courses via MOOC as I can.	1
7. I was satisfied with the way this MOOC course worked out.	**0.55**
8. If I had it to do over, I would take this course via MOOC.	1
9. I think conducting the course via MOOC made it easier than other courses I have taken.	1
System Quality	
1. For me, the MOOC system is easy to use.	1
2. For me, The MOOC system is easy to manage.	1
3. For me, MOOC system meets my expectations.	1
4. For me, MOOC system includes necessary features and functions for my study.	1
5. For me, MOOC system does what it should.	**0.33**
6. For me, the MOOC user interface can be easily adapted to one's personal approach.	**0.11**
7. For me, MOOC system requires only the minimum number of feature and screens to achieve a task.	1
8. For me, all data within MOOC system is fully integrated and consistent.	1
Information Quality	
1. I believe that MOOC system provides me with the outputs that I need.	1
2. I believe that information (i.e. learning materials) needed from the MOOC system is always available for me.	**0.11**
3. I believe that information (i.e. learning materials) from the MOOC system is in a form that is readily usable.	1
4. I believe that, MOOC system provides information (i.e. learning materials) that is easy to understand.	1
5. I believe that information (i.e. learning materials) from the MOOC system is concise.	1

Table 4.9 continued

Questionnaire items	CVR
Service quality	
1. In my MOOC learning experiences, the instructors are good to learners.	1
2. In my MOOC learning experiences, the instructors are friendly to learners.	1
3. In my MOOC learning experiences, the instructors are knowledgeable enough about the content.	1
4. In my MOOC learning experiences, I think that the service supported by the university is good enough.	**0.55**
5. In my MOOC learning experiences, the instructors are available via e-mail, phone or fax.	1
6. In my MOOC learning experiences, I do not encounter any problems to contact helpdesk.	1
7. In my MOOC learning experiences, I do not experience any registration problems.	1
8. In learning through MOOC, I can easily solve a problem during admission to a module in registrations.	**0.11**
Course quality	
1. In my MOOC learning experiences, students are provided with information about the course that outlines course objectives, concepts, and main ideas.	1
2. In my MOOC learning experiences, learning outcomes for the course are summarized in clearly written, straightforward statements.	1
3. In my MOOC learning experiences, courses are designed to encourage learners to work together utilizing problem-solving activities to develop topic understanding.	1
4. In my MOOC learning experiences, the course content is communicated well.	1
5. In my MOOC learning experiences, the courses content is up-to-date.	1
Attitude	
1. I feel confident in using MOOC.	1
2. I enjoy using MOOC for my studies	1
3. I believe that MOOC gives me the opportunity to acquire new knowledge.	1
4. I believe that MOOC enhances my learning experience.	1
5. I believe that convenience is an important feature of MOOC.	1
6. I believe that MOOC increases the quality of learning because it integrates all forms of media.	1
7. I believe that adopting MOOC allows for increased student satisfaction.	1
8. I believe that studying courses that use MOOC is interesting.	1

Table 4.9 continued

Questionnaire items	CVR
Self-regulated learning	
1. I know what I am going to achieve in this MOOC course.	1
2. I have set aside time to study the MOOC course.	1
3. I have high standards for my work on this MOOC course.	1
4. I have set targets for all I want to achieve in this MOOC course.	1
5. I do not see my engagement in the MOOC course as less important solely because it is an online course.	1
6. I have written down the goals I plan to achieve by the end of this MOOC course.	1
7. I work strategically to prioritise tasks to help me achieve my learning goals in MOOC course.	1
8. I prepare for my online study by reading the suggested background learning materials beforehand.	1
9. I set out my study agenda before engaging with the online resources.	1
10. I am prepared to tackle any challenging aspects of the work in this MOOC course.	1
11. I have planned ahead in order to devote the necessary time to my online studies.	1
12. I find a good time to study when I won't be distracted.	1
13. I choose my study location in order to avoid distractions.	1
14. I find a comfortable place to study.	1
15. I choose an appropriate place to work in order to study effectively.	1
16. I plan to use the interactive communication channels provided to gain support from peers and tutors.	1
17. I plan to participate in the course discussion forums in order to get the most out of the course.	1
18. While engaging in this course, I will reflect on my study in each module.	1
19. I will be proactive in engaging and reviewing progress in the learning path I select.	1

In the validity research instrument items literature, achieving 80% expert agreement is the rule of thumb when estimating the expert judge validity (Newman, Newman, & Newman, 2011). Thus, only items with a total agreement (CVR=1) and items CVR of 0.77, which is close to 80% of agreement among the 9 experts are included in the final survey for data collection.

Accordingly, 6 items were deleted from the first draft of the instrument (Appendix D) because their CVR scores were lower than 0.77.

Input from experts' comments and CVR scores were used to produce the second version of the instrument in this study and further processed in the third stage, that is the pre-test stage.

Stage 3: Pre-test.

A pre-test is an informal method to test a survey instrument (Remenyi, Williams, Money, & Swartz, 1998). The purpose of the pre-test stage is to confirm clarity and accuracy in the design of the questionnaire instrument (Remenyi et al., 1998). In this study, pre-testing was conducted to check the difficulties in understanding the items, assess the format of the questions, and determine the accuracy of the questions and response wording.

The following procedures were applied in conducting pre-testing of the second version of the instrument:

1. The second version of the questionnaire with a cover letter explaining the purpose of this study was sent to 10 Ph.D. students from a research-intensive university who were involved with research relating to MOOCs project.

2. These 10 Ph.D. students were requested to ensure and identify any problematic, ambiguous and unclear items from the questionnaire. The purpose was to confirm that there is no ambiguity or difficulties in understanding the items of the questionnaire.

3. The results of the pre-test indicated that the format, content, comprehensibility, and clarity of the items were achieved. No items deleted in this stage.

The pre-test resulted in 56 finalized items as shown in table 4.10.

Table 4.10

The final items of the questionnaire

Questionnaire items
Satisfaction
1. I am satisfied with my decision to take this course via MOOC.
2. If I had an opportunity to take another course via MOOC, I would gladly do so.
3. My choice to take this course via MOOC was a wise one.
4. I was very satisfied with the MOOC course.
5. I feel that this MOOC course served my needs well.
6. I will take as many courses via MOOC as I can.
7. If I had it to do over, I would take this course via MOOC.
8. I think conducting the course via MOOC made it easier than other courses I have taken.
System Quality
9. For me, the MOOC system is easy to use.
10. For me, the MOOC system is easy to manage.
11. For me, MOOC system meets my expectations.
12. For me, MOOC system includes necessary features and functions for my study.
13. For me, MOOC system requires only the minimum number of feature and screens to achieve a task.
14. For me, all data within MOOC system is fully integrated and consistent.
Information Quality
15. I believe that MOOC system provides me with the outputs that I need.
16. I believe that information (i.e. learning materials) from the MOOC system is in a form that is readily usable.
17. I believe that, MOOC system provides information (i.e. learning materials) that is easy to understand.
18. I believe that information (i.e. learning materials) from the MOOC system is concise.
Service quality
19. In my MOOC learning experiences, the instructors are good to learners.
20. In my MOOC learning experiences, the instructors are friendly to learners.
21. In my MOOC learning experiences, the instructors are knowledgeable enough about the content.
22. In my MOOC learning experiences, the instructors are available via e-mail, phone or fax.
23. In my MOOC learning experiences, I do not encounter any problems to contact helpdesk.
24. In my MOOC learning experiences, I do not experience any registration problems.
Course quality
25. In my MOOC learning experiences, students are provided with information about the course that outlines course objectives, concepts, and main ideas.
26. In my MOOC learning experiences, learning outcomes for the course are summarized in clearly written, straightforward statements.
27. In my MOOC learning experiences, courses are designed to encourage learners to work together utilizing problem-solving activities to develop topic understanding.

Table 4.10 continued

Questionnaire items
Course quality
28. In my MOOC learning experiences, students are provided with information about the course that outlines course objectives, concepts, and main ideas.
29. In my MOOC learning experiences, learning outcomes for the course are summarized in clearly written, straightforward statements.
30. In my MOOC learning experiences, courses are designed to encourage learners to work together utilizing problem-solving activities to develop topic understanding.
31. In my MOOC learning experiences, the course content is communicated well.
32. In my MOOC learning experiences, the courses content is up-to-date.
Attitude
33. I feel confident in using MOOC.
34. I enjoy using MOOC for my studies
35. I believe that MOOC gives me the opportunity to acquire new knowledge.
36. I believe that MOOC enhances my learning experience.
37. I believe that convenience is an important feature of MOOC.
38. I believe that MOOC increases the quality of learning because it integrates all forms of media.
39. I believe that adopting MOOC allows for increased student satisfaction.
40. I believe that studying courses that use MOOC is interesting.
Self-regulated learning
41. I know what I am going to achieve in this MOOC course.
42. I have set aside time to study the MOOC course.
43. I have high standards for my work on this MOOC course.
44. I have set targets for all I want to achieve in this MOOC course.
45. I do not see my engagement in the MOOC course as less important solely because it is an online course.
46. I have written down the goals I plan to achieve by the end of this MOOC course.
47. I work strategically to prioritise tasks to help me achieve my learning goals in MOOC course.
48. I prepare for my online study by reading the suggested background learning materials beforehand.
49. I set out my study agenda before engaging with the online resources.
50. I am prepared to tackle any challenging aspects of the work in this MOOC course.
51. I have planned ahead in order to devote the necessary time to my online studies.
52. I find a good time to study when I won’t be distracted.
53. I choose my study location in order to avoid distractions.

Table 4.10 continued

Questionnaire items
Self-regulated learning
54. I plan to participate in the course discussion forums in order to get the most out of the course.
55. While engaging in this course, I will reflect on my study in each module.
56. I will be proactive in engaging and reviewing progress in the learning path I select.

Reliability

Reliability is a very important analysis used to measure the questionnaire consistency or dependability (Neuman, 2006). In this study, the reliability of the instrument was conducted through 2 methods:

Method One: Construct (or composite) reliability

The purpose of calculating the construct reliability is to test the internal consistency of the measures (Holmes-Smith, 2011). In the current study, construct reliability was used to confirm the reliability of all the observed variables that represent the factors of the study. Holmes-Smith (2011) pointed out that the construct reliability is frequently used to estimate model parameters.

Method Two: Cronbach's alpha

The most common measurement for testing the internal consistency is Cronbach's alpha (α) (Van Zyl, Neudecker, & Nel, 2000). The rule of thumb for (α) is 0.70 which is recommended value, and 0.60 is acceptable value (Hair, Black, Babin, Anderson, & Ronald, 2006). George and Mallery (2012) classified alpha values as the following, ($\alpha > 0.9$ = excellent); ($\alpha > 0.8$= good); ($\alpha > 0.7$= acceptable); ($\alpha > 0.6$= questionable); ($\alpha > 0.5$= poor); and ($\alpha < 0.5$= unacceptable).

Pilot Test

Pilot test is considered to be an excellent step that should be executed before presenting the final version of the instrument for collecting data. Pilot test is a small version of the main study carried out through a small group from the population that the researcher plans to sample (Pallant, 2011). The purpose of conducting a pilot test is to fix any mistakes in the instruments and to improve the quality and the efficiency of measurement instruments (Kumar, 2005). The pilot study aims to ensure that the instrument and procedure function suitably as proposed (Bordens & Abbott, 2008) and to confirm that the questions and items in the questionnaire are clear. The pilot study is believed to be a key approach to determine the study feasibility (Leedy & Ormrod, 2010).

In this study, a pilot test was conducted with 52 students from a research-intensive university who have enrolled in a MOOCs course titled "Malaysian Taxation" through OpenLearning.com, the main MOOCs platform in Malaysia. The purpose of this course was to provide students with basic knowledge on the two main taxes in Malaysia: goods and service tax, and income tax.

An online survey of the finalized instruments was distributed to the students via e-mail with the help of the course instructor. Out of 52, thirty-six students finished the pilot study for a response rate of 69%.

The reliability of the instrument was examined using Cronbach alpha (α) and the value was 0.968. The reliability of each factors also tested and the results indicated that the reliability of all factors > 0.9; hence, the results of the pilot study verified the excellent reliability (George & Mallery, 2012). Table 4.11 displays the alpha value for the factors in the pilot test.

Table 4.11

Alpha value for the pilot test

Factors	Cronbach alpha
Satisfaction	0.949
System quality	0.955
Information quality	0.954
Service quality	0.960
Course quality	0.963
Attitude	0.948
SRL	0.960

The Cronbach alpha scores for each subscale of the instrument were examined. The internal consistency of the subscales is ranged from 0.966 to 0.968. Table 4.12 displays α value for the subscales of the instrument.

Table 4.12

Cronbach's Alpha value ((when items deleted) for the subscales of the instrument

Questionnaire items	Cronbach's alpha
Satisfaction	
1. I am satisfied with my decision to take this course via MOOC.	0.967
2. If I had an opportunity to take another course via MOOC, I would gladly do so.	0.967
3. My choice to take this course via MOOC was a wise one.	0.967
4. I was very satisfied with the MOOC course.	0.966
5. I feel that this MOOC course served my needs well.	0.967
6. I will take as many courses via MOOC as I can.	0.966
7. If I had it to do over, I would take this course via MOOC.	0.967
8. I think conducting the course via MOOC made it easier than other courses I have taken.	0.967
System Quality	
9. For me, the MOOC system is easy to use.	0.967
10. For me, the MOOC system is easy to manage.	0.967
11. For me, MOOC system meets my expectations.	0.967
12. For me, MOOC system includes necessary features and functions for my study.	0.967
13. For me, MOOC system requires only the minimum number of feature and screens to achieve a task.	0.967
14. For me, all data within MOOC system is fully integrated and consistent.	0.967
Information Quality	
15. I believe that MOOC system provides me with the outputs that I need.	0.966
16. I believe that information (i.e. learning materials) from the MOOC system is in a form that is readily usable.	0.967
17. I believe that, MOOC system provides information (i.e. learning materials) that is easy to understand.	0.966
18. I believe that information (i.e. learning materials) from the MOOC system is concise.	0.967
Service quality	
19. In my MOOC learning experiences, the instructors are good to learners.	0.967
20. In my MOOC learning experiences, the instructors are friendly to learners.	0.967
21. In my MOOC learning experiences, the instructors are knowledgeable enough about the content.	0.967
22. In my MOOC learning experiences, the instructors are available via e-mail, phone or fax.	0.967
23. In my MOOC learning experiences, I do not encounter any problems to contact helpdesk.	0.967
24. In my MOOC learning experiences, I do not experience any registration problems.	0.967

Table 4.12 Continued

Questionnaire items	Cronbach's alpha
Course quality	
25. In my MOOC learning experiences, students are provided with information about the course that outlines course objectives, concepts, and main ideas.	0.968
26. In my MOOC learning experiences, learning outcomes for the course are summarized in clearly written, straightforward statements.	0.967
27. In my MOOC learning experiences, courses are designed to encourage learners to work together utilizing problem-solving activities to develop topic understanding.	0.967
28. In my MOOC learning experiences, the course content is communicated well.	0.967
29. In my MOOC learning experiences, the courses content is up-to-date.	0.967
Attitude	
30. I feel confident in using MOOC.	0.967
31. I enjoy using MOOC for my studies	0.966
32. I believe that MOOC gives me the opportunity to acquire new knowledge.	0.967
33. I believe that MOOC enhances my learning experience.	0.966
34. I believe that convenience is an important feature of MOOC.	0.967
35. I believe that MOOC increases the quality of learning because it integrates all forms of media.	0.967
36. I believe that adopting MOOC allows for increased student satisfaction.	0.967
37. I believe that studying courses that use MOOC is interesting.	0.967
Self-regulated learning	
38. I know what I am going to achieve in this MOOC course.	0.967
39. I have set aside time to study the MOOC course.	0.967
40. I have high standards for my work on this MOOC course.	0.967
41. I have set targets for all I want to achieve in this MOOC course.	0.967
42. I do not see my engagement in the MOOC course as less important solely because it is an online course.	0.967
43. I have written down the goals I plan to achieve by the end of this MOOC course.	0.967
44. I work strategically to prioritise tasks to help me achieve my learning goals in MOOC course.	0.967
45. I prepare for my online study by reading the suggested background learning materials beforehand.	0.967
46. I set out my study agenda before engaging with the online resources.	0.967
47. I am prepared to tackle any challenging aspects of the work in this MOOC course.	0.967

Table 4.12 continued

Questionnaire items	Cronbach's alpha
48. I have planned ahead in order to devote the necessary time to my online studies.	0.966
49. I find a good time to study when I won't be distracted.	0.968
50. I choose my study location in order to avoid distractions.	0.967
51. I find a comfortable place to study.	0.967
52. I choose an appropriate place to work in order to study effectively.	0.967
53. I plan to use the interactive communication channels provided to gain support from peers and tutors.	0.967
54. I plan to participate in the course discussion forums in order to get the most out of the course.	0.967
55. While engaging in this course, I will reflect on my study in each module.	0.967
56. I will be proactive in engaging and reviewing progress in the learning path I select.	0.967

No changes have been made to the wording of the questionnaire items. Accordingly, the items have been used in the actual data collection phase.

Summary

Chapter 4 described the methodology utilized in this study. The chapter detailed the sampling, the instrument used and the development of scale items. It also investigated the processes conducted for validating the questionnaire followed by the pilot test. The chapter also discussed the data collection and data analysis that implemented in this study.

CHAPTER 5

DATA ANALYSES AND FINDINGS

Introduction

Chapter 5 examines the outcomes of the questionnaire and reports the data on the statistical analysis. The chapter begins with the descriptive information and the preparation for data analyses. Then, presentation of the results of a bivariate correlation analysis among all of the study variables, factor analysis using EFA and CFA were discussed. The statistics for testing of the research model using PLS-SEM were investigated and the findings related testing the hypotheses were performed.

Descriptive Analysis

This section presents the result of responses, data cleaning, and demographic profile of participants.

Distribution of the Survey and Analysis of Responses

The survey was sent by chat feature in OpenLearning -the MOOCs platform- to 1000 undergraduate students from five Malaysian public universities (i.e. UKM, UPM, UiTM, UNIMAS, and UTeM) asking them to participate in the study questionnaire.

Two hundred thirty-five responses were received during the first week of the study. Additional 146 responses were received during the next week. Two weeks later a reminder for answering the survey was sent to the students via Chat feature in OpenLearning resulting in an additional 163 responses. During the week following the reminder, the number of responses increased to 614. The study was closed one week later with a final number of 646 responses. In total, the survey website was active for 35 days.

Some incentives were given out to respondents as a token of gratitude and to increase people's willingness to participate in the survey. Providing prizes to participants is considered as an effective way to tackle the non-response problem as well (Leary, 2014).

Data Cleaning

During the data cleaning process, 24 responses were excluded from further analyses because some participants did not complete of the whole survey (n=6) and due to the unsuitability of some responses to be target sample (n=18) as they have a distance study mode so these responses are out of five universities chosen. The final number of accepted surveys used in the data analysis was 622 representing a response rate of 62%, the sample was usable for subsequent analyses. Table 5.1 displays the expected, collected, excluded and usable survey responses that will be used for the next data analysis processes.

Table 5.1

The questionnaires distribution

Universities	**Expected**	**Collected**	**Excluded**	**Usable**
UKM	203	128	2	126
UPM	221	142	5	137
UiTM	215	141	7	134
UNIMAS	204	130	3	127
UTeM	157	105	7	98
Total	**1000**	646	24	**622**

Demographic Data

The sample of this study is undergraduate students from the top 5 public universities in Malaysia in using MOOCs. In the study sample, there were more female (63.8%) than male (35.9%) participants, while some refused to disclose their gender (0.3%).

With regard to age group, most of the respondents (54.2%) were between 20 to 30 years old, less than 20 years were (45.7%) of the sample, while (0.2 %) were between 31 and 40 years old. Most of the participants were Malay (74.3%) followed by Chinese (15.9%), Indians (5.1%) and international students (4.7%). Regarding participants experience in MOOCs, 41.3% of the participants have limited experience to current course, 42.9% have MOOCs experience from (1 to 2) courses, 10.9% from (3 to 4) courses while 4.9% of the participants have more than 4 courses. The highest number of participants were from UPM (22%), followed by UiTM (21.5%), UNIMAS (20.4%) and UKM (20.3%) while UTeM had the lower number (15.8%) of participants from the target sample. Table 5.2 displays a summary of demographic data results.

Table 5.2

Demographic data results

Variable	**Category**	**Frequency (n=622)**	**Valid percent (%)**
Gender	Female	397	63.8
	Male	223	35.9
	Not specified	2	0.3
Age group	Less than 20 years	284	45.7
	20-30 Years	337	54.2
	31-40 Years	1	0.2
Ethnicity	Malay	462	74.3
	Chinese	99	15.9
	Indian	32	5.1
	Others	29	4.7
Experience	Limited to current course	257	41.3
	1-2 courses	267	42.9
	3-4 courses	68	10.9
	More than 4 courses	30	4.2
University	UiTM	134	21.5
	UKM	126	20.3
	UNIMAS	127	20.4
	UPM	137	22.0
	UTeM	98	15.8

Preparation of Data

Preparing data has been conducted through missing data and outliers, common bias method, normality test, and collinearity assessment. All these methods were tested to confirm that the data is ready for more analyses. The analyses were done using the SPSS software.

Missing Data and Outliers

Missing data happens when the participants do not answer a specific item in the study survey or responding it wrongly (Muijs, 2004). To estimate the missing data, the imputation approach has been utilized. The imputation technique is often chosen when the missing data is not exceeded the 10% (Hair et al., 2010). Imputation is the process of replacing missing data with substituted values. In this study, the imputation technique using SPSS was employed to replace the missing value with the mean of that variable for all other cases to estimate the missing data.

After assessing the missing data, the outlier values should be examined to check whether this issue exists in the data. According to Holmes-Smith (2011), the most obvious reason of outliers is uncorrected miscoding of the data. In the present study, the data was imported electronically from google document to SPSS and did not code manually, thus, the outliers' issue should not take place in this study. As a result, checking the outliers were done via examining the frequency distributions of the data (Holmes-Smith, 2011), the findings indicated that all values were between the scales used in this study range which is from1 to 5, and no outline issue exist.

Common Method Bias (CMB)

Harman's Single Factor analysis method was conducted to identify whether the common method bias (CMB) exists in the research design of this study. MacKenzie and Podsakoff (2012) explored many reasons that cause the common method bias (CMB) issue in the study such as:

- Using a common source that provides both independent and dependent variables can be introduced a self-reporting bias.
- The survey instrument's design, the length of the survey instrument, complexity, ambiguity and scale format can influence the rater's responses.

The principal component factor analysis via SPSS program employed to test the CMB by entering all the factors of the study in this analysis. The principal components factor analysis in this study indicated that each principal factor explains variance (43.08%). MacKenzie and Podsakoff (2012) indicated that if the total variance for a single factor is $< 50\%$, then CMB is not affected the research data.

CMB tests were also conducted by drawing paths in PLS to all variables. Bagozzi and Yi (1998) stated that common method bias becomes more evident when the intercorrelations of principal construct $r > .90$. However, based on Figure 5.7 the highest intercorrelations among latent constructs are below 0.85. Thus, the results of the two techniques displayed that result suggests a lack of substantial common bias method.

Normality of the Factors

The normality of the data was tested using the skewness and kurtosis statistical method as shown in table 5.3.

Table 5.3

Normality test for the items

	SA	SQ	IQ	SRQ	CQ	AT	SRL
Mean	3.68	3.68	3.84	3.76	3.86	3.89	3.71
Std. Deviation	0.679	0.629	0.590	0.561	0.572	0.654	0.526
Skewness	-0.350	-0.373	-0.409	-0.077	-0.277	-0.823	-0.072
S.E of Skewness	0.098	0.098	0.098	0.098	0.098	0.098	0.098
Kurtosis	0.382	0.805	1.390	0.338	0.776	2.151	0.920
S.E of Kurtosis	0.196	0.196	0.196	0.196	0.196	0.196	0.196

Note: S.E: Standard Error.

The factors used in this study had values within the normality curve, between -0.823 and +2.151. In this context, Sekaran (2006) indicated that the values of data within the two absolute values -2 and +2 show good normal distribution. Peugh and Enders (2005) stated that any values of standard error between -3 and +3 are an indication that the distributions of the variables are normal.

Summary of the mean score and standard deviation of each factor also calculated as shown in Table 5.3. All factors were positively worded in the questionnaire with a mean score of above 3.6. This indicates the overall agreement for each factor. The standard deviations were all similar suggested that there are no outliers for any of the factors. After these tests, the data sets were ready for further analysis.

Collinearity Assessment

The main cause of the collinearity problem is the high correlation between two indicators of the study. The collinearity assessment calculated using SPSS. According to O'brien, (2007) If VIF value exceeded 5.00 then collinearity problems exist. Table 5.4 displays the collinearity assessment results.

Table 5.4

The collinearity assessment results

Model		**Collinearity Statistics**	
		Tolerance	**VIF**
1	Satisfaction	0.380	2.631
	System quality	0.334	2.994
	Info quality	0.377	2.650
	Service quality	0.449	2.225
	Course quality	0.355	2.820
	Attitude	0.329	3.039
a. Dependent Variable: SRL			

According to the table 5.4, the VIF for all the factors were below 3.04 and none of the factors were > 5.00. This result showed that there is no collinearity issue exist.

Correlation Test

The correlation data was examined via SPSS program to determine the relationships between the study factors. The first step was creating factors, which done by calculating the mean (average) of the items for each factor.

Next, to measure the strength of a linear relationship between two factors, the *Pearson correlation coefficient* (*r*) was employed. Pearson's correlations used to identify the significance of the independent and dependent factors, strength, and magnitude of each relationship (Pallant, 2011). Table 5.5 shows the correlation analysis which revealed moderately large positive relationships between all the seven factors.

Table 5.5

The correlation test results

Factor	SA	SQ	IQ	SRQ	CQ	AT	SRL
SA	1						
SQ	0.722**	1					
IQ	0.644**	0.723**	1				
SRQ	0.574**	0.645**	0.614**	1			
CQ	0.624**	0.648**	0.647**	0.685**	1		
AT	0.709**	0.669**	0.695**	0.591**	0.731**	1	
SRL	0.596**	0.545**	0.560**	0.580**	0.668**	0.653**	1

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

The correlation findings showed a strong and positive correlation value between attitude and course quality factors [r =0.731, n=622, $p < 0.001$] which indicated that learners' attitude toward using MOOCs are increased when the levels of course quality is high. The least strong, positive correlation was between self-regulated learning and system quality factors [r =0.545, n=622, $p < 0.001$], however, the positive relationship meant that self-regulated learning associated with high levels of system quality.

Reliability Tests

The most common indicator of internal consistency is Cronbach alpha (α). The rule of thumb of α is 0.70 and above (Hair et al., 2006). The SPSS used to examine the Cronbach's alpha which is 0.968 for 56 items. Table 5.6 displays the Cronbach's alpha scores for each factor and subscale.

Table 5.6

The reliability test results

Item	α value	Item	α value	Item	α value
SA factor	**0.915**	**SRQ factor**	**0.919**	**SR factor**	**0.921**
SA1	0.967	SRQ1	0.968	SR1	0.967
SA2	0.967	SRQ2	0.968	SR2	0.968
SA3	0.967	SRQ3	0.968	SR3	0.968
SA4	0.967	SRQ4	0.968	SR4	0.968
SA5	0.967	SRQ5	0.968	SR5	0.968
SA6	0.968	SRQ6	0.968	SR6	0.968
SA7	0.968	**CQ factor**	**0.912**	SR7	0.968
SA8	0.968	CQ1	0.968	SR8	0.968
SQ factor	**0.912**	CQ2	0.968	SR9	0.968
SQ1	0.968	CQ3	0.967	SR10	0.968
SQ2	0.968	CQ4	0.967	SR11	0.968
SQ3	0.967	CQ5	0.968	SR12	0.968
SQ4	0.967	**AT factor**	**0.910**	SR13	0.968
SQ5	0.968	AT1	0.967	SR14	0.968
SQ6	0.968	AT2	0.967	SR15	0.968
IQ factor	**0.914**	AT3	0.968	SR16	0.968
IQ1	0.967	AT4	0.967	SR17	0.968
IQ2	0.968	AT5	0.968	SR18	0.968
IQ3	0.968	AT6	0.967	SR19	0.968
IQ4	0.968	AT7	0.967		
		AT8	0.967		

Note: SA: satisfaction; SQ: system quality; IQ: information quality; SRQ: service quality; CQ: course quality; AT: attitude; SR: self-regulated learning. α: The Cronbach's alpha.

The Cronbach alpha (α) of each factor was above 0.9, and the reliability of the subscales ranged from 0.967 and 0.968 showing a high degree of internal consistency. SRL scale showed the highest alpha value at 0.921, while attitude recorded the lowest alpha at 0.910.

Factor Analysis

Factor analysis method provides tools for identifying the factors that highly connected to each other, this method utilizes for analyzing the structure of correlations between variables (Hair et al., 2006). Factor analysis is used in this study to define the factors that expected to influence MOOCs success in higher education, the factors were identified earlier as SQ, IQ, SRQ, CQ, AT, SRL, and satisfaction. Accordingly, exploring the most factors affecting MOOCs success and their scales have been applied using exploratory factor analysis (EFA); next, (CFA) method is used for examining the fitness of the model based on EFA results.

Exploratory Factor Analysis (EFA)

Exploratory Factor Analysis (EFA) has been examined into two stages. Stage 1 is executed for analyzing the independent factors and mediator "satisfaction", and stage 2 is analyzed for the dependent factor "SRL".

EFA for Independent Factors and Mediator

All 37 items (independent factors and mediator) were analyzed using EFA analysis. As suggested by Pallant (2011), two statistical methods were employed to measure the factorability or adequacy of the pattern matrix of the data which are: Bartlett's Test of Sphericity (BTS) and the Kaiser-Meyer-Olkin (KMO) (Kaiser, 1974), these two statistics have been utilized in the current study.

The result of the KMO was above the 0.9 value at 0.955, which is exceeding the suggested value of 0.6 for KMO analysis (Williams, Onsman, & Brown, 2010). The BTS result [df= 666, $\chi 2 = 7656$; $p < 0.001$] was also significant value.

The initial EFA result indicated that the items captured six factors with eigenvalue ≥ 1, however, the scree plot pointed out to 5 factors. Figure 5.1 display the first order of the scree plot.

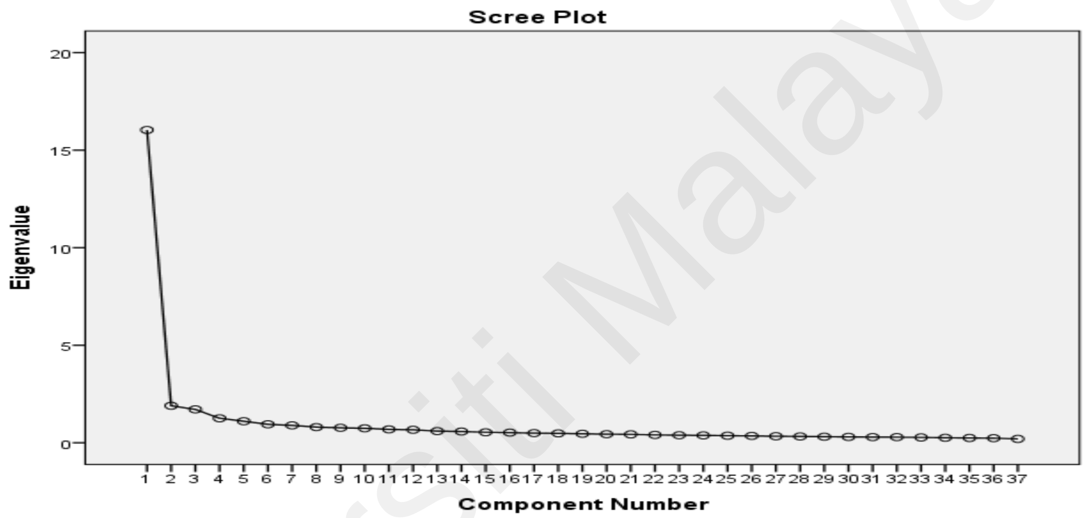

Figure 5.1. Scree plot of all factors (first order)

The second round of the factor analysis was produced by fixing the number to 5 factors (in tandem with the proposed model as described in Chapter 3), all items were exposed to EFA analysis again. The results of this round showed that the first factor has the largest percentage of the total variance (44.8%) and four other factors have been achieved (61.5%) of the total variance. The scree plot (second round) displays in figure 5.2.

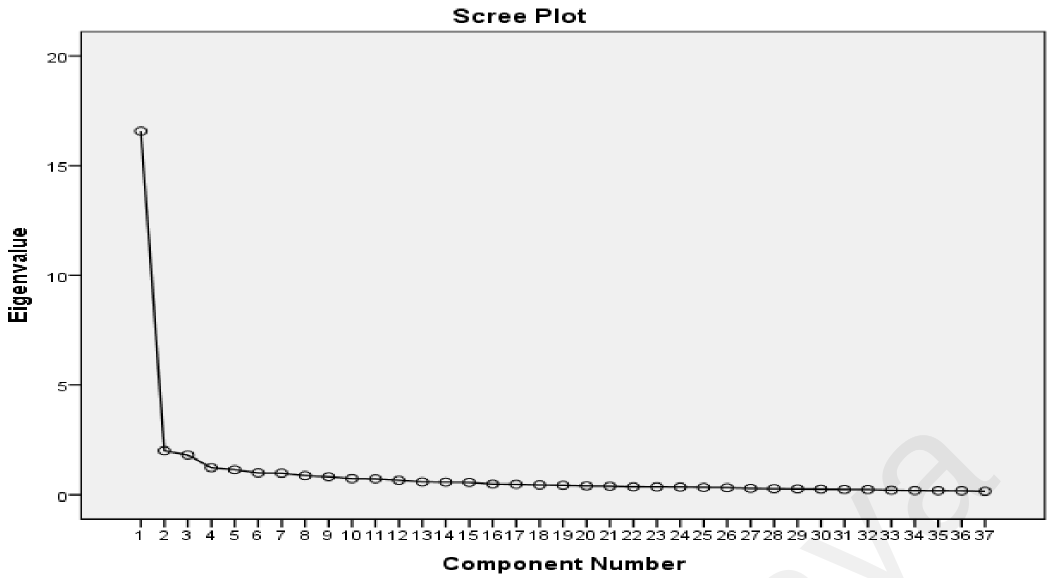

Figure 5.2. Scree plot of all factors (second order)

Upon examination of this Pattern Matrix, three items were deleted due to the low Communality values < 0.3 for these factors (i.e., SQ5: "*For me, MOOCs system requires only the minimum number of feature and screens to achieve a task*", SRQ5: "*In my MOOCs learning experiences, I do not encounter any problems to contact helpdesk*", and SRQ6: "*In my MOOCs learning experiences, I do not experience any registration problems*"). These items were no longer included in the subsequent analyses.

On the other hand, CQ5: "*In my MOOCs learning experiences, the courses content is up-to-date*" from course quality factor has been loaded on attitude factor. The significant components that form these factors and the reliability are shown in the following Tables (5.7-5.12) below.

Table 5.7

Factor loadings, communalities, Eigenvalue, % variances explained, and reliability by Attitude factor

Code	Items	Factor loading	Communalities	Eigen value	% variance	Reliability
AT1	I feel confident in using MOOC.	0.832	0.730	6.575	44.798	0.928
AT2	I enjoy using MOOC for my studies.	0.808	0.688			
AT3	I believe that MOOC gives me the opportunity to acquire new knowledge.	0.702	0.661			
AT4	I believe that MOOC enhances my learning experience.	0.764	0.625			
AT5	I believe that convenience is an important feature of MOOC.	0.709	0.713			
AT6	I believe that MOOC increases the quality of learning because it integrates all forms of media.	0.720	0.665			
AT7	I believe that adopting MOOC allows for increased student satisfaction.	0.811	0.688			
AT8	I believe that studying courses that use MOOC is interesting.	0.823	0.666			
CQ5	In my MOOC learning experiences, the courses content is up-to-date.	0.728	0.687			

The factor loadings for the attitude factor were above 0.7, the communalities above 0.6 and the reliability 0.928 > 0.7. All these values were significant and exceeded the recommended values.

Table 5.8

Factor loadings, communalities, Eigenvalue, % variances explained, and reliability by satisfaction factor

Code	Items	Factor loading	Commu nalities	Eigen value	% variance	Reliability
SA1	I am satisfied with my decision to take this course via MOOC.	0.795	0.648	2.004	8.417	0.913
SA2	If I had an opportunity to take another course via MOOC, I would gladly do so.	0.793	0.692			
SA3	My choice to take this course via MOOC was a wise one.	0.833	0.737			
SA4	I was very satisfied with the MOOC course.	0.776	0.646			
SA5	I feel that this MOOC course served my needs well.	0.828	0.580			
SA6	I will take as many courses via MOOC as I can.	0.600	0.646			
SA7	If I had it to do over, I would take this course via MOOC.	0.687	0.683			
SA8	I think conducting the course via MOOC made it easier than other courses I have taken.	0.700	0.613			

The factor loadings for the satisfaction factor were ≥ 0.6, the communalities above 0.5 and the reliability 0.913 > 0.7. All these values were significant and exceeded the recommended values.

Table 5.9

Factor loadings, communalities, Eigenvalue, % variances explained, and reliability by system quality factor

Code	Items	Factor loading	Commu nalities	Eigen value	% variance	Reliability
SQ1	For me, the MOOC system is easy to use.	0.719	0.544	1.809	4.889	0.848
SQ2	For me, the MOOC system is easy to manage.	0.693	0.656			
SQ3	For me, MOOC system meets my expectations.	0.770	0.555			
SQ4	For me, MOOC system includes necessary features and functions for my study.	0.770	0.625			
SQ6	For me, all data within MOOC system is fully integrated and consistent.	0.680	0.601			

The factor loadings for the system quality factor were above 0.6, the communalities above 0.5 and the reliability 0.848 > 0.7. All these values were significant and exceeded the recommended values.

Table 5.10

Factor loadings, communalities, Eigenvalue, % variances explained, and reliability by service quality factor

Code	Items	Factor loading	Communalities	Eigen value	% variance	reliability
SRQ1	In my MOOCs learning experiences, the instructors are good to learners.	0.742	0.784	1.228	3.320	0.823
SRQ2	In my MOOCs learning experiences, the instructors are friendly to learners.	0.684	0.814			
SRQ3	In my MOOCs learning experiences, the instructors are knowledgeable enough about the content.	0.811	0.577			
SRQ4	In my MOOCs learning experiences, the instructors are available via e-mail, phone or fax.	0.685	0.655			

The factor loadings for the service quality factor were above 0.6, the communalities above 0.5 and the reliability 0.823 > 0.7. All these values were significant and exceeded the recommended values.

Table 5.11

Factor loadings, communalities, Eigenvalue, % variances explained, and reliability by course quality factor

Code	Items	Factor loading	Commu nalities	Eigen value	% variance	Reliability
CQ1	In my MOOC learning experiences, students are provided with information about the course that outlines course objectives, concepts, and main ideas.	0.647	0.733	1.137	3.072	0.824
CQ2	In my MOOC learning experiences, learning outcomes for the course are summarized in clearly written, straightforward statements.	0.752	0.636			
CQ3	In my MOOC learning experiences, courses are designed to encourage learners to work together utilizing problem-solving activities to develop topic understanding.	0.741	0.587			
CQ4	In my MOOC learning experiences, the course content is communicated well.	0.797	0.655			

The factor loadings for the course quality factor were above 0.6, the communalities above 0.5 and the reliability 0.824 > 0.7. All these values were significant and exceeded the recommended values.

Table 5.12

Factor loadings, communalities, Eigenvalue, % variances explained, and reliability by information quality factor

Code	Items	Factor loading	Communalities	Eigen value	% variance	Reliability
IQ1	I believe that MOOCs system provides me with the outputs that I need.	0.745	0.635	1.110	2.678	0.827
IQ2	I believe that information (i.e. learning materials) from the MOOCs system is in a form that is readily usable.	0.766	0.485			
IQ3	I believe that, MOOCs system provides information (i.e. learning materials) that is easy to understand.	0.699	0.496			
IQ4	I believe that information (i.e. learning materials) from the MOOCs system is concise.	0.739	0.522			

The factor loadings for the information quality factor were above 0.6, the communalities above 0.4 which are acceptable value as suggested by Child (2006) and the reliability 0.827 > 0.7. All these values were significant and exceeded the recommended values.

EFA for Dependent Factor

All 19 items for self-regulated learning (SRL) factor were analyzed using EFA. The result of the KMO value was 0.921 > 0.6 (Kaiser, 1974). The BTS result [df= 171, $\chi2$ = 3234; p < 0.001] was significant and exceeded the recommended value.

The EFA result indicated that the items captured three factors with the eigenvalue of 1.0 and more. The results of this round showed that the first factor has achieved the largest percentage of the total variance (43.5%) and the other 2 factors extracted (58.7%) of the variance. The second round of the factor analysis was produced by fixing the number of factors to 3; all items were subjected to EFA again.

The scree plot (second round) is display in figure 5.3 and the result of EFA is shown in table 5.13.

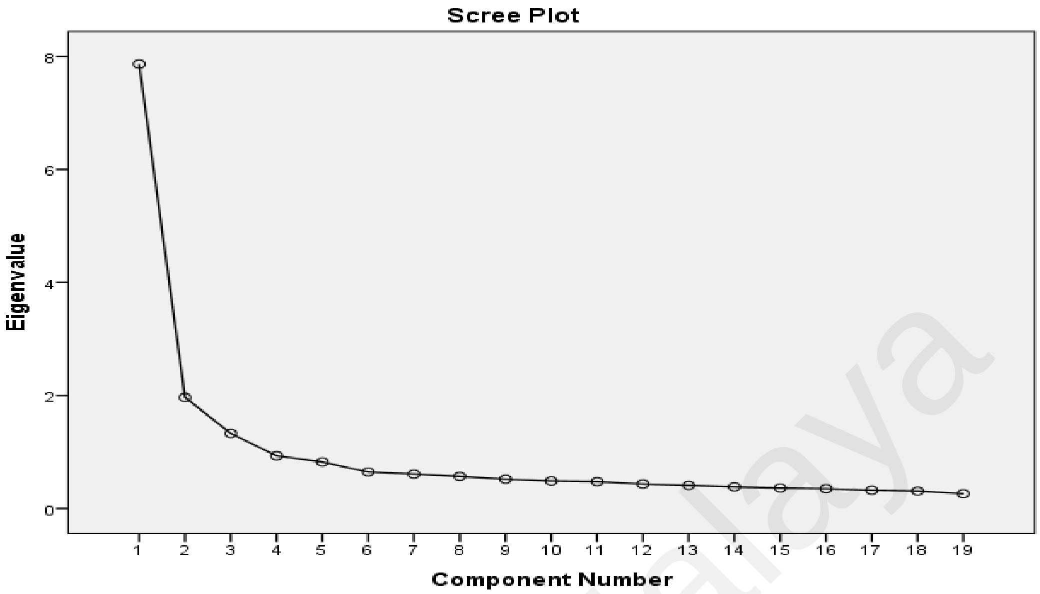

Figure 5.3. Scree plot of the SRL factor (second order)

The significant components that form self-regulated learning factor and the reliability is shown in the following Table 5.13 below.

Table 5.13

Factor loadings, communalities, eigenvalue, % variances explained, and reliability by self-regulated learning factor

Code	Items	Factor loadings: 1 α=0.917	2 α=0.848	3 α=0.831	Communalities	Eigen value	% variance
SR1	I know what I am going to achieve in this MOOC course.	0.592			0.519	8.266	43.503
SR2	I have set aside time to study the MOOC course.	0.691			0.582		
SR3	I have high standards for my work on this MOOC course.	0.689			0.576		
SR4	I have set targets for all I want to achieve in this MOOC course.	0.656			0.599		
SR6	I have written down the goals I plan to achieve by the end of this MOOC course.	0.801			0.420		
SR7	I work strategically to prioritise tasks to help me achieve my learning goals in MOOC course.	0.747			0.655		
SR8	I prepare for my online study by reading the suggested background learning materials beforehand.	0.725			0.610		
SR9	I set out my study agenda before engaging with the online resources.	0.711			0.588		
SR10	I am prepared to tackle any challenging aspects of the work in this MOOC course.	0.664			0.586		
SR11	I have planned ahead in order to devote the necessary time to my online studies.	0.765			0.554		
SR12	I find a good time to study when I won't be distracted.		0.708		0.653	2.012	10.589
SR13	I choose my study location in order to avoid distractions.		0.808		0.660		
SR14	I find a comfortable place to study.		0.843		0.710		
SR15	I choose an appropriate place to work in order to study effectively.		0.764		0.592		
SR16	I plan to use the interactive communication channels provided to gain support from peers and tutors.			0.765	0.651	1.365	7.184
SR17	I plan to participate in the course discussion forums in order to get the most out of the course.			0.745	0.724		
SR18	While engaging in this course, I will reflect on my study in each module.			0.766	0.796		
SR19	I will be proactive in engaging and reviewing progress in the learning path I select.			0.665	0.711		

The result of EFA suggested dividing the self-regulated learning factor to 3 factors. This result is consistent with Zimmerman (1989) who considered self-regulated learning as a give-and take-action where the learners are able to participate actively and improve their motivation, behavior, and metacognitive in their own learning.

The result of EFA for self-regulated learning indicated that all factor loadings were above 0.59 and the reliability 0.83 > 0.7 were all acceptable values. The results of communalities were values above 0.4 which are considered acceptable values according to many studies such as (Child, 2006; Field, 2005; Taherdoost, Sahibuddin, & Jalaliyoon, 2014). However, the communality value for SR5 item "*I do not see my engagement in the MOOCs course as less important solely because it is an online course*" was 0.363 < 0.4, thus this item was deleted.

All the above-mentioned factors were exposed to the next stage. CFA analysis has been conducted to ensure the fitness of the study model.

Confirmatory Factor Analysis (CFA)

CFA technique is utilized to evaluate the fitness of the study model. CFA aims to determine whether the loadings of observed variables and the number of factors are fitting by the pre-established theory. This study tested the measurement model using the estimation method of maximum likelihood (ML) which performed on the overall model that consists of all the factors measures derived from the EFA.

CFA analysis includes many of fit indices such as Goodness-of-Fit Index (GFI), Root Mean Square Error of Approximation (RMSEA), and Comparative Fit Index (CFI). The overall fit of the hypothesized model was also tested by using the Chi-square ($\chi 2$) statistics (Hooper, Coughlan, & Mullen, 2008).

To show highly satisfactory fits to data, these criteria were applied in the assessment: GFI values not less than 0.9, CFI values greater than 0.93, and RMSEA between 0.05 and 0.08 (Byrne, 2001; Gefen et al., 2011). The measurement model for all constructs is displayed in figure 5.4.

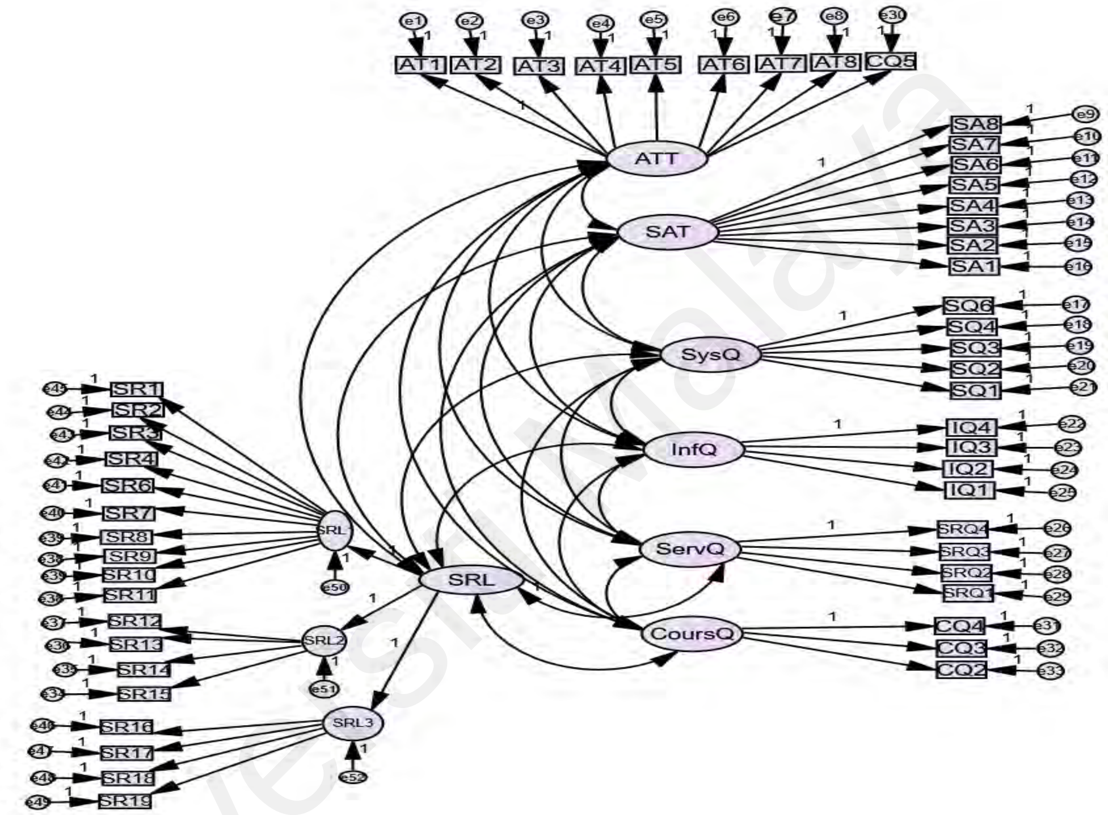

Figure 5.4. The measurement model for all constructs

The initial result of CFA indicated poor fit data; thus, the modification indices were employed to improve the fitness of the model. AMOS options suggested utilizing the modification indices to get rid of some constraints on some parameters of the model for promoting the overall fitting of the model. Thus, three poorly-fitting items: (CQ1, SR8, SR9) were identified and deleted due to higher standard error (SE), and low explained variances (R^2).

The result of the final iteration indicated that all of the fit indices produced a model that moderately fitted the data. Table 5.14 display the Goodness-of-fit analysis using CFA.

Table 5.14

Goodness-of-fit analysis for the measurement model

Goodness-of-fit measures	**value**
Chi-square (χ^2)	2822.365
CMIN/df	2.56
Root mean square error of approximation (RMSEA)	0.068 between (0.05 -0.08)
Goodness-of-fit Index (GFI)	0.897
Tucker Lewis Index (TLI)	0.905 > 0.9
Comparative Fit Index (CFI)	0.940 > 0.93

Table 5.14 indicated that the value of chi-square is 2822.365 and the CMIN/DF is 2.56 which are acceptable values. The Comparative Fit Index (CFI) value is 0.940 which is acceptable, the required value for CFI ≥ 0.93. The Random Mean Squired Error RMSEA is (0.068) greater than 0.05 which is also considering acceptable. The GFI value is 0.897 which is almost 0.9. So according to criteria for data fit model, this model is acceptable (Hair et al., 2006). Figure 5.5 display the path diagram model for the final iteration.

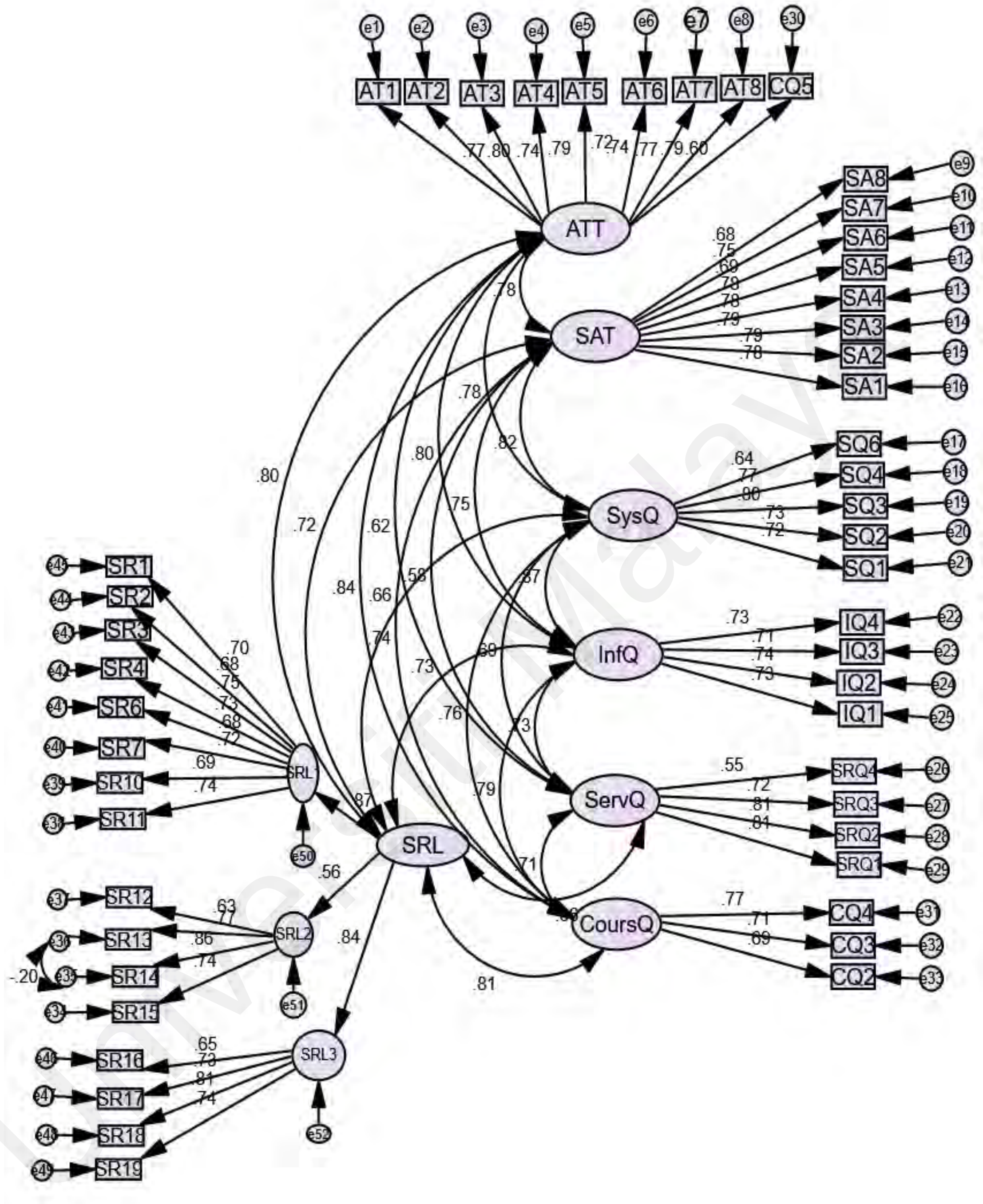

Figure 5.5. Path diagram model (final iteration)

Note: SAT: satisfaction; SysQ: system quality; InfQ: information quality; ServQ: service quality; CourseQ: course quality; ATT: attitude; SRL: self-regulated learning.

Testing the Reliability and the Validity

Confirming the reliability and the validity of the proposed model is considered a vital step. The results obtained from testing the EFA and CFA methods utilized as input to measure the reliability and validity of the study model. The indices used to gauge the convergent validity of the measurement model are: average variance extracted (AVE) and composite reliability (*CR*) (Hair, Hult, Ringle, & Sarstedt, 2014). The recommended values of CR, AVE are 0.7 and 0.5, respectively (Hair et al., 2014). The CR and AVE values of the model are displayed in table 5.15.

Table 5.15

The CR and AVE values of the factors

Factor	items	Composite reliability (CR)	Average variance extracted (AVE)
Attitude	9	0.907	0.521
Course quality	3	0.700	0.538
Information quality	4	0.807	0.513
Satisfaction	8	0.914	0.571
Service quality	4	0.804	0.509
System quality	5	0.854	0.541
SRL1	8	0.857	0.502
SRL2	4	0.788	0.651
SRL3	4	0.811	0.519

Evaluation of the convergent validity of the study factors was done by examining the CR values after eliminating some items excluded from the CFA analysis phase. The CR values for the factors were between (0.7 and 0.914) which are considered acceptable values. Testing the AVE values revealed that all of the factor's values are > 0.5. These results of the measurement model indicated that all of the study factors satisfy the recommended value of the reliability and validity as suggested by Hair et al. (2014), consequently, the proposed model of this study is reliable and shows sufficient convergent validity.

Partial Least Square (PLS-SEM) Analysis

In this study, the PLS-SEM analysis method via the measurement and the structural model (Hair et al., 2011) adopted to examine the proposed model. Examining the measurement model includes testing the validity and reliability of the items, the factors, and the complete model while assessing the structural model consist of measuring the relationships between the constructs, confirming or rejecting the study hypotheses, and testing the whole model fitness. Schumacker and Lomax (2004) indicated that testing the measurement model achieved by evaluating the convergent and discriminant validity and confirmed that the model validity accomplished by assessing the structural model.

Measurement Model

The purpose of assessing the measurement model is confirmed the reliability of the survey instrument and ensured that the survey items are measuring the factors that are intended to measure. Testing the convergent validity and discriminant validity is the key process in evaluating the measurement model. Gefen and Straub (2005) noted that the convergent validity is achieved when each item is significantly associated with its expected theoretical factor, while the discriminant validity is obtained when each item weakly linked with all other factors excluding for the one which it is theoretically related. The research constructs and their indicators are displayed in figure 5.6.

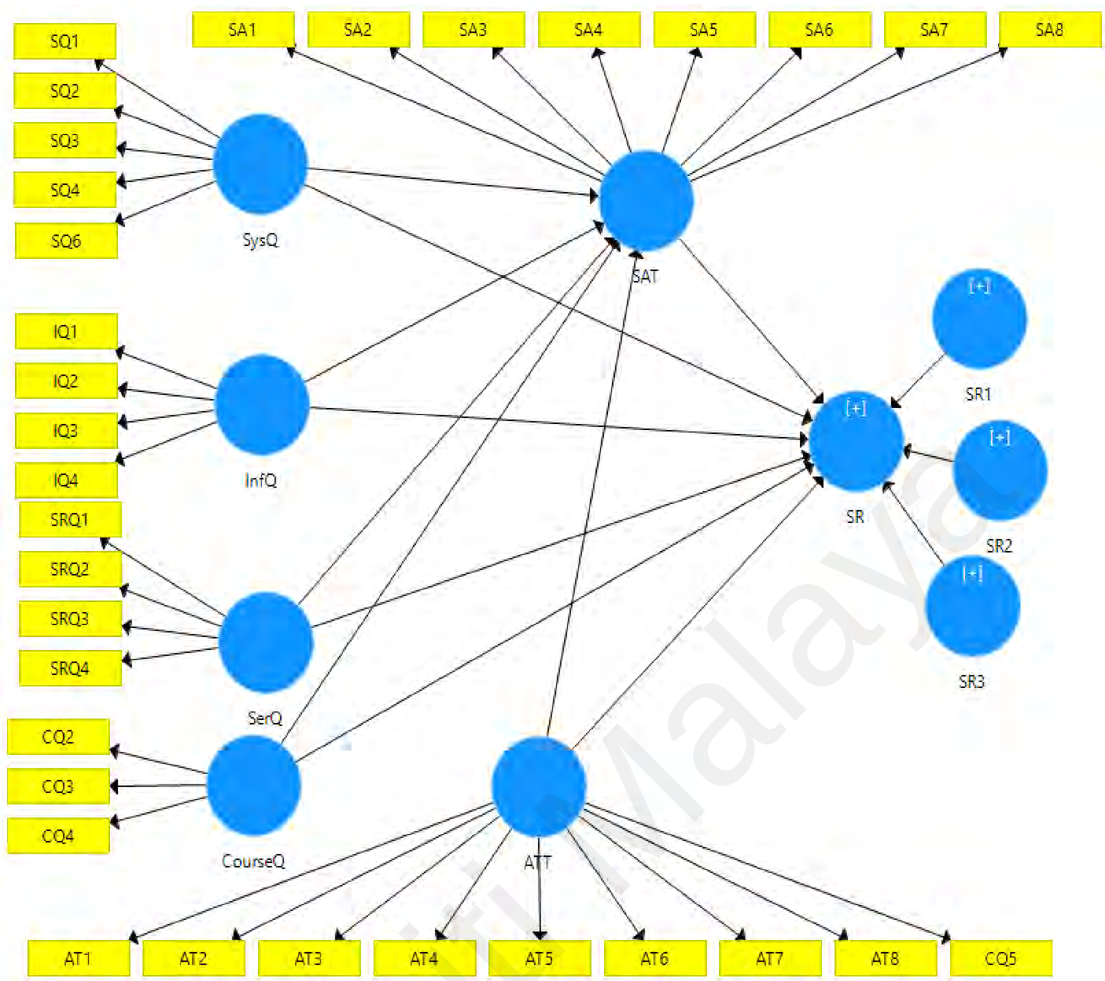

Figure 5.6. Research constructs and their indicators

Convergent Validity

Convergent validity is believed to be key processes in measuring the survey instrument. Convergent validity refers to the degree to which the measurement items of the particular factor in the context of the proposed model are comparable to the other measurement items of the same factor (Phang, Sutanto, Kankanhalli, Yan, Tan, & Teo, 2006). Convergent validity is the significant association between alternative measures of a specific factor (Hair et al., 2011). The correlation between the constructs and the observed variables are evaluated by the convergent validity (Schumacker & Lomax, 2004).

Factor loading indices used to assess the convergent validity, the validity is achieved when the value of loading is significant (Holmes-Smith, 2011). Each item loads of the factor should be exceeding the 0.50 value to achieve convergent validity (Hair et al., 2006; Holmes-Smith, 2011; Sun & Teng, 2012; Vinzi, Chin, Henseler, & Wang, 2010). Convergent validity is also determined by the value of Average Variance Extracted (AVE) and composite reliability (CR). To obtain the convergent validity the AVE value should be > 0.50, and CR has to be > 0.7 (Hair et al., 2014) or exceed 0.80 (Guo, Yuan, Archer, &Connelly, 2011). The criteria for convergent validity in the measurement model are shown in table 5.16.

Table 5.16

The criteria for convergent validity process

Criteria	**Value Range**	**Definition**	**References**
Factor Loading	> 0.5 (acceptable)	Correlation between the observed value and the latent value for a given factor.	(Hair et al., 2006; Holmes-Smith, 2011; Sun and Teng, 2012; Vinzi et al., 2010).
Composite Reliability (CR)	0.70 and higher	CR - Determines reliability based on the outer loadings of the indicator variable.	(Bagozzi & Yi, 1988; Hair et al., 2014).
Convergent Validity (based on AVE)	0.708 is preferred > 0.50 is acceptable	Measures correlations with alternative measures of the same construct.	(Bagozzi & Yi, 1988; Hair et al., 2011, Hair et al., 2014).

Source: Lewis, J. B. (2015). *Identifying Key Determinants of Service Provider Effectiveness and the Impact it has on Outsourced Security Success* (Doctoral dissertation, Nova Southeastern University) Retrieved from http://nsuworks.nova.edu/cgi/viewcontent.cgi?article=1365&context=gscis_etd

Convergent validity has been tested using PLS technique; table 5.17 displays the results of this analysis.

Table 5.17

The convergent validity results

Construct	Items	Loadings	CR	AVE
Attitude	AT1	0.800	0.934	0.639
	AT2	0.818		
	AT3	0.778		
	AT4	0.817		
	AT5	0.760		
	AT6	0.775		
	AT7	0.797		
	AT8	0.812		
	CQ5	0.641		
Course quality	CQ2	0.791	0.863	0.678
	CQ3	0.833		
	CQ4	0.846		
Information quality	IQ1	0.783	0.881	0.649
	IQ2	0.822		
	IQ3	0.809		
	IQ4	0.808		
Satisfaction	SA1	0.802	0.930	0.623
	SA2	0.819		
	SA3	0.820		
	SA4	0.808		
	SA5	0.806		
	SA6	0.740		
	SA7	0.791		
	SA8	0.724		
System quality	SQ1	0.799	0.894	0.629
	SQ2	0.806		
	SQ3	0.840		
	SQ4	0.812		
	SQ6	0.701		
Service quality	SRQ1	0.844	0.875	0.639
	SRQ2	0.841		
	SRQ3	0.807		
	SRQ4	0.696		

Table 5.17 continued

Construct	Items	Loadings	CR	AVE
SRL1	SR1	0.712	0.914	0.57
	SR10	0.738		
	SR11	0.782		
	SR2	0.727		
	SR3	0.788		
	SR4	0.772		
	SR6	0.744		
	SR7	0.773		
SRL2	SR12	0.774	0.885	0.658
	SR13	0.824		
	SR14	0.851		
	SR15	0.793		
SRL3	SR16	0.760	0.883	0.653
	SR17	0.813		
	SR18	0.849		
	SR19	0.808		

The factors loadings for all items were exceeding the 0.7 value except values of CQ5 and SRQ4 were > 0.6. The AVE for all the factors were above the 0.5. The composite reliability (CR) for the factors were (0.8 and above) which is more than the suggested minimum level of the CR (> 0.7). The results of the measurement model indicated that all the factors confirmed adequate convergent validity.

Discriminant Validity

Discriminant validity is the degree to which measurement items of a specific factor reflect this factor instead of other factors in the specific model (Hulland, 1999). This measurement is significant because it helps to confirm from the results that hypothesized the structural paths either its significant or discrepancies (Farrell, 2010).

The new HTMT criteria using PLS has been conducted to check from the lack of discriminant validity. This analysis is depending on comparing the monotrait-hetero method correlations and the heterotrait-hetero method correlations. Assessing the discriminant validity using the HTMT can be done as the following:

1. As a criterion: the HTMT discriminant validity between two factors is achieved when HTMT $_{0.90}$ value of 0.90 (Gold, Malhotra, & Segars, 2001) or when the HTMT $_{0.85}$ value < 0.85 (Kline, 2011).

2. As analysis test: this analysis is used to examine the alternative hypothesis (H_1: HTMT < 1) against the null hypothesis (H_0: HTMT $\geq$ 1).

In this phase, the lack of discriminant validity occurs when the confidence interval has the value one (Henseler et al., 2015). The Heterotrait-Monotrait (HTMT) analysis is shown in Table 5.18.

Table 5.18

The Heterotrait-Monotrait (HTMT) Analysis

	AT	**CQ**	**IQ**	**SA**	**SRL**	**SRQ**	**SQ**
AT							
CQ	0.836 CI.90 (0.786, 0.883)						
IQ	0.800 CI.90 (0.748,0.894)	0.796 CI.90 (0.724, 0.862)					
SA	0.772 CI.90 (0.647, 0.828)	0.737 CI.90 (0.679, 0.796)	0.745 CI.90 (0.679, 0.804)				
SRL	0.715 CI.90 (0.662, 0.770)	0.758 CI.90 (0.693, 0.821)	0.651 CI.90 (0.575, 0.717)	0.657 CI.90 (0.599, 0.715)			
SRQ	0.650 CI.90 (0.572, 0.723)	0.754 CI.90 (0.682, 0.831)	0.746 CI.90 (0.684, 0.811)	0.618 CI.90 (0.542, 0.691)	0.652 CI.90 (0.583, 0.712)		
SQ	0.769 CI.90 (0.704, 0.822)	0.776 CI.90 (0.709, 0.837)	0.874 CI.90 (0.820, 0.922)	0.824 CI.90 (0.775, 0.866)	0.610 CI.90 (0.534, 0.676)	0.719 CI.90 (0.653, 0.783)	

The findings of the analysis revealed that the confidence interval for the factors did not hold one value, and all the values passed the HTMT value of 0.90 tests. This result showed that the discriminant validity issue has not occurred. The measurement model is displayed in figure 5.7.

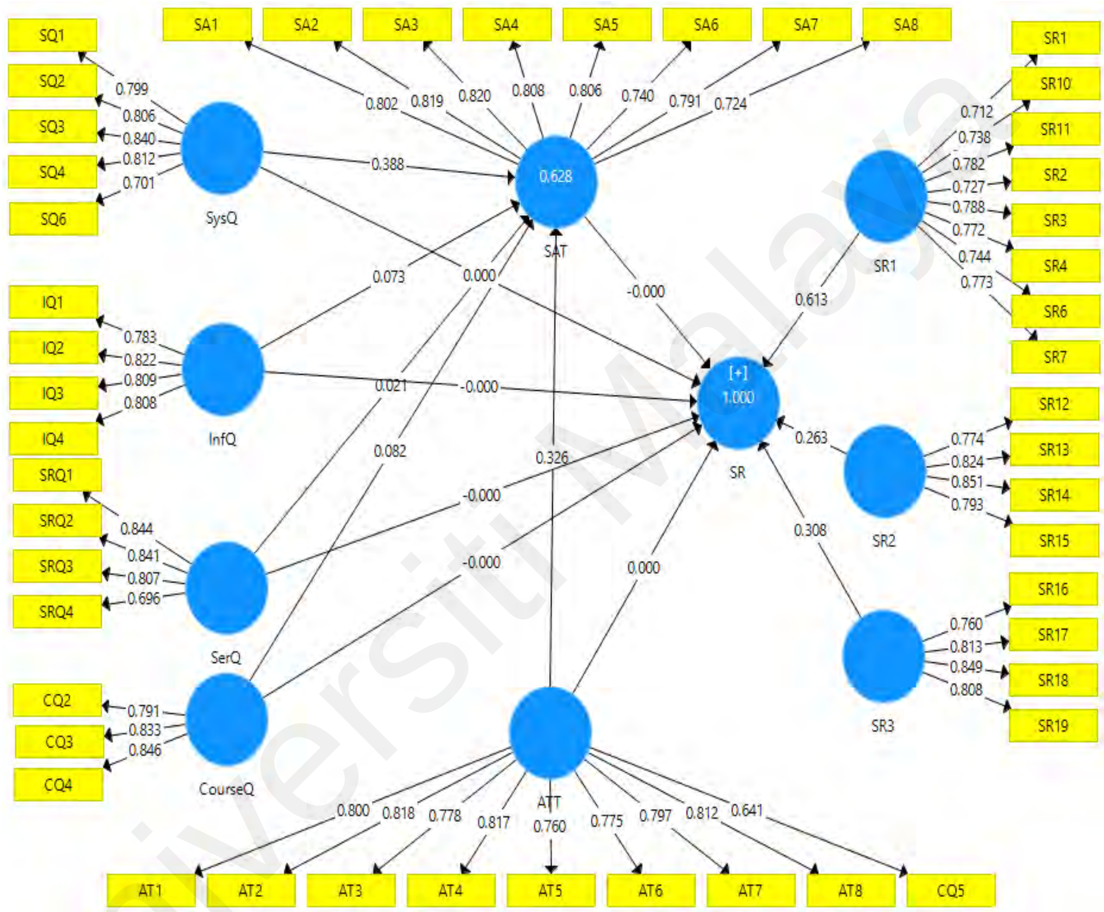

Figure 5.7. The measurement model

Note: SAT: satisfaction; SysQ: system quality; InfQ: information quality; SerQ: service quality; CourseQ: course quality; ATT: attitude; SR: self-regulated learning

Overall, the findings of the measurement model for the convergent and discriminant validity indicated sufficient values.

Structural Model

The structural model represents the connections between the exogenous and the endogenous variables that formulated in model hypotheses (Kline, 2011). The purpose of this analysis is confirmed or rejected of the proposed hypotheses. Hair, Anderson, Tatham, and Black (1998) noted that the structural model involves a set of relationships between factors that hypothesized the model. The structural model establishes the direct and indirect relationships between the factors and explores the amount of (explained/unexplained) variance in the model (Wang, 2003).

To evaluate the structural model, four assessment procedures have been employed as followed:

(1) Assess the R^2 Coefficient of determination values: Guo et al. (2011) explored that R^2 represents the productiveness of the theoretical model. Three levels were suggested to gauge the power of R^2: above 0.67: high, from (0.33 to 0.67): moderate, and less than 0.33: weak (Chin, 1998).

(2) Assess the predictive relevance of Q^2: This index (Q^2) evaluate the quality of the structural model and to examine the predictive relevance for the structural model (Tenenhaus, Vinzi, Chatelin, & Lauro, 2005). Henseler et al. (2009) indicated that when Q^2 > zero then the model has predictive relevance, while when Q^2 < zero this give evidence that the model has a lack of predictive relevance.

(3) Assess the path coefficient: this measure shows the strength of the relationships between independent and dependent variables (Guo et al., 2011). Cohen (1988); Sridharan, Deng, Kirk, and Corbitt (2010) suggested three levels

to measure the path coefficient: when path coefficient less than or equal 0.2, weak; between (0.2 and 0.5), moderate; and > 0.5 then path coefficient is strong.

(4) Evaluate the effect size (f^2): This indicator measure of the changing in the R^2 value when a particular factor is deleted from the model. The cut-off of effect size (f^2) is: 0.02 and above: small; 0.15 and above: medium; and 0.35 and above is considered large effects (Cohen, 1988; Henseler et al., 2009).The criteria for the structural model is displayed in Table 5.19.

Table 5.19

Measures for the PLS-SEM structural model

Criteria	**Value Range**	**Definition**	**References**
R^2 value	• above 0.67 High • from (0.33 to 0.67) moderate •less than 0.33 weak	Represents the amount of explained variance of each endogenous latent variable and measures the quality of the model.	Chin (1998).
Path Coefficient Size	• 0.2 weak • between (0.2 and 0.5) is moderate • > 0.5 is strong	Assesses the hypothesized relationship linking the constructs.	(Cohen, 1988; Sridharan, Deng, Kirk, & Corbitt, 2010).
*f*2 effect size	• 0.02 small effect, • 0.15 medium and • 0.35 large effects.	The effect of change in the R^2 value when removing specific construct from the model.	(Cohen, 1988; Henseler et al., 2009).
Cross-validated redundancy (Q^2 value)	• 0.02 small effect, • 0.15 medium, and • 0.35 is large effect.	Determining if there is a significant effect on the endogenous constructs when omitting construct from the model.	(Hair et al., 2014; Hair, Sarstedt, Hopkins, & Kuppelwieser, 2014b).

Coefficient of determination (R^2) and Predictive relevance (Q^2)

The Coefficient of determination (R^2) is considered one of the main indicators that utilize to evaluate the paths of the structural model in PLS; R^2 indicates the amount of variance explained by the dependent variables.

On the other hand, the quality of the structural model is evaluated using (Q^2) which is developed to assess the predictive relevance of the structural model (Tenenhaus et al., 2005). Table 5.20 displays the values of R^2 and Q^2 results.

Table 5.20

The values of R^2 and Q^2

Construct	**Relationships**	R^2	**Result (R^2)**	Q^2	**Result (Q^2)**
Satisfaction	Attitude -> SAT CourseQ -> SAT InfoQ -> SAT ServiceQ -> SAT SystemQ -> SAT	0.628	Moderate	0.361	large effect
SRL	Satisfaction -> SRL Attitude -> SRL CourseQ -> SRL InfoQ -> SRL ServiceQ -> SRL SystemQ -> SRL	0.563	Moderate	0.220	medium effect

According to Table 5.20 the R^2 value is 0.628, this means that all of the five factors: (SQ, IQ, SRQ, AT, CQ) explain 62.8% of the variance in satisfaction; this ratio reveals the vital role of these factors in providing a high level of students' satisfaction toward MOOCs systems.

In this study, self-regulated learning (SRL) is a significant indicator in gauging the success of MOOCs. SRL is supposed to represent the result of the six factors: SAT, SQ, IQ, SRQ, AT, CQ. All of these factors are explaining 56.3% of variance in SRL. The value of R^2 between (0.67 and 0.33) suggested the moderate model (Chin, 1998).

To calculate the (Q^2) value of the model, the blindfolding process analysis was used. The Q^2 analysis applies for the endogenous constructs that have reflective measurement (Hair et al., 2014). The proposed model has sufficient predictive relevance for the endogenous construct when Q^2 exceed zero, while when the value of Q^2 less than zero, this indicated that the model has not satisfied the predictive relevance for the endogenous construct (Hair et al., 2014).

According to Table (5.20), the model has sufficient predictive relevance. The Q^2 values for satisfaction (Q^2=0.361) and SRL (Q^2=0.220) are both > 0. Additionally, the results of Q^2 (0.361 > 0.35) indicated large predictive relevance for satisfaction, and the results of Q^2 for SRL (0.220 > 0.15) has medium predictive relevance (Hair et al., 2014). Figure 5.8 is displayed the structural model.

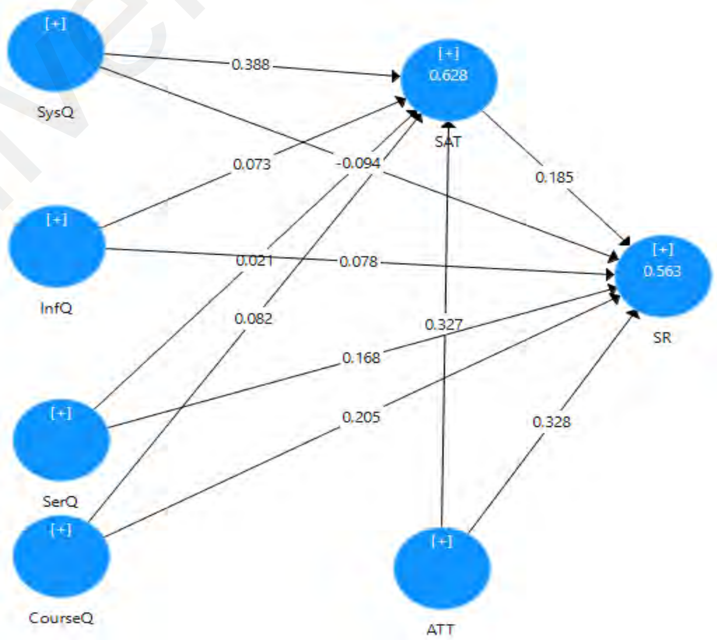

Figure 5.8. The structural model

Path Coefficients

Path coefficients highlighted the strength of a relationship between two constructs in the structural model (Cohen, 1988). In this section, the Bootstrapping technique with 5,000 re-samples was conducted to attain the beta (β) values, t-values and confirm the significance of the hypotheses as recommended by Chin et al. (2003). The bootstrapping results are displayed in Table 5.21.

Table 5.21

Bootstrapping result and hypotheses testing

Hypotheses	**Relationship**	**Std Beta**	**Std Error**	***t*-value**	***p*-value**	**Supported**
H1	SystemQ -> SAT	0.388	0.052	7.48**	000	**Yes**
H2	InfoQ -> SAT	0.073	0.05	1.379	0.168	No
H3	ServiceQ -> SAT	0.021	0.042	0.587	0.557	No
H4	Attitude -> SAT	0.327	0.054	5.954**	000	**Yes**
H5	CourseQ -> SAT	0.082	0.044	2.115*	0.035	**Yes**
H6	Satisfaction -> SRL	0.185	0.045	4.265**	000	**Yes**
H7	SystemQ -> SRL	-0.094	0.054	1.751	0.081	No
H8	InfoQ -> SRL	0.078	0.050	1.578	0.115	No
H9	ServiceQ -> SRL	0.168	0.044	3.842**	000	**Yes**
H10	Attitude -> SRL	0.328	0.047	7.001**	000	**Yes**
H11	CourseQ -> SRL	0.205	0.048	4.305**	000	**Yes**

Note. (t-values > 1.645* where $p < 0.05$), (*t*-values > 2.33** where $p < 0.01$)

Referring to Table 5.21, the predictors of satisfaction are: system quality ($\beta = 0.388$, $p < 0.01$), attitude ($\beta = 0.327$, $p < 0.01$), and course quality ($\beta = 0.082$, $p < 0.05$) were all significantly associated to satisfaction toward MOOCs, while information quality ($\beta = 0.073$) and service quality ($\beta = 0.021$) were not significant ($p > 0.05$). Hence, hypotheses (H1, H4, and H5) were supported while hypotheses (H2 and H3) were not supported.

Regarding to the predictor of self-regulated learning, satisfaction ($\beta = 0.185$), service quality ($\beta = 0.168$), attitude ($\beta = 0.328$), and course quality ($\beta = 0.205$) were all significantly associated to SRL ($p < 0.01$). Therefore, H6, H9, H10, H11 were supported. While system quality (β = -0.094) and information quality (β = 0.078) were not significant (p > 0.05). Thus, H7 and H8 were not supported.

Effect Sizes (f^2)

Effect size (f^2) is used to assess the changing in the R^2 value when a particular factor is removed from the model. The cutoff values of effect size: 0.02: small; 0.15: medium; 0.35: large (Cohen, 1988; Henseler et al., 2009). Table 5.22 shows the results of the effect size analysis.

Table 5.22

Effect size (f^2) results

Hypotheses	**Relationship**	**Effect Size (f^2)**	**Effect Size**
H1	SystemQ -> SAT	0.152	Medium
H2	InfoQ -> SAT	0.005	No effect
H3	ServiceQ -> SAT	0.001	No effect
H4	Attitude -> SAT	0.102	Small
H5	CourseQ -> SAT	0.033	Small
H6	SAT -> SRL	0.029	Small
H7	SystemQ -> SRL	0.007	No effect
H8	InfoQ -> SRL	0.005	No effect
H9	ServiceQ -> SRL	0.024	Small
H10	Attitude -> SRL	0.080	Small
H11	CourseQ -> SRL	0.040	Small

With reference to Table 5.22, the effect size of H1 (f^2 = 0.152) had a medium relationship which is higher than the other three factors. This indicated that system quality factor best predicts to the satisfaction toward MOOCs system. While the effect sizes for H4: attitude -> satisfaction (f^2 = 0.102), H5: course quality -> satisfaction (f^2 = 0.033), H9: service quality -> SRL (f^2 = 0.024), H10: attitude -> SRL (f^2 = 0.080), and H11: course quality -> SRL (f^2 = 0.040) had relationships with small effect sizes. However, the effect sizes for H2: (information quality -> satisfaction), H3: (service quality -> satisfaction), H7: (system quality -> SRL), and H8: (information quality Q -> SRL) had no effect sizes.

Goodness of Fit Model (GoF)

The purpose of GoF is testing the study model at both level measurement and structural model by focusing on the inclusive model performance (Henseler & Sarstedt, 2013). The formula of GoF is:

$$GoF = \sqrt{Mean\ (R^2) * \text{Mean (AVE)}}$$

The criteria of GoF according to Wetzels, Odekerken-Schröder, and Oppen, (2009) is: (GoF < 0.1) no fit, (between 0.1 and 0.25) small, (between 0.26 and 0.36) medium, and when GoF value is greater than 0.36 then a large fit model is obtained. The GoF for the study model is 0.35 which presented medium fit model.

Evaluation of the Mediation

This study followed Preacher and Hayes (2008) method to conduct the mediation analysis. Mediation is confirmed when (1) the indirect effect is significant and (2) the results of indirect effect from the confidence interval (CI) is not showing zero value, this means that the results between the lower and upper bound in the (CI) indirect effect are all positive or negative (Hayes, 2009).

The significance of the indirect effect was tested using a bootstrapping routine with 5000 subsamples. The results of the mediator factor are shown in Table 5.23.

Table 5.23

The results of testing the of mediator factor

HYP	Relationship	Path a	Path b	Indirect Effect	SE	t-value	P-value	95% LL	95% UL	Supported
H12	SysQ -> SAT ->SR	0.388	0.185	0.072	0.035	2.051	000	0.003	0.140	**Yes**
H13	InfQ -> SAT ->SR	0.073	0.185	0.014	0.052	0.260	0.183	-0.088	0.115	No
H14	SerQ -> SAT ->SR	0.021	0.185	0.004	0.042	0.093	0.631	-0.078	0.086	No
H15	ATT -> SAT ->SR	0.327	0.185	0.073	0.036	2.014	0.001	0.002	0.143	**Yes**
H16	CourseQ -> SAT ->SR	0.082	0.185	0.015	0.049	0.310	0.105	-0.081	0.111	No

Note: SAT: satisfaction; SysQ: system quality; InfQ: information quality; SerQ: service quality; CourseQ: course quality; ATT: attitude; SR: self-regulated learning

Table 5.23 indicated that satisfaction has mediated the influences between system quality and SRL (H12) and also satisfaction has mediated the influences between attitude and SRL (H15) where all p-values < 0.05. Thus, these hypotheses are supported. However, satisfaction has failed to mediate the effect of the factors: information quality, service quality, and course quality on SRL where (all p-values were > 0.05). This means that the hypotheses (H13, H14, and H16) were not supported.

Table 5.23 above highlights the indirect effects 95% Boot for (H12: system quality -> satisfaction ->SRL) CI: [LL=0.003, UL=0.140] and (H15: attitude-> satisfaction->SRL) CI: [LL=0.002, UL=0.143] are not showing zero value within the (CI) at the given significance level of 0.05. The results between the lower and upper bound in the (CI) indirect effect are all positive. As recommended by Preacher and Hayes (2008) followed by Hair et al. (2014), this results statistically confirming the mediation effects of satisfaction for H12 and H 15.

On the other hand, the indirect effects 95% Boot for (H13: information quality -> satisfaction -> SRL) CI: [LL= -0.088, UL=0.115] and (H14: service quality -> satisfaction ->SRL) CI: [LL= -0.078, UL=0.086], and (H16: course quality-> satisfaction-> SRL) CI: [LL= -0.081, UL=0.111] are showing zero value within the (CI) at the given significance level of 5%. The results between the lower and upper bound in the (CI) indirect effect are all zero. Thus, these results indicated that satisfaction has not mediated the effect for (information quality, service quality, and course quality factors) on SRL.

Strength of Mediation

Variance Accounted For (VAF) analysis was adopted in this study as an evaluation for determining the strength of mediation as recommended by Hair et al. (2014). The formula of the VAF is as the following:

$$\text{VAF} = \frac{indirect\ effect}{total\ effect\ (i.e. direct\ effect + indirect\ effect)}$$

The criteria for VAF are > 80%: is full mediation; VAF between (20% and 80%): is partial mediation; VAF value less than 20%: shows no mediation.

The assessment of the VAF for the H12 and H15 showed that the VFA values are 50.1%, and 45.1%, these two values located between (20% and 80%), thus, satisfaction partially mediated the relationship between (system quality and SRL) and (attitude and SRL).

Importance-Performance Map Analysis (IPMA)

The Importance-Performance Map Analysis (IPMA) has been adopted in this study to understand the key factors that have the main influence on MOOCs success. This analysis is conducted using SmartPLS to add another measurement that demonstrates the actual performance for each factor of the study model. The purpose of IPMA is identifying the factors that have relatively higher performance and/or relatively important in the structural model (Hair et al., 2014; Ramayah, Chiun, Rouibah, & May, 2014; Ringle & Sarstedt, 2016). According to Hair et al. (2014), the Performance is obtained by calculating the average of the latent variables values while the Importance is examined by estimating the total effects of the structural model. Figure 5.9 displays the result of Importance-Performance Map Analysis (IPMA).

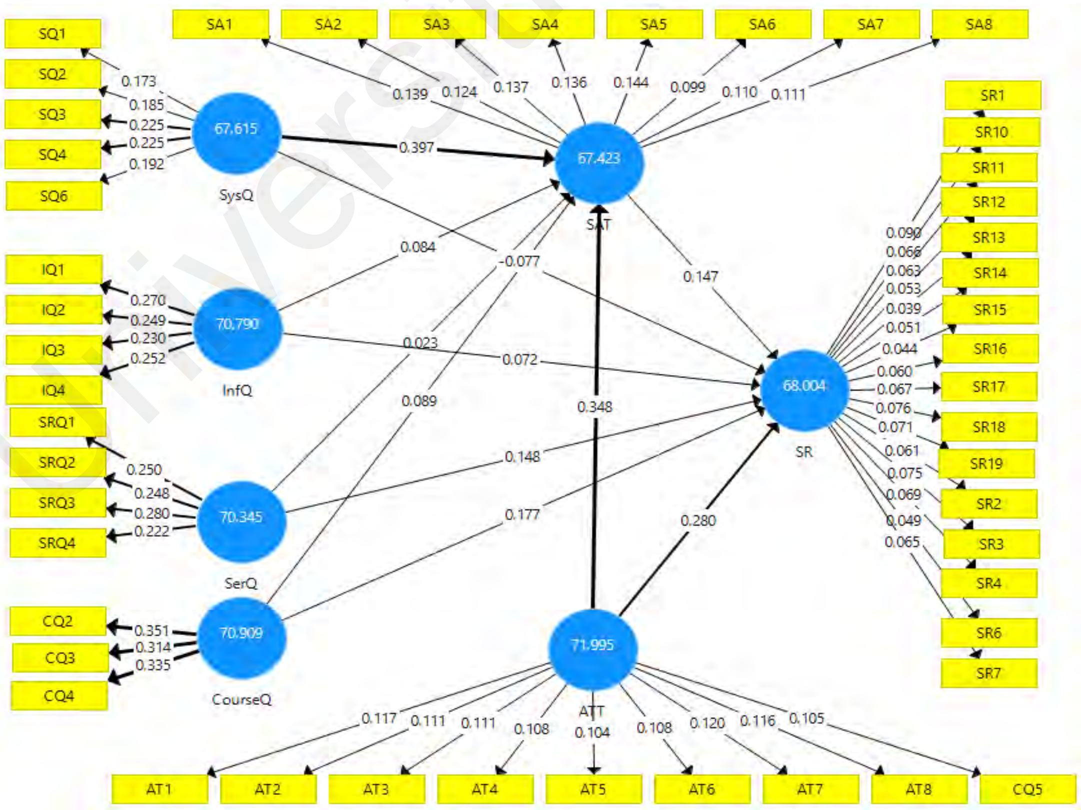

Figure 5.9. Importance-Performance Map Analysis (IPMA)

Figure 5.9 showed the results of IPMA for SRL as a key target construct. The results indicated that attitude factor has the highest performance (71.995) and highest total effect (0.280), next course quality with performance (70.909) and (0.177) total effect. Meanwhile, system quality factor has the highest importance (0.397) when considering satisfaction as a key target construct.

Summary

Chapter 5 summarized the important findings of the survey. The normality data, reliability, correlation test, the CFA and EFA analysis were conducted using SPSS to prepare data to the next stage, and then PLS-SEM analysis using SmartPLS was executed to test and confirm the study hypotheses. The direct and indirect hypotheses have been assessed. The procedures for examining the validity and reliability of the proposed model have also discussed. The findings indicated that the model is valid and reliable. Next chapter debates the discussions and conclusions of the study.

CHAPTER 6

DISCUSSIONS AND CONCLUSION

Introduction

This aim of this study is to evaluate the critical factors influencing the successful implementation of MOOCs and develop the most appropriate framework for MOOCs in higher education in Malaysia. In this chapter, a summary of the study, a summary of the findings, and a discussion of the findings related to research questions were provided. Next, the contribution, the implications and the limitations of the research, and the topics for future research were debated.

Summary of the study

The educational institutions and organizations are seen assessing the success of MOOCs as one of the essential issues that should be encountered. Currently, the success of MOOCs seems to be associated with the high completion rate of MOOCs courses (e.g. Alraimi et al., 2015; Hew & Cheung, 2014; Kizilcec et al., 2013). Many researchers have called for the need to have a more systematic measurement of MOOCs successes (Taha, 2014), however, such research is still lacking. The key reasons for this lacking are the disagreement among scholars regarding the best critical factors that promoting the success of MOOCs (Alsabawy et al. 2011). This research fills the gap in current literature by addressing the research objectives which are:

a) To determine the factors that influence the success of MOOCs.
b) To determine the significant influence of the 5 success factors (i.e. SQ, IQ, SRQ, AT, CQ) on learners' satisfaction.

c) To determine the significant influence of learners' satisfaction on learners' self-regulated learning.

d) To determine the significant influence of the 5 success factors (i.e. SQ, IQ, SRQ, AT, CQ) on learners' self-regulated learning.

e) To determine the significant influence of learners' satisfaction in mediating the relationship between the five success factors (i.e. SQ, IQ, SRQ, AT, CQ) and self-regulated learning.

f) To establish the validity and reliability of the MOOCs success model.

In order to address the study objectives, the unstructured reviewing of the literature related to e-learning and MOOCs success was highlighted. Then a systematic review for the existing literature related to MOOCs success was examined to formulate a proposed model of MOOCs success.

The MOOCs systems success factors suggested by prior's studies were organized based on the theoretical foundation and the literature review. Out of the 7 MOOCs systems success factors, 4 of them were derived from IS success model by DeLone and McLean (D & M) (2003), the factors are SQ, IQ, SRQ, and satisfaction. The other 2 factors which are attitude towards MOOCs and course quality, are derived from Sun et al. (2008) study on student characteristics role in the success of e-learning (Sun et al., 2008) while another factor: self-regulated learning was derived from self-regulated learning theory (Zimmerman & Moylan, 2009).

This research employed a correlation design method. Data were collected from one-thousand learners from top 5 public universities that have the largest number of MOOCs users using OpenLearning.com platform. The universities are UPM, UKM, UiTM, UTeM, and UNIMAS, the most active universities in using "OpenLearning" the MOOCs platform in Malaysia. Finally, 622 responses with a response rate of 62 % were included in the analysis phase. In the data analysis phase, the descriptive data analysis method was employed to calculate the demographic data of the study. The hypotheses and model validation were assessed through the Partial least squares (PLS-SEM) method.

Table 6.1 displays research summary that include research questions and the findings of the study.

Table 6.1

Research summary

No	Research Questions	Findings
1	What are the factors that influence the success of MOOCs?	Review of the literature and the findings of EFA and CFA analysis confirmed that **seven factors** (SQ, IQ, SRQ, AT, CQ, SAT, and SRL) are critical factors influencing MOOCs success.
2	To what extent the 5 success factors (i.e. SQ, IQ, SRQ, AT, CQ) influence significantly learners' satisfaction?	There are significant relationships between 3 factors: (SQ, AT, CQ) and learners' satisfaction. In all these hypotheses *t*-values were all above 1.645 and $p < 0.05$).
3	To what extent learners' satisfaction influence significantly learners' self-regulated learning?	There are significant relationships between satisfaction and learners' self-regulated learning. where *t*-values > 2.33 and $p < 0.01$.
4	To what extent the 5 success factors (i.e. SQ, IQ, SRQ, AT, CQ) influence significantly learners' self-regulated learning?	There are significant relationships between: (SRQ, AT, CQ) and learners' self-regulated learning. In all these hypotheses *t*-values were above 1.645 and $p < 0.05$).
5	To what extent the influence of learners' satisfaction mediates the relationship between the five success factors (i.e. SQ, IQ, SRQ, AT, CQ) and self-regulated learning?	1. The relationship between system quality and self-regulated learning is mediated by satisfaction (H12). 2. The relationship between course quality and self-regulated learning is mediated by satisfaction (H16). In these hypotheses (1) The indirect effect is significant (2) the results of indirect effect from the confidence interval (CI) are not showing zero value.
6	Is the proposed model in the present study valid and reliable to measure MOOCs success?	The results of testing the proposed study model showed that the indicators of the model (e.g., Cronbach alpha (α), path coefficients, predictive relevance (Q^2), coefficient of determination (R^2) have met the cut-off level of these indicators and confirmed that the proposed model is reliable and valid model.

Learners' perceptions on integrating MOOCs at Malaysian universities

MOOCs has definitely become an important tend in Malaysia context. However, it is MOOCs research in the Malaysia setting is still rare. For this reason, there is an urgent need for examining learner's perception toward MOOCs to be familiar with this new and modern technology. A well thought out framework developed in this study can provide universities with the necessary data regarding the factors that influence success of MOOCs significantly.

The findings of this study showed that that students in public universities in Malaysia see MOOCs as good facilitator of learning and as advance innovative mode of learning. This study also showed that a quality of technological tools in MOOCs can improve education in the future. Having focused on student's perception toward the quality of MOOCs such as their opinion regarding MOOCs' system quality and MOOCs' service quality and other factors such as satisfaction and SRL skills, this study has exposed a positive response to MOOCs overall at the Malaysian public universities. The outcomes of the study questionnaire have revealed that satisfaction, attitude, and learners perceived about quality of MOOCs were optimistic. Hence, this study may be believed to be as the first corner stone toward building MOOCs as a new technical revolution that improve teaching and learning processes in Malaysia context from now on, aiming to emulate other countries.

This research intents to increase awareness of educational institutional toward potential of MOOCs in higher education context and the educational factors that would have the ability to significant influence on successful adoption and implementation of MOOCs in Malaysian universities. The findings of this study would also allow MOOCs designers and developers to promote instructional design of MOOCs courses that improve the learner's satisfaction and SRL skills.

Discussion on RQ1: What are the factors that influence the success of MOOCs?

To answer research question 1, three stages of work were conducted:

1. **The first stage** consisted of the inclusive review of the literature on MOOCs, as shown in chapter three. Accordingly, **seven (7) factors** were identified:

    i) system quality (SQ);

    ii) information quality (IQ);

    iii) service quality (SRQ);

    iv) student attitude (AT);

    v) course quality (CQ);

    vi) user satisfaction (SAT); and

    vii) self-regulated learning (SRL).

2. **The second stage** consisted of collecting the factors that selected in stage one in one model and then developing the relationships among them (see Figure 3.4: The proposed model). Accordingly, **16 hypotheses** were formulated and further divided into two categories: direct and mediation effects.

    a. Direct effects

        i. Five of those hypotheses (H1 until H5) measured direct effects between five (5) factors i.e., SQ, IQ, SRQ, AT, CQ and learners' satisfaction learning in MOOCs;

ii. Five hypotheses (H7 until H11) measured direct effects between five (5) factors i.e., SQ, IQ, SRQ, AT, CQ and learners' self-regulated learning in MOOCs; and

iii. One hypothesis (H6) measured direct effects between learners' satisfaction and learners' self-regulated learning in MOOCs.

b. Mediation effects

i. Five hypotheses (H12 until H16) measured mediation effects of learners' satisfaction between the five (5) factors i.e., SQ, IQ, SRQ, AT, CQ and learners' self-regulated learning in MOOCs.

3. In the **third stage, two (2) analyses** were conducted:

a. Exploratory factor analysis (EFA) was applied to identify the key factors influencing MOOCs; and

b. Confirmatory factor analysis (CFA) was later employed to confirm the vital factors influencing MOOCs success identified by EFA and examine the fitness of the model.

Figure 6.1 summarized the stages conducted to answer research question 1.

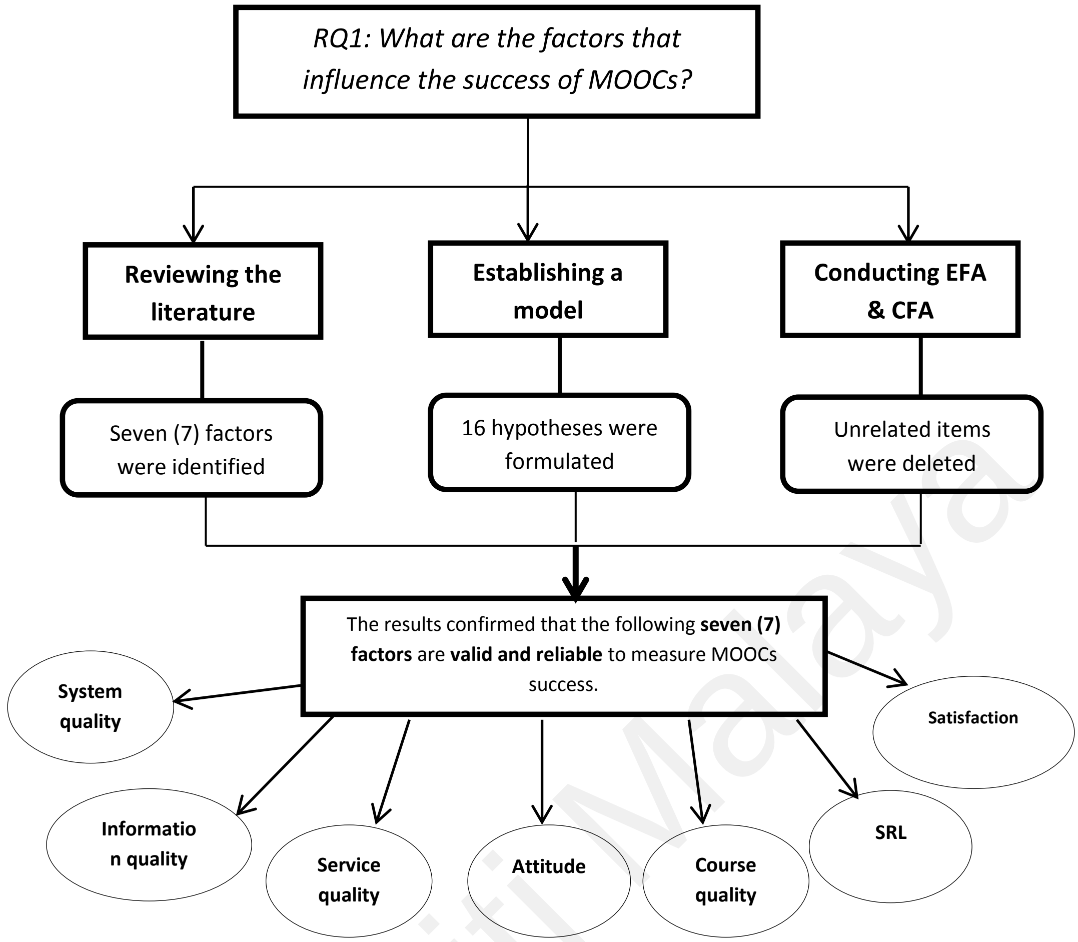

Figure 6.1. The three stages conducted to answer RQ1

The research question 1 aimed to select MOOCs success factors that identified from reviewing the literature on MOOCs and e-learning and gathering it in a model to identify the relationships among these factors based on the theoretical foundations.

A comprehensive review of the literature revealed seven factors selected to assess the success of MOOCs: SQ, IQ, SRQ, AT, CQ, SAT, and SRL.

A study model was proposed by formulating relationships between the study factors based on the correlation method. Each hypothesis proposed was supported by MOOCs or e-learning literature that empirically examined the suggested relationships.

In the proposed mode, sixteen hypotheses were established. Eleven relationships proposed to represent the direct effects and five relationships were allocated to examine the mediation effect of satisfaction.

The selecting of these factors was confirmed empirically. The quantitative data of the study was collected via the survey. EFA technique has been employed in the first stage to explore the most effective factors influencing MOOCs, then CFA technique was employed to confirmed the factors that identified by EFA and to test the fitness of the model. Results of the EFA showed that the survey items grouping in seven different factors. The feature groupings are consistent with the previous literature and definitions of SQ, IQ, SRQ, AT, CQ, SAT, SRL. CFA reported a strong goodness-of-fit test.

PLS-SEM analysis measurement model phase was employed to examine the reliability and validity of each factor in measuring the success of the MOOCs. The measurement model was supported reliability and validity indicators such as Cronbach's alpha, construct reliability, and AVE. The measurement model analysis confirmed that the seven factors proposed in the study are valid and reliable to examine the success of MOOCs from students' point of view. The findings indicated that attitude and satisfaction were the most reliable factors ($\alpha > 0.9$) while course quality was the most valid factor (AVE value > 0.67).

The analysis in this stage was not limited to examine the factors proposed, it also tested the validity and reliability of the factors' items. All the items achieved the validly and reliability criteria were included, and all the non-significant items were removed from the measurement model. The findings of this analysis stage for selection of the factors to examine MOOCs success were supported from the theoretical framework and the literature.   This finding is a significant addition to the MOOC literature due to its implications for practitioners in terms of implementation of MOOC and for researchers in terms of determining specific features for the success factors influencing MOOC success.

All seven (7) factors are discussed in the following section.

Factors Influencing MOOCs Success

Factor One: System quality

System quality in this study is defined as desirable performance characteristics of a MOOCs. In other words, SQ refers to the integrity and reliability of the MOOCs and the extent to which the learners believe that using MOOCs is ease of use and easy to learn.

To examine the quality of MOOCs systems, six items were adapted. However, one item was not representing the quality of MOOCs systems significantly. Thus, the measurement model findings confirmed that the first construct, System quality, is a **reliable and valid factor** as a measurement of success of MOOCs. This result is consistent with the results of e-learning system studies, for example, Liaw (2008a); Ozkan and Koseler (2009); Wang and Wang (2009); Tella (2011); Wang and Chiu (2011); Alsabawy et al. (2012); and Islam (2012) all of these studies indicated the important of system quality in assessing e-learning success. Consequently, this study emphasized the importance of system quality factor through the aspects: easy to use, easy to learn and operate the MOOCs system in measuring the success of MOOCs.

Factor Two: Information quality

IQ in this study is defined as the quality of the information offered by MOOCs. IQ represents aspects of MOOCs such as usability, understandability, update of the information, and conciseness. To measure information quality factor, four items were adapted. The findings of the measurement model confirmed that these four items significantly represent the information quality factor. Consequently, the result indicated the **reliability and validity** of this factor in gauging MOOCs success.

This result is supported by studies conducted in the e-learning system success field (e.g., Alsabawy et al., 2012; Freeze et al., 2010; Ozkan & Koseler, 2009; Wang & Wang, 2009), and all of these studies revealed that information quality is valid and reliable factor to measure the success of an e-learning systems including MOOCs.

Factor Three: Service quality

SRQ is defined as the reliability of the system, the technical ability, and the understanding of operating the personnel stuffs (Petter, DeLone & McLean, 2008). SRQ factor can be utilized to represent the instructor support for e-learning environment (Ozkan, Koseler, & Baykal, 2009). SRQ employed as the measurement of the instructor support and the capability of the technical functions of the system.

Six items were adapted to measure service quality factor, however, two items were eliminated from this factor because of the measurement model finding indicated that these items were not representing the factor of service quality. Thus, the elimination of two items from service quality factor was based on theoretical grounds and statistical findings as presented in the previous chapter. Consequently, the findings of this study emphasized that SRQ is considered a crucial factor in gauging the success of MOOCs as found by other e-learning researchers e.g., Ozkan and Koseler (2009); Adeyinka and Mutula (2010); Masrek et al. (2010); Teo (2011); Wang and Chiu (2011); Alsabawy et al. (2012); Cheng (2012a); and Hassanzadeh et al. (2012).

Factor four: Course quality

Course quality refers to the extent to which a learner believes that using a specific system would be providing quality of material (content). Course quality is measured by aspects of MOOCs design, the relevance of the outputs, understanding of course materials easily, and up-to-date status of the MOOCs course. Five items were employed to assess course quality factor, but two items out of five were eliminated from this factor because these items were not representing the factor of course quality significantly. The results from the measurement model confirmed that the three items left were significant in measuring course quality. Previous e-learning studies (e.g., Al-Ammary & Hamad, 2008; Goi & Ng, 2009; Hassanzadeh et al., 2012; Sun et al., 2008; Taha, 2014) were emphasized the reliability and the validity and of course quality as an indicator to measure the success of MOOCs systems. These e-learning studies mentioned indicated that course quality promoted the success of e-learning.

Factor Five: Students' attitude

This study assumed that attitude is a significant factor in evaluating MOOCs systems success. Attitude has been measured by a set of beliefs that indicate whether MOOCs is good or bad.

Eight items were used to gauge attitude factor, the findings of the measurement model indicated that these items were significantly representing the factor of attitude and emphasized that attitude is the main factor in measuring the success of MOOCs system success.

The critical role of attitude in measuring the success of MOOCs was confirmed by previous e-learning studies (e.g., Fageeh, 2011; Hammoud, 2010; Presley & Presley, 2009; Sun et al., 2008; Taha, 2014; Zewayed et al., 2011). These studies indicated that students' attitudes significantly support the successful implementation of e-learning systems.

Factor Six: Satisfaction

Learners' satisfaction was another factor proposed in this study as an indicator of MOOCs success. This factor also adopted to examine its effect as a mediator among study factors. The items used to examine satisfaction toward MOOCs reflected five aspects: satisfaction with decision; re-use MOOCs system; MOOCs system performance; MOOCs system experience; and learners' needs.

Eight items were used to examine the learners' satisfaction toward MOOCs. The results of the measurement model confirmed that these eight items were important in gauging learners' satisfaction toward using MOOCs. The results also approved that satisfaction is a **valid and reliable factor** in gauging the success of MOOCs. These finding is supported by the results of e-learning studies such as Shee and Wang (2008); Sun et al. (2008); Wu et al. (2010); Alsabawy et al. (2012); Lin and Chen (2012); and Ramayah and Lee (2012), all these studies confirmed that satisfaction is a major factor for promoting the success of e-learning systems.

Factor Seven: Self-Regulated Learning (SRL)

Self-Regulated Learning (SRL) was selected as a dependent factor in the proposed model. It refers to the way that the learners participate and take decisions regarding their learning toward MOOCs. In MOOCs environments where the attendance of the instructors is low, learners have to make the decisions regarding to their study; when to study, how to approach the study materials.

SRL was measured by five aspects: goal settings, help seeking, self-evaluation, time management, and task strategies. Nineteen items were utilized to examine SRL factor. Three items were eliminated from this factor because of these items did not significantly represent the factor of SRL. The results from the measurement model confirm that the 16 items left were significant in measuring SRL in MOOCs environment. These results are supported by literature related to e-learning such as Zhao (2016), Liaw and Huang (2013); and MOOCs research (e.g. Onah &Sinclair, 2017) that indicated the essential role of SRL in gauging e-learning systems success.

Discussion on RQ2: To what extent the 5 success factors (i.e. SQ, IQ, SRQ, AT, CQ) significantly influence learners' satisfaction?

To answer research question 2, five hypotheses (H1 to H5) were proposed to investigate the direct relationships between 5 factors (i.e., SQ, IQ, SRQ, AT, CQ) and learners' satisfaction. Table 6.2 are displayed summary of the direct effect for H1 to H5.

Table 6.2

Summary of the direct effect for H1 to H5

Code	Hypothesis	*t*-value	Decision
	Direct effect		
H1	System quality significantly influences satisfaction	7.48**	**Supported**
H2	Information quality significantly influences satisfaction	1.379	Not Supported
H3	Service quality significantly influences satisfaction	0.587	Not Supported
H4	Attitude significantly influences satisfaction	5.954**	**Supported**
H5	Course quality significantly influences satisfaction	2.115*	**Supported**

Note. (*t*-values > 1.645* where $p < 0.05$), (*t*-values > 2.33** where $p < 0.01$)

Findings Related to Direct Effect Hypotheses for RQ2

Five hypotheses formulated to investigate the direct relationships for research question2. The discussion of hypotheses in this model is exposed in the next sections.

System Quality to Satisfaction Hypothesis

H*1: MOOCs' system quality has a significant influence on learners' satisfaction.*

This hypothesis investigates the relationship between system quality and satisfaction. Analyzing of the study data confirmed that system quality significantly influences learners' satisfaction (t-value = 7.48**) thus, hypothesis (H1) is supported.

System quality - as previously defined- is measured via MOOC functionalities and the level of usability. The significant finding of H1 highlighted that the features, functions, and flexibility of MOOCs that meet students' expectations and make learning via MOOCs easy will create new learning environments that encourage students to be more engaged in their learning, thus improve their satisfaction and help them to achieve their learning goals.

In the MOOC context, learners are often removed from the traditional learning environment. Since MOOCs allow learning anywhere and anytime, learners need to adopt self-discipline behaviors and use a distant environment in a continuous way. Thus, MOOCs should represent aspects such as easiness to use the MOOCs, easiness to learn, and operate the MOOCs system; which may allow learners to persist and do their work and learning activities effectively, and consequently improve learner's satisfaction toward using MOOCs.

If learners find that MOOCs provide access to the contents in an easy way, that the platform is well structured, and that they can easily navigate in MOOCs, the MOOCs usage may be encouraged. These features of MOOC's system quality play a key function in generating a high satisfaction toward MOOCs, thus success in MOOCs. Therefore, the results suggested that MOOCs designers have to ensure from the easiness to use, learn, and operate the MOOCs so as to improve learners' satisfaction toward learning via MOOCs.

This finding is supported by other studies such as Ozkan et al. (2009), Wang and Chiu (2011), Alsabawy et al. (2012); Islam (2012); Ramayah and Lee (2012), all these e-learning studies emphasized the influence of system quality on learners' satisfaction. This is consistent with Malik's (2010) argument that the quality and effectiveness of the technological tools and the infrastructure encourage both students and teachers to engage with the multimedia resources in e-learning environments and increase their satisfaction toward the e-learning implementation. Ehlers et al. (2013) also indicated that MOOCs quality is a predictor for effective and successful learning.

Information Quality to Satisfaction Hypothesis

H2: *MOOCs' information quality has a significant influence on learners' satisfaction.*

The analyses confirmed that hypothesis (H2) was not significant (t-value = 1.379). This means that information quality aspects such as understandability, usability, and updated information have no influence on satisfaction toward learning via MOOCs.

In each semester when the MOOCs course started, the learners have to receive essential information related to MOOCs courses, the activities and homework, and important dates such as assignment and project due dates, exam dates. This information, according to the result of this hypothesis, does not improve learner's satisfaction in learning via MOOCs. The possible justification for this non-significant result of this hypothesis is maybe because the volume of information provided to learners are not well designed, thus unhelpful for learners to improve their learning via MOOCs. In the e-learning environment, learners are sensitive to information quality (Wang & Chiu, 2011).

MOOCs is a new learning mode that offer several multimedia tools and materials. These resources and materials should be clear, relevant to the learning objectives, and delivered in more detailed format to provide opportunities for all learners to accept the information easily. Thus, any complexity, ambiguity, or conflict in the MOOCs information may require more time and effort to review the information and might be causing the information overload (Zheng el al., 2015). Consequently, it is important for academic staff to offer MOOCs learners with clear, complete, and relevant information to the learning purposes and avoid the complexity and mystery information in order to improve satisfaction toward MOOCs.

A good case that represents this argument is one provided by Rai and Chunrao (2016). They analyzed the amount of homework required for *Introduction to Computing with Java* course offered on edX by Hong Kong University of science and technology. The course includes: 26 problem sets, 6 lab exercises a final exam and a final project. The study concluded that the course activities and overloaded information have overburdened the MOOCs learners.

The insignificant relation between MOOCs information quality and satisfaction is consistent with e-learning studies (e.g. Alsabawy et al., 2012; Wang & Chiu, 2011) indicated that the satisfaction toward e-learning was not influenced by information quality.

Service Quality to Satisfaction Hypothesis

H3: *MOOCs' service quality has a significant influence on learners' satisfaction.*

Service quality can be represented the technology staff support for addressing various problems that the learners may face when using MOOCs, it also related to the support that the learners get from instructors when they learning via MOOCs.

When learners experience problems with MOOCs and the responsible staff provides personal attention with sufficient knowledge and answers their questions in the expected time then learner's satisfaction toward using MOOCs will be increased. However, the survey findings indicated that service quality factor was not considered as key factor in assessing MOOCs success. Thus, hypothesis (H3) (t-value = 0.587) was not supported. In other words, the learners in this study perceived that the quality of MOOCs services such as the quality of the institutional support to learners and the availability of academic stuff support did not affect their learning satisfaction.

The quality of service is understood as the ability of MOOCs to dispense of useful support. In MOOCs context service quality can influence the behavior of learners. If service is good, then they are encouraged to use MOOCs. Therefore, the possible explanation for this non-significant result may be related to the fact that the sample for this study was undergraduate students who were still novice users for MOOCs. The analyses of the demographic data revealed that 41.3% of the respondents were beginner users to online learning environments and they have limited experience to current MOOCs course.

Therefore, the participants may have had confidence issues in using this novel technology, and may not yet have been skilled enough to use the full functionality and services of the MOOCs such as the instructor and institutional support. Fear of utilizing new technology also (Chang, Hung, & Lin, 2015; Pundak, 2014) tend to prevent learners from successfully utilizing and completing MOOCs.

A personal observation of the studied MOOCs courses also revealed that students in the courses are more focused on learning the content of the course and completing the assignments, the two features of e-learning that they are already familiar with.

To overcome this issue, it is suggested that the Ministry of Education provide training for students to acquire the essential skills they need to learn via MOOCs. Training is considered important for improving learners' satisfaction toward MOOCs. With continuous training updates, learners will become more and more comfortable in e-learning environments and more skillful in the use of technology for better learning outcomes (Al-Busaidi, 2012). This can lead to provide good opportunities for all students to learn and grow, and consequently improve standards of MOOCs success. Thus, it is worth conducting longitudinal studies to gain more understanding about this relationship.

The finding of H3 is not consistent with some of the previous e-learning research such as Ramayah and Lee (2012); Hsieh and Cho (2011); Petter and Fruhling (2011); Klobas and McGill (2010), all of these studies found that satisfaction is affected by service quality.

Attitude to Satisfaction Hypothesis

H4: *Student attitude has a significant influence on learners' satisfaction.*

The analysis of Hypothesis (H4) concluded that the influence of students' attitude on learners' satisfaction toward MOOCs is significant. The positive student' attitude increase their satisfaction toward MOOCs, thus lead to success in MOOCs learning.

The sample of this study indicated that MOOCs provides a greater opportunity for them to learn effectively to achieve the targeted outcomes and also make the learning more interesting and thus, promote success in MOOCs. The significant finding of this hypothesis also indicated that the impression of the learners toward MOOCs activities, feeling pleasure regarding all the benefits that they received from interaction with MOOCs, and feeling confident, enjoyable and interesting in using MOOCs improve learners' satisfaction toward MOOCs. Hammoud (2010) and Presley and Presley (2009) indicated that attitude toward e-learning systems lead significantly to success of these systems. Thus, learners' attitude must be committed and considered during the implementation of MOOCs.

The results from hypothesis (H4) is supported by studies such as Rhema and Miliszewska (2014); Zewayed et al. (2011); Malik (2010). The finding of these studies found those learners' behavior and their attitude determines satisfaction toward e-learning; a more positive attitude towards a new technology –such as MOOCs- improves learners' satisfaction rates.

Course Quality to Satisfaction Hypothesis

H5: *MOOCs' course quality has a significant influence on learners' satisfaction.*

The finding of H5 indicated that the aspect of course quality such as the design, the appropriateness of outputs, updated content, and easy to understand the materials of MOOCs course influence learners' satisfaction toward using MOOCs and effect in the success of MOOCs. The finding of testing hypothesis (H5) provided evidence that high course quality leads to increase learners' satisfaction towards MOOCs, thus, the result support hypothesis (H5).

The survey findings showed that the content of MOOCs materials such as the presentations, videos, and lecture notes are easy to understand, up-to-date, and have rich content which positively influence MOOCs learners' satisfaction. The successful implementation of MOOCs is highly depending on learners believe that MOOCs will provide quality of material (content).

MOOCs literature highlighted that designing MOOCs courses should be consistent, coherent with clear outline to the pedagogical approach involved (Istrate & Kestens, 2015). Rai and Chunrao (2016) for example, highlighted that learner behavior and quality of course are considered critical factors that influencing success of MOOCs. Lin et al. (2015) argued that the perceptions of learners toward the quality and richness of course content have a significant influence on accepting the knowledge.

Adamopoulos (2013) also highlighted that course material has a significant impact on MOOCs retention. Thus, the MOOCs quality content issue needs to be addressed and committed from MOOCs implementer and developer.

Furthermore, e-learning studies revealed similar conclusion and exposed that course quality influence on satisfaction significantly (e.g., Hassanzadeh et al., 2012; Musa & Othman, 2012; Owens & Price, 2010; Sun et al., 2008). Musa and Othman (2012) noted that the course quality is a key factor contribute to enhane learners' satisfaction and e-learning success.

Discussion on *RQ3: To what extent learners' satisfaction significantly influence learners' self-regulated learning?*

Satisfaction to SRL Hypothesis

H6: *Learners' satisfaction has a significant influence on learners' self-regulated learning.*

Hypothesis (H6) related to the effect of satisfaction on students' self-regulated learning (SRL) skills. The result of testing this hypothesis was supported (t-value= 4.265**). This indicated that positive learner's satisfaction improves their self-regulated learning skills toward learning via MOOCs.

Learners SRL skills will be improved if the learners perceive that MOOCs is useful for their job, or if MOOCs help in their productivity as a learner or even if they accomplish tasks more efficiently. This high SRL skills involves organizing and planning of learning process independently, setting learning goals, and identifying effective ways to learn. Thus, succeed in MOOCs learning.

MOOCs is a new learning mode that has the ability to enhance the learning process. The significant contribution in MOOCs is the shift from teacher-centered to student-centered education that improves students' ability in regulating and organizing their learning effectively. Thus, the finding of this hypothesis provided evidence that positive learners' satisfaction toward MOOCs promotes MOOCs learners' capability to review their material regularly, manage their time effectively, explore assistance from peers or instructors and require metacognition skills that reflect their own learning (You & Kang, 2014).

Positive learners' satisfaction will improve their self-regulation learning skills where they can determine their own purposes and ideas, as well as creating and sharing the information collaboratively. Multiple and varied peer interactions in MOOCs allow learners to create their own networks through social networking tools (e.g., Google groups, Blogs, Wikis, Facebook, and Twitter) and other tools outside of the learning platform that does not need any observation from the instructor (Kruiderink, 2013), consequently success in MOOCs environment.

The finding of this hypothesis is supported by MOOCs studies. Abeer and Miri (2014) for example, highlighted that self-regulation learning skills promote learners' participation and their motivation toward learning via MOOCs. The finding of H6 is also in agreement with e-learning studies such as by Zhao (2016); Liaw and Huang (2013); Chen (2009); Roca and Gagne (2008) which indicated that high degree of self-regulation improves learners' engagement and contribute in more succeed within e-learning. Using of SRL strategies effectively is a necessary skill for success in e-learning settings (Barnard-Brak et al., 2010).

Discussions on *RQ4: To what extent the 5 success factors (i.e. SQ, IQ, SRQ, AT, CQ) significantly influence learners' self-regulated learning?*

To answer research question 4, five hypotheses (H7 to H11) were proposed to investigate the direct relationships between 5 success factors (i.e. SQ, IQ, SRQ, AT, CQ) and learners' self-regulated learning. Table 6.3 are displayed the hypotheses, t-value, and the decisions for hypotheses (H7-H11).

Table 6.3

Summary of the direct research

Code	Hypothesis	*t*-value	Decision
	Direct effect		
H7	System quality significantly influences SRL	1.751	Not Supported
H8	Information quality significantly influences SRL	1.578	Not Supported
H9	Service quality significantly influences SRL	3.842**	**Supported**
H10	Attitude significantly influences SRL	7.001**	**Supported**
H11	Course quality significantly influences SRL	4.305**	**Supported**

Note. (*t*-values > 1.645* where $p < 0.05$), (*t*-values > 2.33** where $p < 0.01$)

Findings Related to Direct Effect Hypotheses for RQ4

System Quality to SRL Hypothesis

H7: *MOOCs' system quality has a significant influence on learners' self-regulated learning.*

Hypothesis (H7) related to test the influence of system quality on learners' self-regulated learning to use MOOCs. The result of testing this hypothesis was not supported. This indicated that MOOCs' system quality was not affected students' self-regulated learning. The quality of system features such as use and learn the system easily would not affect the way that the students participate and take decisions toward their learning via MOOCs.

The importance of MOOCs is enabling learners to engage on a self-managed investigation of topics rather than depending on the teacher monitoring and the expertise of authorities. However, the availability of system quality did not affect learners SRL skills levels.

The justification of non-significant result for the relationship between system quality and SRL may be related to the lack of learners' skills in using MOOCs. The limited experiences of participants to use MOOCs indicated that many learners have not the essential competencies to use all MOOCs features effectively. Accordingly, the quality of MOOCs system such ease to learn MOOCs is not sufficient to enable the learners to organize and regulate of the learning process due to the shortfall in their skills to use all the potential functions in this system.

Therefore, it is suggested that MOOCs lectures must make sure providing training through the universities for learners to acquire the essential skills they need during the learning and teaching process via MOOCs.

The finding of H7 was not consistent with e-learning studies such as Zhao (2016); Liaw and Huang (2013) who indicated the positive relation between system quality and SRL.

Information Quality to SRL Hypothesis

H8: *MOOCs' information quality has a significant influence on learners' self-regulated learning.*

The finding of hypothesis (H8) which examined the influence of information quality on SRL was not supported. The result of testing the hypothesis indicated that the availability and understandability of MOOCs information would not increase the level that the learners' self-regulated their learning when learning via using MOOCs.

In learning through MOOCs, learners need to receive some information, resources, and materials regarding the course and other information related to assignments and assessments. These resources and materials should be relevant, clear and delivered in more detailed format to meet the needs, levels, and backgrounds of all MOOCs learners and it should provide good opportunities for the learners to organize and regulate their learning. Thus, any problems in MOOCs such as non-relevant data, ambiguity or conflict information maybe consider the reason of delay in releasing the information and cause information overloaded.

Therefore, the possible justification for the non-significant finding of H8 maybe relate to the information overload. This overload in MOOCs' information system avoids students to organize, participate and take decisions regarding their learning in MOOCs. Consequently, to increase learners' self-regulated skills toward learning via MOOCs, it is necessary for instructors to provide learners with information that is highly relevant to the learning purpose to enhance their ability in organizing and regulating learning process in MOOCs.

This finding was not consistent with e-learning studies (e.g. Liaw &Huang, 2013; Zhao, 2016) found that information quality predicts learners 'self-regulated learning.

Service Quality to SRL Hypothesis

***H9**: MOOCs' service quality has a significant influence on learners' self-regulated learning.*

The result of the empirical study indicated that (H9) hypothesis is supported. This hypothesis emphasized that significant influence of MOOCs' service quality on SRL. When learners perceive that MOOCs have good service, in other words when MOOCs are available and responsive, then learners SRL skills will enhance, thus, success in MOOC learning.

This indicate that MOOCs service qualities such as quality of the institutional support and quality of the instructor support can be affected learners' SRL skills and improve the way that they participate in MOOCs thus, success in MOOCs learning.

The finding of H9 revealed that the learners perceive that the quality of MOOCs service such as institutions support (e.g., solve technical problems) and instructors support (e.g., providing feedback quickly) creates a sense of personalization that allows learners to organize and plan the learning process independently, this involve setting learning goals, reviewing course material regularly, managing the time effectively, and identifying the effective ways to learn thus, succeed in MOOCs learning.

The reliability of the MOOCs to answer learners' inquiries and the ability of MOOCs instructors in providing feedback in a reasonable timeframe can develop SRL skills and improve the ways to learn toward the MOOCs. Therefore, availability and quality of MOOCs services are considered to be an essential indicator in developing the self-regulated learning skills toward using MOOCs.

Thus, it is recommended that instructors support and institutional support must be considered as key factors during the development and implementation of MOOCs systems. With regard to instructor interaction, educational institutions need to make sure that instructors teaching MOOCs that provide feedback immediately via a variety of methods, support and guidance learners concerning learning process, and involve the class actively by frequently offering opinions and asking questions of learners.

Several researchers are consistent with this finding and provided evidence of the substantial impact of service quality on SRL in e-learning environment (e.g., Liaw &Huang, 2013; Zhao, 2016). The significance of the service quality factor is confirmed that the different types of the e-learning system are successful and established well (Cenfetelli et al., 2008).

Attitude to SRL Hypothesis

H10: *Student attitude has a significant influence on learners' self-regulated learning.*

Hypothesis (H10) that examined the relationship between attitude and SRL is significant. The positive learners' attitude would increase learners SRL skills and improve the way that they participate in MOOCs and take decisions regarding their learning.

MOOCs is a new learning style that promotes the transit from the teaching age to the learning age and supports the learner-centered education that allows learners to learn according to their individual needs. MOOCs also provide greater opportunities for learners to learn according to their preferred learning style which enhance their attitude toward using MOOC, this positive attitude increase SRL skill levels, and consequently, lead to success in MOOCs.

The possible justification for (H10) finding might be that the positive impression of learners toward using MOOCs such as feeling confident while doing MOOCs activities, feeling enjoyable and interesting in using MOOCs, and feeling pleasure regarding all the benefits that they received from MOOCs would improve their self-regulated learning skills toward MOOCs, this includes organizing and planning of the learning process independently, setting learning goals, and identifying the effective ways to learn. Thus, succeed in MOOCs learning.

The result from (H10) is consistent with e-learning studies such as Kramarski and Gutman (2006); Zimmerman and Schunk (2001) who found that attitude determines learners self-regulated learning skills in e-learning context. Researchers such as Hammoud (2010); Presley and Presley (2009) indicated that attitudes contribute significantly in the success of e-learning implementation.

Course Quality to SRL

H11: *MOOCs' course quality has a significant influence on learners' self-regulated learning.*

Hypothesis (H11) that tested the influence of course quality on SRL indicated significant result. This finding provided evidence that the aspects of quality content such as the design, the appropriateness of outputs, and ease of understanding of course materials support SRL skills toward learning via MOOCs.

The participants of this study showed that MOOCs success depends on high quality of design the content of MOOCs and the easiness of understanding the materials in

MOOCs which contribute in making learners more independent in organizing and planning their learning process. High SRL skills level promote learners to set learning goals, identify effective ways to learn, thus, achieve the success in MOOCs learning.

Consequently, it is suggested that MOOCs developers and instructors have to make sure that the materials of MOOCs are easy to understand and designed in high-quality format to create real opportunities for learners to be more responsible learners toward learning via MOOCs and to increase their SRL level.

The quality of course content is one of the most crucial elements that motivate the learners around the world to join and engage in MOOCs platforms (Yousef et al., 2014b). The finding of this hypothesis is supported by e-learning studies which indicated that the content quality factor has a direct impact on e-learning systems success (e.g., Hassanzadeh et al., 2012; Owens & Price, 2010; Sun et al., 2008). Hung (2015) for instance, showed that the perceptions of learners toward the quality and the richness of the course content have significant influence on accepting the knowledge and improve the quality of the learning exchanges.

Discussions on *RQ5: To what extent the influence of learners' satisfaction mediates the relationship between the five success factors (i.e. SQ, IQ, SRQ, AT, CQ) and self-regulated learning?*

Five hypotheses established to test the mediation effect of satisfaction between the factors of the study. Table 6.4 are displayed the hypotheses, t-value, and the decisions for hypotheses (H12-H16).

Table 6.4

Summary of the mediation research hypotheses related to RQ5

Code	**Hypothesis**	**Supported**
H12	System quality on SRL is mediated by satisfaction	**Yes**
H13	Information quality on SRL is mediated by satisfaction	No
H14	Service quality on SRL is mediated by satisfaction	No
H15	Attitude on SRL is mediated by satisfaction	**Yes**
H16	Course quality on SRL is mediated by satisfaction	No

Findings Related to Mediation Effects

System Quality on SRL Mediated by Satisfaction

H12: *Learners' satisfaction has a significant influence on mediating the relationship between system quality and self-regulated learning. User satisfaction is assumed to enhance the relationship between system quality and self-regulated learning.*

Hypothesis (H12) was developed to assess the mediating effect of satisfaction on the relationship between system quality and SRL. The finding revealed that H12 is supported.

The statistic result of this hypothesis revealed that satisfaction has a significant mediating effect on the relationship between system quality and SRL. In other words, an uncomplicated system and easy to use MOOCs will enhance learners' satisfaction toward learning via MOOCs, and that satisfaction will enhance students' SRL skills.

The availability of necessary features and functions in a MOOCs platform, as well as easiness to use the MOOCs, will result in better learners' satisfaction in learning via

MOOCs. For example, important features that allow learners to discuss, document, create, download, post and search for information support students' learning via MOOCs, enhance their abilities to organize their learning and accomplish all MOOCs activities effectively thus, improve their SRL skills. MOOCs learners need to be independent and active participates in the learning process, thus, learners with high self-regulated learning has more ability to engage in learning by setting learning objectives individually, identifying the effective techniques to learn, and monitoring the process to achieve the objectives. Consequently, success in MOOCs. Previous research supported this finding indicated that MOOCs learners with high self-regulated learning have different cognitive, affective and behavioral reaction toward learning via MOOCs than those have low levels of self-regulated learning (Littlejohn & Milligan, 2015; Hood et al., 2015).

Information Quality on SRL Mediated by Satisfaction

H13: *Learners' satisfaction has a significant influence on mediating the relationship between information quality and self-regulated learning. User satisfaction is assumed to enhance the relationship between information quality and self-regulated learning.*

Hypothesis (H13) was developed to assess the mediating effect of satisfaction on the relationship between information quality and SRL. The finding failed to support the mediating effect of satisfaction on information quality and SRL. Satisfaction toward MOOCs and learners' aptitude to understand MOOCs information and materials did not enhance learners regulated learning skills in MOOCs.

In MOOCs, the information quality is represented the reliability of the available contents. Learners need MOOCs contents to be understandable and adequate to their needs. However, when the information provided via MOOCs are not clear, then learners satisfaction and their SRL skills will not improve.

The non-significant result of (H13) can be explained by the fact that information overload and ambiguities in the content materials result in dissatisfaction in learning as learners have to consume more time to filter and identify relevant materials. This also reflects negatively to self-regulated learning skill; hence, learners may fail to organize their learning process, give up continuing, and may turn to other competing educational providers (Wang & Chiu, 2011).

It is worth mentioning that the result of testing the relationship between information quality and SRL was not supported, as shown in (H8) finding, and the influence of information quality on learners' satisfaction hypothesis (H2) was also not supported.

Consequently, MOOCs instructors should provide materials and information that is clear and in more detailed format to enhance learners' satisfaction toward MOOCs to improve self-regulated learning skills when using MOOCs systems. Additionally, the educational institutions that provide MOOCs courses need to communicate with learners to achieve their needs and to deliver information as they promised.

Hence, it is suggested providing training to MOOCs learners. Training to use new technology –such as MOOCs- can provide the necessary skills that improve learners' ability to receive MOOCs information effectively. Consequently, understanding MOOCs information and materials will support their satisfaction toward MOOCs and can raise learner's capability to control and organize the MOOCs tool effectively, enhancing their self-regulated learning skills, consequently, success in MOOCs environment.

Service Quality on SRL Mediated by Satisfaction

H14: *Learners' satisfaction has a significant influence on mediating the relationship between service quality and self-regulated learning. User satisfaction is assumed to enhance the relationship between service quality and self-regulated learning.*

Hypothesis (H14) highlighted the mediation role of satisfaction on the relationship between service quality and SRL. The finding of this hypothesis was not supported.

Satisfaction did not mediate the relationship between service quality and SRL; however, the effect of service quality on SRL was significant (H9). In other words, the quality service provided by MOOCs systems allows learners to perform their tasks effectively and improve the self-regulated learning skills regardless of the availability of level of satisfaction. It is worth mentioning that the influence of service quality on learners' satisfaction hypothesis (H3) was not supported.

The explanation for this outcome could be – as indicated in hypothesis (H3) – that the learners failed to employ many functions and services (e.g., instructors and institutional support) provided by MOOCs due to the lack their experience in using MOOCs systems.

When learners perceive that MOOCs have good service, in other words when MOOCs are available and responsive, then learners experience may be enjoyable, thereby leading to satisfaction. Positive satisfaction regarding MOOC will enhance learners SRL skills. On contrary, the shortfalls in learners' experience to use MOOCs services and functionality and their low capability to fix problems facing them might make undesirable feelings by learners toward using MOOCs system and it may be affected their satisfaction and SRL skills.

The absence of the effect of satisfaction on the relationship between service quality and SRL also could be due to deficiency encourage provided from MOOCs instructors to learners. The MOOCs academic stuff have to inspire learners and support them to do the activities and tasks effectively and achieve their goals, hence, the nonappearance of the instructors' support reflects on learners' satisfaction toward the use of MOOCs system.

Consequently, it is recommended that MOOCs instructors make sure to provide the necessary support to answer students' questions quickly and help them to solve their problem that may face them during learning via MOOCs; this may contribute to improve learners' expectation and provide opportunities for students to develop their ability to organize and regulate their learning via MOOCs.

The finding of this hypothesis is not supported with many of MOOCs studies noted that the participation of instructors in MOOCs activities such as their engagement in the discussion forums contribute in supporting the learners actively and has impact on the learning outcomes positively. For example, Ross et al. (2014) emphasized the importance of instructors' experiences in MOOCs environment and highlighted the influence of instructor in improving learners' engagement in MOOCs activities. Guo et al. (2014) also found that recorded short videos and present of instructor talking head videos were the critical factors for enhancing student engagement in MOOCs.

Attitude on SRL Mediated by Satisfaction

H15: *Learners' satisfaction has a significant influence on mediating the relationship between student attitude and self-regulated learning. User satisfaction is assumed to enhance the relationship between student's attitude and self-regulated learning.*

Hypothesis (H15) was examined the mediation influence of satisfaction on the relationship between attitude and SRL. The finding was significant.

This analysis revealed that learners were largely satisfied with learning via MOOCs when they believed that MOOCs met or exceeded their expectations, and learning via MOOCs was compatible with their learning or life style. Learners' satisfaction has the ability to enhance the relationship between attitude toward MOOCs and SRL thus, improve learners' participation in learning by MOOCs and success in MOOCs environment.

Learners 'attitude toward MOOCs represent their believe that learning via MOOCs is interesting and give them a good opportunity to acquire new knowledge and enhance their learning experience that creates great and positive satisfaction toward MOOCs and enhance their SRL skills. In fact, learners' satisfaction toward MOOCs provides real opportunities for all learners to make learning via MOOCs more interesting more convenience in achieving learning objectives and contribute in enhancing SRL skills by providing more opportunities to design individualized learning toward MOOCs.

Satisfaction enhances the relationship between attitude and SRL. This outcome indicate that satisfaction has the ability to develop learners' skills by promote them to be active learners specially when the learners believe that learning via MOOCs is interesting and fun. Enhancing self-regulated learning (SRL) skills allow learners to find out of the best solutions for any challenging or obstacles facing them hence, achieve learning goals and get success in their learning process. Artino and Stephens (2009) indicated that highly self-regulated learners are holding positive motivation and self-efficiency to their own learning process such as selecting learning content, identifying learning goals, organizing and controlling their learning processes.

In MOOCs literature, Belanger and Thornton (2013) suggested four categories for learner motivations toward MOOCs: the learners interested in supporting lifelong learning, they register in MOOCs courses for fun and enjoyment, they find MOOCs courses convenience, and for exploring MOOCs as a new style of online learning. The study concluded that the large majority of learners indicated that they are signing up in MOOCs systems for fun and enjoyment.

Course Quality on SRL Mediated by Satisfaction

H16: Learners' satisfaction has a significant influence on mediating the relationship between course quality and self-regulated learning. User satisfaction is assumed to enhance the relationship between course quality and self-regulated learning.

The finding of testing this hypothesis was not supported the mediating effect of satisfaction on the relationship between course quality and SRL; however, the direct relationship between course quality and SRL was significant and the direct effect between course quality and satisfaction was also supported.

Course quality can affect the self-regulated learning skills without considering the availability of satisfaction. In other words, the way that the students accomplish MOOCs tasks can be enhanced by the quality of MOOCs content such as the quality of MOOCs design and the appropriateness of outputs without the support of satisfaction toward MOOCs.

The explanation for the non-significant influence of satisfaction on the relationship between course quality and SRL can be related to the design of MOOCs content.

The finding of H16 indicated that MOOCs content was not met the expectations, needs, interests, levels, and backgrounds of all MOOCs learners, which affect to their satisfaction toward MOOCs.

MOOCs learners need to have high-quality content that contributes to build their own knowledge and provide good opportunities for them to learn according to their learning needs. MOOCs should be designed with high-quality content and in the participatory form that supports learners' diversity and needs, this form should improve learning activities and promote different learning styles (Margaryan et al., 2015). Therefore, it recommended that the developer teams and instructors of MOOCs have to make sure that developing MOOCs course materials (content) should be design in suitable format to meet the diversity of all learners which contribute in supporting their satisfaction toward MOOCs, thus, establishing actual opportunities for MOOCs learners to improve their SRL skills and encouraging them to become more productive and responsible learners toward learning via MOOCs, will lead to succeed MOOCs systems. Hung (2015) highlighted that the perceptions of learners toward the quality and richness of course content have a significant influence on accepting the knowledge and the quality of the learning exchanges.

Discussions on *RQ6: Is the proposed model in the present study valid and reliable to measure MOOCs success?*

Research question 6 examines the validity and reliability of the whole proposed model, the factors of the study, and the items that represent each factor.

The data has been collected and analyzed; Cronbach's alpha has been employed to check the reliability using SPSS. PLS-SEM technique using SmartPLS software was adopted to gauge the validity of the model based on two stages: measurement and structural model.

Testing the proposed study model showed that the indicators (e.g., path coefficients, predictive relevance (Q^2), coefficient of determination (R^2) have met the rule of thumb of these indicators and emphasized that the proposed model is a reliable and valid model, thus, no changes were conducted to the model. In summary, the results for testing the model highlighted that the reliability and validity of the items, factors, and the whole model were established and the proposed model is suitable to measure the success of MOOCs systems.

The study proposed model was established based on extensive reviewing the literature and supported by empirical evidence. According to researcher knowledge, there are no any previous studies that would obviously establish a similar framework; thus, this framework constitutes an original contribution to knowledge in MOOCs field and e-learning system success sector.

The framework is believed to enhance MOOCs success and provide a clear guideline for decision makers in HE educational settings in Malaysia by helping them to identify the critical factors that improve the success of MOOCs system.

Contributions and Possible Implications of the Study

This study has made several contributions to the existing literature on MOOCs.

Theoretical Contribution

Formulating a model of critical factors influencing MOOCs success in HE is a primary objective of this study. Thus, the major contribution is investigating in-depth the D&M model in MOOCs context. To ensure that the proposed model is relevant to the MOOCs setting, this study examined the research model factors and confirmed that the factors incorporated are necessary and relevant to measure MOOCs success in HE. This thesis filled this gap in the current MOOCs literature.

Consequently, the implications of this study to knowledge and theory of MOOCs are as follows:

- The findings of this study confirmed that McLean & DeLone (2003) model is valid and reliable to assess the factors that affecting MOOCs success.
- This study has extended the M& D (2003) model by adding the self-regulated learning factor as the main factor for achieving the success of MOOCs.
- This study extended the relationships between the factors in the M& D (2003) by evaluating the direct and the mediation effect.
- Due to the rare of the empirical evidence related to the factors that supporting SRL in MOOCs. This research provides empirical evidence that service delivery quality, attitude, course quality and user satisfaction factors effect positively on SRL in MOOCs and improve the quality aspects of MOOCs.
- Satisfaction was used in numerous studies to assess the systems success issue. Most of these studies measured the relationships between satisfaction and other the factors (e.g. system quality, information quality) through the direct effect. This study pays considerable attention to satisfaction by identifying the direct and mediation effect of this factor. The findings emphasized the major role of satisfaction factor as a mediator between (system quality and SRL) and (system quality and SRL). The significant effect of satisfaction as mediator is believed to be an important contribution to the systems success field and MOOCs environment.

- For the direct effect, the findings indicated that system quality, attitude, and course quality influencing positively on learners' satisfaction toward MOOCs.

Practical Contributions

The primary contribution of this study is developing and testing a model for measuring the MOOCs system success in HE education settings especially in universities context in Malaysia. This new model is holistic because its combined factors from the technical perspective (i.e., system quality) and other factors come from the educational perspective (i.e., self-regulated learning, student attitude, and course quality).

This study also provides scientific evidence regarding the factors that should be examined to accomplish an effective implementation of MOOCs and deliver the success of MOOCs system in HE settings. The study explores the effect of the critical factors (i.e., system quality, service quality, student attitude, course quality, satisfaction, and SRL) in achieving the success of the MOOCs system.

This study has found that the SRL is believed to be the most vital factor effect the success of MOOCs in addition to the factors: satisfaction, students' attitude, course quality, and system quality. Moreover, this research contributes to fill the gap in the literature regarding to the lack of studies in Malaysia context that investigate the factors that influencing MOOCs system success in HE settings.

Consequently, this study has several implications for MOOCs practitioners:

1) This study provides instrument and model to evaluate the success of MOOCs to the HE institutions that adopt MOOCs.

2) This study providing awareness regarding the essential role of learners' satisfaction and SRL skills in achieving the success of MOOCs in HE institutions.
3) This study offers an attention to the importance of the factors that influencing MOOCs success in the HE institutions. These factors (i.e. attitude and course quality) are significant for practitioners and instructors to identify the critical success factors of MOOCs success and to explore how these factors affect the quality of MOOCs in universities and other institutions that adopt MOOCs.
4) The study model provides significant evidence in regard the crucial factors influencing MOOCs system success, thus the decision makers in the educational institutions especially; e-learning systems can adopt the study model to improve these factors.

Recommendations

The followings are recommendations to HE institutions, MOOCs administrators, and designers in implementing, managing, and designing MOOCs systems:

a) The significant recommendation is related evaluating of the MOOCs systems in the HE institutions by considering assess different key factors (i.e., SQ, IQ, SRQ, AT, CQ, SAT, and SRL).
b) This study highlighted the critical role of satisfaction factor via the direct and mediation effect on the study factors. Thus, it is recommended to HE institutions and educational settings to consider learners' satisfaction toward MOOCs to achieve the success of MOOCs.

c) It is recommended that the top management in HE institutions have to improve SRL factor by paying more attention to the factors that support self-regulated learning in MOOCs (e.g., service quality and course quality).

d) The management of HE institutions should provide students with relevant and sufficient materials and information (e.g., video lectures, recordings) in a clear and complete format to reduce any confusion about MOOCs information.

e) It is recommended that the HE institutions to pay attention to the quality of MOOCs content. Course quality can assist in improving learner's satisfaction and help them to organize the MOOCs information.

f) The attitude of learners toward MOOCs should be considered when assessing MOOCs system success. Learners' attitude improves students self-regulated learning skills and support satisfaction toward the MOOCs system.

g) The views of different stakeholders (i.e., students, academic staff, ICT staff, and management) toward the success of MOOCs systems should be considered. A careful consideration of all stakeholders in the HE institutions could be provide a clear vision toward meaningful and positive learning in MOOCs, this lead to achieve a success in MOOCs environment.

h) It is recommended to evaluate the factors that influencing MOOCs success by using longitudinal study that might expose how these factors could be changed over the duration of their study.

i) Adding some qualitative data such as interviewing the participants to gain more information about the factors influencing the success of the MOOCs system. Adopting mixed methods of quantitative and qualitative approach could also support the validity of the research and exploring the success of MOOCs in-depth.

j) It is recommended to evaluate the success of MOOCs through examining of the learners who drop-out the MOOCs courses and students who still continue or completed MOOCs courses.

Limitations of the Study

This study has revealed several limitations that should be considered when investigating the significance and generalizability of the research. These limitations may influence the design and the results of the study.

1. All the survey questions were developed based on Likert scale method; thus, this study is limited to quantitative data. The students could not provide any qualitative data in regard to the factors influencing MOOCs success.
2. This study is limited to specific theories. The research instrument was established according to the D & M (2003) model and self-regulated learning theory (Zimmerman & Moylan, 2009).
3. Another limitation is related to the extraneous variables that could affect the study factors. Some extraneous variables which cannot be controlled such as (students' personality, social factors, environment, and socio-economics) could influence learners' satisfaction toward MOOCs systems and SRL.
4. This study is limited to the learners who used MOOCs in the HE sectors and excluded the learners from other organizations or who learned by distance. Due to the differences in the environment and the purposes of using MOOCs in the HE institutions and other organizations; the findings

of this study cannot be generalized to all organizations that adopting MOOCs systems.

5. This study is restricted to the viewpoint of the MOOCs learners and excluded the opinions of other stakeholders (e.g., academic staff, ICT staff, and management) that could have provided worth perspectives and clear vision regarding the key factors that prompting MOOCs success.
6. This study is limited to number of the factors used to evaluate MOOCs success. Some factors that could be influenced MOOCs system success (e.g. self-efficacy, motivation, student training) were not considered in the survey questionnaire.

Future Studies

This section provides researchers with guidelines for future research, as follows:

- Further research that involves collecting data from another HE environment - such as training settings- is needed. Testing the model in different educational settings contribute in determining the strengths and weaknesses of the study model, thus confirming the validity and reliability of the model.
- Further research that introduces more factors that could be influenced MOOCs system success such as the social factors and the environmental factors is needed in order to pursue further investigations of the factors influencing MOOCs system success.
- In future work, it is deal to include the perspective of other stakeholders (such as designers and instructors) to extent the viewpoints and to get a complete picture regarding the factors influencing MOOCs system success.

- The efforts of scholars on the mediation role of course quality, attitude, and system quality and the factors that contribute in supporting these relationships should be considered for future studies to gain more explanations about MOOCs success.
- Evaluating the satisfaction factor according to the nature of using MOOCs (i.e. mandatory or voluntary), and testing the factors that supporting satisfaction by examining different MOOCs stakeholders is needed.

To conclude, this research provides the evaluation to the crucial factors that influencing the success of MOOCs systems in higher education in Malaysia context and delivers a validated model which can be beneficial to current and future research in MOOCs area of studies.

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