USABILITY OF MASSIVE OPEN ONLINE COURSES (MOOCS): MALAYSIAN UNDERGRADUATES' PERSPECTIVE

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ABSTRACT

Massive Open Online Courses (MOOCs) have recently gained popularity in a blended learning approach at educational institutions around the world. Despite this trend, little research exists on the students' experiences and emerging challenges with implementing this online learning platform in a higher education setting, particularly from the Malaysian perspective. To address this need, this study was conducted to evaluate the usability of MOOC-OpenLearning based on the undergraduate students' perception of it. Utilising the quantitative approach, a survey was disseminated online to students in various undergraduate programs in a public university in Malaysia, Universiti Tun Hussein Onn Malaysia (UTHM). The study findings revealed a generally moderate level of positive perceptions among the respondents towards all the usability aspects of MOOC-OpenLearning in supporting their learning process, i.e., in terms of usefulness, ease of use, ease of learning, and satisfaction. An implication of this study is that respondents have significant uncertainties towards the usability of MOOC—OpenLearning and the emerging challenges of using it may require further exploration.

Keywords: usability, usefulness, ease of use, ease of learning, satisfaction, MOOCs, Massive Open Online Courses, Malaysia, UTHM, undergraduates, higher education, public universities, teaching and learning, online learning.

INTRODUCTION

The current COVID-19 pandemic, which took the world by surprise since the end of 2019, has made online learning tools and approaches more important than they were before. With the lockdowns and educational institutions closing globally, teaching and learning process are no longer restricted to traditional, face-to-face approaches. Advances in information and communications technology are considered the panacea for higher education institutions to ensure the continuity of education and effectively facilitate the process of educational delivery through the proliferation of online learning tools and platforms for various fields of studies. Massive Open Online Courses (MOOCs) are one such tool that has emerged as a new form of technology-enhanced learning in the higher education setting and beyond.

MOOCs have become especially relevant for supporting teaching and learning process during this pandemic. MOOC providers have responded to the pandemic in three broad ways: "by opening up catalogue access to campus students, by launching free courses about COVID-19, and by offering free

certificates for particular courses" (Schaffhauser, 2020, para.3). According to Impey (2020), MOOCs have seen a surge in enrolment since March 2020, and at Coursera (i.e., an online platform offering MOOCs), enrolment has skyrocketed to 640% higher from mid-March to mid-April 2020 than during the same period in 2019. Globally, around 10 million more learners were enrolled in MOOCs in 2019 compared to 2018, leading to an estimated global enrolment of 110 million students and a 10% growth in student numbers (ICEF Monitor, 2020). Furthermore, the global growth of MOOCs is projected to rise at a rate of 29% from 2020 to 2025, making the learning platform the fastest-growing education market (Guide2Research, 2020).

Similarly, MOOCs are gaining momentum in Malaysia. In 2016, the MOOCs Malaysia platform hosted at OpenLearning.com offered 63 courses with more than 148,917 students taking or having taken courses through the platform (Rahman 2016). In 2018, the number increased significantly to over 800 courses with a total of 900,000 enrolments in Malaysia MOOC and other MOOCs in Malaysia (The Star Online, 2018). In fact, as reported in the same article, in line with its ambition to become an international education hub, the Malaysian government aims to attract 250,000 international students, and already over 100,800 overseas students are enrolled in Malaysian-developed MOOCs. The above statistical evidence shows the relevance and potential of MOOCs, not only in supporting the 21st century learning needs among students but also in realising the country's aspiration towards becoming a more developed nation through a regionally and internationally recognised higher education system.

Given this aspiration, it is importance to study the usability of MOOCs. As suggested by Ball and Bothma (2017), usability evaluation is an important aspect to be studied to reveal how certain tools and systems are really used so that further improvements can be made to the design of them. As revealed by Rabin et al. (2019), poor usability can delay learners' progress and decrease the personal benefits learners could gain from participating in the learning intervention. The challenges in designing MOOCs lie not only in the pedagogical aspect but also technical areas that also comprise the "usability" element.

Few studies have been conducted on the usability aspect of MOOCs. In fact, past studies have shown that there are many usability issues that tend to recur in the process of implementing certain learning interventions, particularly those involving online technologies (e.g., Kenttälä et al., 2015; Obel, 2018; Santoso et al., 2016). Although user experience measurements have been used widely in the evaluation of any product, there is still a limited effort to assess the usability of online learning platforms (Santoso et al., 2016). When it comes to MOOCs, Explorance (2013) listed four main challenges in evaluating the usability of these online courses, which are the lack of established criteria, low completion rates, varying instructor involvement, and accessibility issues. In Malaysia, although the government has been actively supporting the use of MOOCs in both public and private educational sectors, research on the usability aspect has been scarce.

The main objective of this study was to evaluate the usability of MOOC-OpenLearning from the perspective of undergraduate students in a Malaysian public university, specifically from the aspects of: (a) usefulness, (b) ease of use, (c) ease of learning, and (d) satisfaction. Emerging challenges with regards to the implementation of MOOC-OpenLearning at the university were also examined.

LITERATURE REVIEW

MOOCs in Higher Education

Online technologies have become a great influence in education nowadays and have opened doors for new opportunities for learners outside the traditional boundaries of educational delivery. Since the late 20th century, blended learning, i.e., combining online and some form of face-to-face interaction, appears to be emerging as the main approach for supporting 21st century education across higher education institutions globally (Cairns & Alshahrani, 2013). MOOCs are one of the blended learning approaches with interactive tools to offer online courses that enable students to access learning resources anytime and anywhere. MOOCs are designed mainly as standalone, online courses that provide learners free access to education and unrestricted participation in any course of their choice. A new format of teaching and learning that has emerged in higher education globally is the combination of MOOC

with traditional university courses, resulting in a blended course design (McNamarah et al., 2017). One of the primary goals of such a hybrid approach to teaching and learning is to enhance students' learning experience and ultimately their success and satisfaction (McNamarah et al., 2017).

According to Alanazi and Walker-Gleaves (2019), there are many explanations for the emergence of MOOCs, which had the starting philosophy of Connectivism and Connective Knowledge. This philosophy "describes the manner in which new learning opportunities have come into existence from the widespread use of digital and web technologies and devices, in combination with the instructional paradigms of distributed and collaborative learning" (Alanazi & Walker-Gleaves, 2019, p. 3140).

In recent years, many scholars and educational practitioners have investigated how MOOCs can contribute to improving the learning attitudes, outcomes, and experience of students, especially in a higher education setting within the context of either formal or informal education. This includes developing positive attitudes, individualizing education, and learning outside the classroom (Alanazi & Walker-Gleaves, 2019); providing free and accessible education (Manalo, 2014); and increasing learners' satisfaction (Rabin et al., 2019). Apart from that, several studies also reported on how MOOCs are integrated into the existing teaching and learning approach in a higher education context. For instance, a study by Fidalgo-Blanco et al. (2016) described the hybrid pedagogical model of MOOC, namely the xMOOC and cMOOC. While "xMOOCs promote instructivist and individualist, use classic elearning platforms and are based on resources, cMOOCs are connectivist and are based on social learning, cooperation and use of web 2.0" (Fidalgo-Blanco et al., 2016, p. 2). Regardless of the type of MOOC, we observed similar perceptions among the participants in our study with regards to the quality of the learning experience.

In Malaysia, MOOCs are considered a new initiative by the government that aims to increase the level of technological use in public and private higher education institutions (Nordin et al., 2015). In fact, Malaysia is said to be the first country in the world to implement the MOOC initiative for public universities, as stated by the former Higher Education Minister of Malaysia, Datuk Seri Idris Jusoh (Centre for Global Online Learning, n.d.). Initially, Malaysia MOOC was officially launched in 2015 through the Malaysia's national MOOC platform for public higher education institutions, called OpenLearning.com (Kumar & Al-Samarraie, 2018). Under the 11th National Malaysia Plan (2016–2020), the Malaysian government has allocated funds for the Ministry of Education (MOE) to further implement online initiatives for higher education institutions. One of the main initiatives of the MOE, under the Malaysian Education Blueprint 2015–2025 (Higher Education), is to use blended learning as a conduit for transforming existing pedagogy, and the further development of MOOCs has been outlined as one of the important plans in the online initiative (Fadzil et al., 2015). Under this plan, public universities in Malaysia will develop MOOCs on core modules and pools of students from these universities will participate in those courses through the national platform of MOOC, i.e., OpenLearning.com. Until 2018, over 880 courses have been created by Malaysian educators, and a total of 900,000 participants in this country have enrolled in MOOCs on OpenLearning, either Malaysia MOOC or MOOCs by other entities (The Star Online, 2018).

In UTHM, the Centre for Global Online Learning is responsible for developing and monitoring MOOC-OpenLearning while delivering training and advisory services related to elearning implementation at the university. Until early 2018, a total of 25 MOOC courses had been jointly developed by all faculties and schools at the university (Hammim, 2018). UTHM's MOOC-OpenLearning covers six fields of studies, which are Civil Engineering, Education, Electrical Engineering, Computer Engineering, Mechanical Engineering, and General Studies (Centre for Global Online Learning, n.d.). MOOC-OpenLearning has been integrated as one of the teaching and learning approaches at the university, along with other techniques such as problem-based learning, blended learning, and fully online learning, assessment, and training (The Official Portal of UTHM, 2020).

The Concept of Usability

Usability is one of the key attributes that are used to measure the usefulness of a certain product or application. Berns (2004) defined usability as "the extent to which a product can be

used by specific users to achieve specified goals with effectiveness, efficiency, and satisfaction in a specified context of use" (p. 21). Notess (2001) argued that the definition of usability "is not standardised in the same way that, for example, some performance measurements have been assigned standard benchmarks" (para. 3). Usability can be seen as either a measurable attribute of a product, a process that aims for improvement, or a functional group that needs to be balanced with business objectives, technical constraints, and time constraints (Notess, 2001).

From a theoretical perspective, usability is part of the broader term "user experience," which refers to the ease of access and/or use of a certain products or services. User experience, generally abbreviated as UX, refers to "the subjective experience of the user when interacting with technology to perform some task or function to achieve a desired outcome and end goal" (Fishbeck, 2016, para. 5). The two fundamental elements of user experience are the user and the technology, which drive each other and produce a subjective experience in the user's perceptual space (Fishbeck, 2016). Morville (2004) developed the User Experience Honeycomb to illustrate the facets of user experience and explained that there are seven elements contributing to developing a meaningful and valuable user experience (useful, usable, desirable, findable, accessible, credible, and valuable). As part of these elements, usability emphasizes the importance of ease of use on the interface-centred methods and perspectives of human-computer interaction (Morville, 2004).

"Usability evaluation" and "usability testing" are always used interchangeably. According to Rosenbaum (1989), the goal of both usability evaluation and usability testing is the same, which is to improve the usability of products or services. The implementation of usability evaluation is not limited to web platforms (Sidhawara et al., 2018). It can also be performed on mobile platforms, such as phones and tablets. Usability evaluation includes several aspects of the product or application. Lund (2001) suggested four dimensions to evaluate the usability of a product: usefulness, ease of use, ease of learning, and satisfaction dimensions. Meanwhile, Sidhawara et al. (2018) listed the criteria for usability evaluation of web-based platforms as ease of use in relation to usage steps, user time, and consistency of web site elements. Rubin, Jeffrey, Chrisnell and Dana (2008, as cited in Lestantri et al., 2018, p. 6) provided the description of each dimension as follows:

- Usefulness is related to the usefulness of the product for the user; how much is the product useful and utilised by the user to achieve user goals?
- Ease of use is related to the ease of the user using the product.
- Ease of learning is how fast a user can operate the product and how long until the user understands how to use it.
- Satisfaction is related to user acceptance, feelings, and opinions of the product

Usability evaluations can provide both qualitative data and quantitative data. "Quantitative data notes what actually happened. Qualitative data describes what participants thought or said" (usability.gov, 2020, para. 7). The evaluation of usability can be done using the survey method to process data related to the products of a service's effectiveness, efficiency, and satisfaction (Hendra & Yulyani Ariffin, 2018). There are several surveys developed by early scholars that can be used to measure usability from the user perceptions. For instance, the USE Questionnaire was developed by Lund (2001), which includes four dimensions to measure the usability of a product or service, namely Usefulness, Ease of Use, Easy of Learn, and Satisfaction. Other common surveys for usability evaluation include the User Experience Questionnaire, i.e., UEQ (Laugwitz et al., 2008), the System Usability Scale, i.e., SUS (Brooke, 1996), and the Questionnaire for User Interaction Satisfaction, i.e., QUIS (Chin et al., 1988).

Usability of MOOCs

From the educational perspective, the usability of a learning tool or intervention refers to the extent to which learners can learn through and use the tool or intervention to achieve their learning goals. In elearning, for instance, usability is closely related to user interaction (Sidhawara et al., 2018). For the case of mobile-based platforms, the expert usability review method was useful in proposing new guidelines for developing and implementing mobile learning applications based on usability attributes (Hujainah et al., 2016). Other than that, studies by

various scholars also linked usability as the main factor in both students' and instructors' adapting to a learning management system (Aharony & Bar-Ilan, 2016), students' satisfaction in educational websites (Hasan, 2014), and students' and lecturers' experience as users in a student-centered elearning environment (Junus et al., 2015).

A vital aspect to be considered when it comes to the usability of a teaching and learning intervention is how such a tool or application supports the development and mastery of students' 21st century learning skills. As suggested by the North American Council for Online Learning and the Partnership for 21st Century Skills (2006), "the mastery of 21st century skills occurs through intentional instructional design, direct instruction of quality curriculum and meaningful assessments—regardless of whether the students complete courses online or in a brick and mortar building" (p. 5). Online learning is an ideal environment for the 21st century students to learn and acquire knowledge. The 21st century students, i.e., participatory learners who use information technology to accomplish specific tasks such as the use of online learning and learning management systems (Chigwada, 2020), require a learning environment that can foster understanding their own activity as learners. Thus, usability is related to the effective and efficient accomplishment of learning-related tasks or goals as experienced by the 21st century students in the online environment, either with or without the use of specified learning tools (Nambisan, 2010).

In the specific context of MOOCs, according to Hew et al. (2020), successful implementation of a MOOC is defined as the extent of student satisfaction with the course. Totschnig et al. (2013) explained that a usable MOOC platform provides intuitive and useful tools for content editing and structuring while, at the same time, its use encourages learners, maintains a familiar environment for them, and reduces the cognitive learning load involved. Studies in the literature provided empirical evidence pertaining to the usability of MOOCs. For instance, a study by Yusoff and Sulaiman (2017) utilized the enhanced problem-solving model to measure the usability of MOOC by adapting the problem-solving videos in the platform. In another study, an empirical investigation was done to identify how various factors, including content, navigation, learning and support, accessibility, interactivity, and self-assessment and learnability could affect student motivation to learn in a MOOC (Deshpande & Chukhlomin, 2017).

While the benefits of MOOCs have been widely discussed in the literature, several scholars also reported some issues and challenges related to the usability aspect of MOOCs. For example, Hasan (2014) evaluated the usability of educational websites among students in a Jordanian university and observed that there was dissatisfaction among the students with regards to the design, although they were satisfied with the content and navigation (ease of use) of the tested websites. In another study, two main conclusions related to challenges in the usability of MOOCs were drawn: "firstly, there is a surprising difference in how users perceive and approach the MOOCs, and secondly, MOOCs do need their own usability checklist" (Frolov & Johansson, 2014, p. 28).

With so much focus given to MOOCs by educational providers and practitioners around the world, their phenomenal development and implementation in higher education has not been examined thoroughly in Malaysia. In fact, MOOCs are considered a very recent development in Malaysia (Fadzil et al., 2015), and another recent study highlighted the need to further explore factors contributing to student readiness for MOOCs (Subramaniam et al., 2019). Although the courses are offered for free and bring advantages for students' learning, there is still a limited number of students who fully utilized the system (Mohamad & Irwan Abdul Rahim, 2018). Furthermore, while the literature on the implementation of MOOC-OpenLearning in Malaysia has been scarce, the aspect of its usability has yet to receive much attention.

Taking the above needs into consideration, this paper addresses the current gap in the research pertaining to the usability of MOOC-OpenLearning in supporting undergraduates' learning from the Malaysian perspective. Emerging issues and ways forward to integrate MOOC-OpenLearning are also further discussed.

METHODOLOGY

This study employed the quantitative method through the online survey approach. One of

the major strengths of online surveys is time efficiency whereby researchers can reach out to potential respondents without time constraint and geographical barriers; at the same time, they can acquire the data the instant responses are submitted by respondents (Park et al., 2019).

Population and Sampling

The population of this study was undergraduate students from UTHM. It was reported by the MOE that the total student enrolment in UTHM at the end of 2018 was 17,862 students. The sampling method used for the respondents was convenience sampling whereby the online survey was administered via the university's student mailing list in all faculties at the university, and those who were willing to participate answered the survey at their convenience. According to Leiner (2014), convenience sampling is researching those elements of the population that are easily available to the researcher, and ideally, the convenience pool of samples "provides a sufficiently large number of highly motivated respondents from different backgrounds, available on demand and throughout multiple survey waves" (p. 3).

Thus, the convenience sampling approach suited the nature of this study, which was to measure the usability of MOOC-OpenLearning among students at the university with diverse demographic profiles and study background. The respondents' experience in using MOOC-OpenLearning was initially identified in the survey, so these students have considerable prior knowledge and experience in the integration of these online learning tools into their undergraduate courses at the university. The convenience sampling and the online survey approach allowed us to gather responses from respondents who represented undergraduate students in the university from different groups by gender, age, ethnicity, study year, and faculty of study.

Survey Instrument

In order to run the data collection, we adopted the USE questionnaire developed by Lund (2001). The USE questionnaire measures the subjective usability of a product or service. This survey instrument contains 30 close-ended items with a five-point Likert scale evaluating the usability in four dimensions: usefulness, ease of use, ease of learning, and satisfaction. In addition, the USE questionnaire includes the listing of several negative and positive aspects of the product being studied. Apart from the personalized web-based form, the questionnaire is also accessible online from https://garyperlman.com/quest/quest.cgi?form=USE.

Data Collection

Prior to implementing the main study, a pilot study was conducted to confirm the reliability and validity of the survey items. A statistical reliability test was conducted to measure the internal consistency of all usability variables. The results of Cronbach's alpha values were found to be 0.970 (usefulness), 0.984 (ease of use), 0.966 (ease of learning), and 0.978 (satisfaction). All Cronbach's alpha values were higher than 0.9, thus exceeded the conventional minimum of 0.70 for reliability (Nunnally, 1978). Therefore, all variables measuring the usability of MOOCs in this study were deemed to be reliable.

Following this, the finalized survey was disseminated to undergraduate students in UTHM through a Google form. The survey link was sent to the list of student emails and included terms indicating the respondents' consent to participate in the study. No forms of incentive were given to the respondents for their participation in the survey; their participation was on voluntary basis whereby they were given the option to proceed answering the survey only if they are willing to participate. At the end of the data collection, 435 responses were received from a total 1,035 students who undertook the general studies subjects. All of them received the questionnaire via email, and further analyses were done according to the study objectives.

Data Analysis

The statistical software SPSS Statistics was used to organize and analyze the primary data obtained from the survey. Specifically, common descriptive statistics, such as frequencies and means, were calculated for each survey item to provide descriptive information about the respondents' demographic profiles as well as their perceptions on various usability aspects of MOOC-OpenLearning. In addition, Pearson correlation analysis was also run to look for significant relationships between the usability variables.

Table 1. Respondents' Demographic Profiles

	Frequency	Percentage (%)
Gender		
Male	192	44.1
Female	243	55.9
Ethnicity		
Malay	331	76.1
Chinese	61	14.0
Indian	32	7.4
Others	8	1.8
No answer	3	0.7
Age		
under 20	73	16.8
20 to 24	353	81.1
25 to 29	8	1.8
35 and above	1	0.2
Current Year of Study		
One	217	49.9
Two	187	43.0
Three	23	5.3
Four	8	1.8
Faculty of Study		
Civil & Environmental Engineering	91	20.9
Electrical & Electronic Engineering	71	16.3
Mechanical & Manufacturing Engineering	55	12.6
Technical & Vocational Education	21	4.8
Technology Management & Business	50	11.5
Applied Sciences & Technology	3	0.7
Computer Science & Information Technology	86	19.8
Engineering Technology	58	13.3

FINDINGS

Demographic Information

As can be seen from Table 1, the majority of respondents were female (n = 243; 55.9%). In terms of ethnicity, a majority were Malay (n = 331; 76.1%), followed by Chinese (n = 61; 14.0%), Indian (n = 32; 7.4%), and other races (n = 8; 1.2%). As for age, almost all of them (n = 353; 81.1%) were between 20 and 24 years old.

As for study profiles, the largest group was first-year students (n = 217; 49.9%). Only 1.8% (n = 8) were in their fourth year. Regarding study program, the majority of the respondents were studying engineering related courses (n = 275; 63.2%) at the time the study was conducted.

Usability of MOOC—OpenLearning

From the descriptive analysis shown in Table 2, the mean values of all variables ranged from 3.50 to 3.61, with standard deviation values less than 1.0.

Table 2. Descriptive and Reliability Analysis

#	Variables	Summary Statistics		
		No. Of items	Mean	SD
1	Usefulness	8	3.50	.883
2	Ease of Use	11	3.51	.947
3	Ease of Learning	4	3.57	.923
4	Satisfaction	7	3.50	.922

The following describes in detailed the four usability aspects of MOOC-OpenLearning, which are usefulness, ease of use, ease of learning, and satisfaction.

a) Usefulness

Table 3 indicates the descriptive results for the usefulness items. The overall mean of 3.50 suggests that respondents generally had a moderate positive perception about the usefulness of MOOC-OpenLearning in supporting their learning. Most of them (61.9%) agreed that MOOC is useful. More than 50% also supported that MOOC saves them time when using it (mean = 3.58), makes things to be accomplished easier to get done (mean = 3.54), and helps them to learn more effectively (mean = 3.50). However, less than 50% supported the usefulness of MOOC in other aspects, such as in helping them to be more productive (mean = 3.49) and giving them control over own activities in their life (mean = 3.44). Many respondents moderately agreed that MOOC meets their need (mean = 3.41) and does everything as they expected (mean = 3.40). Furthermore, based on the mean distribution, a large percentage of respondents were neutral and thus uncertain about the usefulness of MOOC-OpenLearning in all aspects.

b) Ease of Use

Next, the respondents were asked about the ease of use in using MOOC-OpenLearning, and the descriptive results are shown in Table 4.

Table 3. Descriptive Statistics for Usefulness Items

#	Items (Overall mean=3.50, SD=.883)	% of Agreement	% of Disagreement	Mean	SD
1	It helps me to learn more effectively.	53.1	9.2	3.50	.927
2	It helps me be more productive.	49.4	9.9	3.49	.958
3	It is useful.	61.9	7.8	3.67	.977
4	It gives me more control over the activities in my life.	48.1	11.3	3.44	.976
5	It makes the things I want to accomplish easier to get done.	54.7	9.4	3.54	.965
6	It saves me time when I use it.	56.1	11.3	3.58	1.040
7	It meets my needs.	45.0	12.0	3.41	.957
8	It does everything I would expect it to do.	44.4	12.2	3.40	.963

Table 4. Descriptive Statistics for Ease of Use Items

#	Items (Overall mean=3.51, SD=.947)	% of Agreement	% of Disagreement	Mean	SD
1	It is easy to use.	57.5	11.0	3.59	1.026
2	It is simple to use.	58.2	9.9	3.61	1.031
3	It is user friendly.	54.5	11.5	3.55	1.029
4	It requires the fewest steps possible to accomplish what I want to do with it.	50.6	10.8	3.49	.987
5	It is flexible.	53.6	10.8	3.53	1.023
6	Using it is effortless.	56.1	11.5	3.57	1.024
7	I can use it without written instructions.	49.4	13.3	3.46	1.043
8	I don't notice any inconsistencies as I use it.	46.9	12.2	3.42	1.011
9	Both occasional and regular users would like it.	48.5	12.4	3.44	1.017
10	I can recover from mistakes quickly and easily.	48.7	12.6	3.44	1.006
11	I can use it successfully every time.	49.7	12.2	3.48	1.023

There was a moderate positive perception among respondents about the ease of use in using the MOOC-OpenLearning. More than 50% of them agreed that MOOC is simple and easy to use (mean =3.61 and 3.59 respectively), effortless in usage (mean = 3.57), user friendly (mean = 3.55), flexible (mean = 3.53), and requires the fewest steps possible to accomplish tasks (mean 3.49). Yet, more than 50% of them also found that MOOC is not an easy task for several aspects, such as to recover from mistakes quickly and easily (mean = 3.44), to use it without written instruction (mean = 3.46), and to use it successfully every time (mean = 3.48). Based on the percentage distribution for all items, many respondents seemed undecided about the ease of use of MOOC-OpenLearning.

c) Ease of Learning

The aspects summarized in Table 5 indicated respondents' feedback about the ease of learning through MOOC-OpenLearning. Generally, the overall mean of 3.57 suggests respondents' moderate positive perception about this usability aspect. More than 50% of total respondents agreed that it is easy for them to learn using MOOC (mean = 3.61). A larger group also supported that they learned to use MOOC quickly (mean = 3.56), easily remember how to use it (mean = 3.55), and thus quickly became skilful with the learning applications (mean = 3.55). However, similar to the previous aspects, the percentage distributions also revealed that many respondents were neutral about whether or not they find MOOC as easy to be learned.

Table 5. Descriptive Statistics for Ease of Learning Items

#	Items (Overall mean=3.57, SD=.923)	% of Agreement	% of Disagreement	Mean	SD
1	I learned to use it quickly.	53.8	9.9	3.56	.973
2	I easily remember how to use it.	53.6	10.8	3.55	.972
3	It is easy to learn to use it.	57.0	8.5	3.61	.964
4	I quickly became skilful with it.	52.7	10.6	3.55	.967

Table 6. Descriptive Statistics for Satisfaction Items

#	Items (Overall mean=3.5, SD=.922)	% of Agreement	% of Disagreement	Mean	SD
1	I am satisfied with it.	52.4	10.3	3.52	.996
2	I would recommend it to a friend.	50.8	11.0	3.51	.985
3	It is fun to use.	49.4	10.3	3.48	.970
4	It works the way I want it to work.	47.3	11.5	3.46	.967
5	It is wonderful.	51.3	10.8	3.50	.992
6	I feel I need to use it.	50.1	11.7	3.49	.985
7	It is pleasant to use.	53.1	10.3	3.54	.975

Table 7: Correlation analyses between all variables

Components	Usefulness	Ease of Use	Ease of Learning	Satisfaction
Usefulness	1			
Ease of Use	.885**	1		
Ease of Learning	.809**	.838**	1	
Satisfaction	.790**	.849**	.823**	1

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

Table 8: Respondents' Comments and Suggestions

#	Themes	Examples of Respondents' Comments/ Suggestions
1.	Improve ease of use	"make a better and stable platform" "make the interface easier" "improve in searching group subject" "better if the usage of the platform is consistent, too many platforms are messy."
2.	Add more applications	"make games based on learning topics" "include more exercises" "more information videos" "add more interactive ways" "add simple notes and examples of questions"
3.	Improve ease of learning	"There is a need to set timing in MOOC for students to complete their work" "it would be better to have it with online or one-to-one explanation"
4.	Integrate with other platforms	"combine SMAP (Student Academic Information System) and MOOC" "Make it more convenient, such as mobile application"
5.	Make effective contents	"need to simplify the MOOC content" "make it more interesting to read"
6.	Improve accessibility	"build a platform that can works offline" "make it as an application so that it is easier to use without having to navigate the web"

d) Satisfaction

The final aspect of usability in the survey is related to respondents' satisfaction towards the use of MOOC-OpenLearning throughout their study in the university. Again, respondents generally felt moderately satisfied about the use of OpenLearning applications (overall mean = 3.5). Specifically, a majority of respondents agreed that MOOC is pleasant to use and wonderful (mean = 3.54 and 3.50 respectively), and they felt satisfied with it (mean = 3.52). Around 50% also agreed that they would recommend MOOC to their friends (mean = 3.51). Nevertheless, around 50% or less felt that they need to use MOOC (mean = 3.49). While less than 50% found that MOOC is fun to use (mean = 3.48) and works the way they wanted it to work (mean = 3.46), a large number of respondents were still neutral or undecided about their satisfaction in using MOOC throughout their study.

e) Correlation Analyses

Pearson correlation analyses were used to study whether there is a significant relationship between each variable in this study. Results from the analyses are summarised in Table 7. The results confirmed that there were significant positive relationships (at 0.01 confidence level) among all usability variables. Respondents' satisfaction was significantly correlated to their perception about the usefulness, ease of use, and ease of learning of MOOC-OpenLearning.

f) Comments and Suggestions for Improvement

In addition to the above, an open-ended question in the survey sought respondents' comments and suggestions about how the use of MOOC-OpenLearning can be improved at their university. Table 8 summarised the themes identified and the related comments by the respondents. Generally, the respondents suggested that the use of MOOCs can be improved in terms of ease of use, variety of learning applications, ease of learning, integration with other platforms (such as online student information system and mobile applications), effectiveness of content, and accessibility.

DISCUSSION

Overall, the study findings indicated that there were moderate positive perceptions among undergraduates in the university with regards to all usability aspects of MOOC-OpenLearning. Furthermore, the respondents seemed to be mostly neutral in responding to all the aspects.

In terms of usefulness, most students agreed that MOOCs are useful in general, but many others seemed to be neutral, particularly on the expected outcomes of their usage. As for the second aspect, ease of use, the majority found that MOOCs are simple, easy to use, user friendly, and flexible, but a significantly large percentage of students also seemed to be undecided about this aspect. Quite similarly, while most respondents mainly agreed on the ease of learning in using MOOCs, many others remained neutral in responding to this aspect. With regards to satisfaction, although the majority agreed on the pleasant and wonderful experience in using MOOCs, many respondents remained neutral about this aspect.

The above findings on moderate positive perceptions among students somewhat corroborate the findings of other studies that looked at various aspects of usability evaluation in the implementation of MOOCs. For instance, a similar study by Ariffin et al. (2021) aimed to identify the students' acceptance in using MOOCs at UTHM. It was reported in the study that the mean values of the four domains of the students' acceptance, namely perceived usefulness, perceived ease of use, user satisfaction, and attribute of usability, were moderate, with perceived ease of use having a higher value compared to the other domains. Likewise, a study by Cole et al. (2014) reported that students rated their online instruction as moderately satisfactory, while hybrid or partially online courses were found to be more satisfactory than fully online ones.

As observed in this study, a large distribution of students indicated neutral responses for most of the usability items. This indicates that there were significant levels of uncertainty among respondents with regard to the usability of MOOC-OpenLearning. This was similarly observed in a study by Manalo (2014) in which the participants of the online course indicated either neutral or positive reactions towards MOOCs with very few strong negative reactions towards its use. Manalo added, the "neutrality of the responses may indicate that the participants neither agreed nor disagreed with the statements because they did not find the course to be applicable to them" (p. 120). Also, a study by Walker (2016) found that while students were satisfied with most modes of instructor-student

communication in online graduate courses, they were somewhat in between satisfied and neutral for other applications.

The undergraduate students' moderate positive perception towards MOOCs-Open Learning as observed in this study indicates that they were not fully aware of its usability, despite acknowledging its potential and benefits for their learning. This suggests the need to bridge respondents' expectation in using the learning applications to their learning needs and preferences, especially in the wake of the global pandemic. According to Kumar and Garg (2020), the major characteristics contributing to the acceptance and usability of digital learning and integration of MOOCs in higher education include awareness, content, context, certification, capability, and strategic execution. The current crisis has made online distance learning the new norm for many and thus MOOCs have become increasingly relevant for the students to benefit from online and blended learning practices in higher education, particularly in terms of getting cheap or free access to education. Many MOOC platforms have now made some of their courses available for free during the pandemic, such as Coursera, which is providing every university impacted by the crisis with free access to their course catalogue through Coursera for Campus (Carolyn, 2020).

As for 21st century learners in particular, the four Skills for Today as identified by the coalition P21 (Partnership for 21st Century Learning) are creativity, critical thinking, communication, and collaboration; these four skills should be overlaid across all curriculum mapping and strategic planning as an integral part of every lesson (Driscoll, 2016). In line with this need, according to Gamage et al. (2018), an effective MOOC design with three main principles and characteristics of the pedagogical framework (collaborative, interactive, and networked learning framework) would be able to address the 21st century learning goals. In addition, other current studies reported several benefits related to the usability aspects of MOOCs for today's learners, such as the availability and accessibility of free, rights-cleared teaching and learning resources (Haber, 2020); improved career benefits and job performance (Impey, 2020); and online readiness via quality open access resources (Kerr, 2020).

In terms of correlation analysis, Lund (2001) noted that if there is an increase in the rating for ease of use, then the rating of usefulness improves and vice versa. Correlation test results in this study provided evidence supporting Lund's suggestion that the four usability variables have a strong correlation with each other. These significant correlations suggest the importance to consider the intervariable relationships in improving the students' perceived usability of MOOCs. This result is similarly noted in prior research suggesting the effects of usability variables on one another. For instance, while studying the usability of elearning using the USE Questionnaire, Sidhawara et al. (2018) found that Spearman's correlation coefficients for usefulness of the four other variables were of high value, and significance number was less than 0.05. In another study looking at the usability of web-based student grade processing information systems, Hendra and Yulyani Ariffin (2018) observed that usefulness, ease of use, and ease of learning variables influenced the satisfaction variable significantly.

In addition to the above, several issues have emerged based on this study findings:

- Usefulness: many respondents did not find MOOCs useful in helping them to be more productive, supporting their independence in own daily activities, and addressing their learning needs and expectation.
- Ease of use: many of them also did not find it easy to use a MOOC for several aspects, such as to recover from mistakes easily and quickly, to use it without written instruction, and to use it successfully every time.
- Ease of learning: respondents were mainly neutral about whether or not they found MOOCs easy to learn.
- Satisfaction: Areas that many respondents felt less satisfied with include the need to use a MOOC, its fun aspect, as well as its efficacy as required by students.

Therefore, the above findings suggest that there are several usability issues in the implementation of MOOCs-OpenLearning at the university, and these include the aspects of self-learning needs and expectation, supports in using the applications, as well as learning motivation and efficacy. According to Yousef et al. (2015), there are several limitations of MOOCs that present barriers to learners, such as

the limitation of a teacher-centered and centralized learning model, the lack of effective assessment and feedback, the lack of interactivity between learners and the video content, and the diversity of MOOC participants.

Like other online learning tools and applications, the implementation of MOOCs, particularly during the current crisis, is not without certain challenges and limitations. The challenges based on several current studies include the issues of equity of access (Haber, 2020), low penetration of MOOC awareness, nonuniformity of the information among students, and teachers' role in dealing with such issues (Kumar & Garg, 2020). Several earlier studies also highlighted issues and challenges related to the usability of MOOCs in various educational settings. In an exploratory study by Aharony and Bar-Ilan (2016), it was observed that students have different needs and expectations when it comes to adopting MOOCs in their learning process. Thus, the authors highlighted the needs for MOOC platforms to provide multiple options to accommodate the students' needs. In another study, the issue of MOOC usability was highlighted as one of the aspects that causes various problems to teaching assistants and hinders effective support to learners and consequently affects the learners' experience (Ntourmas et al., 2019). With regards to students' satisfaction, Ariffin et al. (2021) found in their study that while some students were not confident in using the MOOC applications, others were worried about having a low level of motivation.

Considering the issues and challenges identified, the following five recommendations are made regarding how the design aspects of MOOCs can be further improved from the perspective of higher education students in Malaysia:

Convenience of Usage

MOOCs should be easy to use. The interfaces and applications should not be too complex. Rather the MOOC needs to be user-friendly and familiar enough for students of all levels to navigate. It should assist students to learn independently at their own path without having to rely on instructions and guidance. Relevant information and communications technology skills are important for the effective use of MOOCs, and therefore instructors and learning providers must ensure that the necessary trainings and guidelines are provided for students who lack of these skills (Fianu et al., 2018). Immediacy is also an important quality that determines the 21st century students' convenience in using MOOCs. As stated by Oblinger and Oblinger (2005), these digital natives are used to receiving information fast, prefer to parallel process and multitask, and thrive on immediate gratification.

Attractiveness and Interactivity

MOOCs should be attractive and interactive to motivate and ignite students' interest in the courses. According to Ngadiman and Sulaiman (2017), an attractive web-based application not only ensures its ease of use and user satisfaction, but it also makes it easy to be understood and save time learning and completing a particular task. This can be achieved using interactive learning applications and gamification of the platform, such as quizzes, rewards, and badges. These seem more appealing to the students, especially the 21st century learners, than using merely textual and graphical information. Gamage et al. (2018) proposed a facilitator-driven group learning pedagogy inspired by cMOOCs and similarly highlighted the need to increase interactivity and collaboration in meeting the 21st century goals. As noted by the authors, a stimulating situation for such learning condition is where a known group of students will discuss, cocreate, and think-aloud about the content they learn through a MOOC.

Convenience for Learning

A good MOOC learning experience is where it can improve both students' learning experience and outcomes. There should be the necessary supports in the learning applications for students to gain an understanding of the learned subjects. Using MOOCs would make students more productive in learning, support them in their self-learning path, and address their learning needs and expectation. Moore (2014) explained that one of the dimensions to be considered in a usable learning application is the quality of learning where lessons are well-organized and encourage both interaction and self-reflection, and the learning feedback should also be available and helpful. A student-centered approach is an essential part of the 21st century learning through which learners need to "learn how to learn" on their own, i.e., be able to acquire new information as problems arise, connect the new information with existing knowledge,

and thus apply it to solving the problem at hand (Nichols, 2019).

Content Effectiveness

Effective contents are helpful not only for students to obtain understandings but also for their learning reinforcement. One way to design effective content for MOOCs is through microlearning, or short bits of learning, which is one type of instruction that suits the nature of online learning, especially when it involves large informal online classes (Pressbooks, n.d.). Through microlearning, curricular content is broken into shorter chunks of content, or microcontent, and it can be in the forms of text-based content or multimedia-based content. It would be easier for students to focus on certain information and decide what content they want to learn at a time rather than focusing on the course as a whole (Pressbooks, n.d.). In addition, the new generation of digital tools allows today's 21st century learners to become generators of content instead of passive consumers of knowledge (Scott, 2015). Thus, the students would value the availability of user-generated content through online platforms and tools such as social networking sites, blogs, wikis, and video-sharing sites (Scott, 2015).

Flexibility and Accessibility

The 21st century learner needs learning environments that embrace the variety of places, ideas, and people as required by today's modern world, and thus reflects a flexibility in terms of space, time, people, and technology (Machado, n.d.). The massive and open nature of MOOCs means that students of all backgrounds and levels would be joining the class. Therefore, MOOCs should be flexible and inclusive to meet the accessibility needs of diverse learners. One way to do this is by integrating MOOCs with other platforms and applications, such as computer-based and mobile-based tools and applications. Sharples et al. (2014) listed three features of mobile and ubiquitous technologies that contribute to enhance students' MOOC learning experience, which are "always with you," "sensor pack," and "connectivity." In addition, MOOCs should also provide supports for both online and offline learning modes to allow students to learn flexibly anytime and anywhere, especially those who lack internet accessibility. For instance, the availability of downloading features for video applications provides offline learning support for students to watch the lecture without depending on the network connection (Goel & Chauhan, 2015).

CONCLUSION

In conclusion, the findings demonstrate that there are moderate positive perceptions and significant levels of uncertainties among the undergraduate students in the university with regards to the usability of MOOCs in supporting their learning. While a majority agree that MOOC-OpenLearning is useful, easy to use, easy to learn, and satisfying in several aspects of learning, many others are neutral on whether or not the online courses are good in several areas of usability. Therefore, this study's findings suggest the need to explore the possible factors leading to the significant level of doubts among students and what further actions could be taken in order to enhance MOOCs learning experience in higher education institutions.

This study has put forward the importance of considering usability as the key element, particularly for the university management and academics, in implementing certain learning intervention aimed to enhance students' learning outcomes and experiences in the 21st century learning environment. Most importantly, five key elements are proposed based on the study findings with regards to how the usability of MOOCs can be improved: (a) convenience of usage, (b) attractiveness and interactivity, (c) convenience for learning, (d) content effectiveness, and (e) flexibility and accessibility. The findings obtained also provide the basis for future similar research focusing on the implementation of MOOCs in a blended teaching-learning approach to course offerings in any higher education setting.

The study findings should also be considered in the light of several limitations. First, this study only explored the usability of MOOC OpenLearning applications by involving respondents from one public university only. Thus, the findings cannot be generalized to represent the whole population of undergraduate students in Malaysia. Furthermore, due to the limitation of the sampling and online survey method, the distribution of study samples was unrepresentative by study years. The most obvious drawback of convenience sampling is the risk of sampling bias, which may lead to the

distribution of samples that does not represent the entire population being studied (explorable.com, 2009). Secondly, this study did not investigate in detail the usability aspect of MOOC-OpenLearning applications from a more qualitative perspective, such as through interviews, which may enrich the data obtained. Finally, other usability aspects of a learning application, such as efficiency, remain unexplored in this study.

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