Student Readiness Factors for Online Distance Learning among Malaysian Public Universities during COVID-19: A Conceptual Model

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Abstract: Students' academic performance will be positively affected by their readiness to learn. This study investigated the association between university students' learning readiness variables and academic achievement. Therefore, the purpose of this study is to identify student readiness factors that influence students' academic performance and to propose a conceptual model that will improve students' academic performance in the ODL system. A set of self-administered questionnaires were distributed to 233 students attending public higher education institutions using a quantitative research approach. Using the Structural Equation Modelling (SEM) technique, the student's readiness was determined by investigating the cause-and-effect relationship between three readiness factors: (i) Efforts Expectancy (EE), (ii) Attitudes (ATT), and (iii) Facilitating Conditions (FC), towards the Performance Expectancy (PE) factor. The results suggested that Facilitating Conditions (FC) is the most influential readiness component and has a significant impact on students' learning acceptance, which directly increases their learning achievement. With great optimism, it is hoped that this study will aid MOHE and university decision-makers in gaining an understanding of the critical factors that drive the online distance learning (ODL) system. Implementing the proposed conceptual model will thereby simplify the acceptance of the system.

Keywords: Online Distance Learning, Student readiness, Higher Education in COVID-19, Conceptual model of ODL implementation

1. Introduction

The COVID-19 epidemic has changed our lives in less than two years. We are now in the period of what our former prime minister, Tan Sri Muhyiddin Yassin, has dubbed the "new normality." According to him, Malaysians should anticipate dramatic changes to their way of life that would last for months, if not years. The general public was advised to accept a new normality because the fight against COVID-19 is far from over (Shah et al., 2020). In the realm of education, notably at all public

and private universities, there are no exceptions. No face-to-face instruction is permitted until December 31, 2020, according to a directive from the Ministry of Higher Education (MOHE), which applies to all Malaysian higher education institutions (Chung, Subramaniam, & Dass, 2020).

All higher education institutions (HEIs) were urged to take a leading part in the adoption of technologies in education by the Ministry of Higher Education (MOHE). Implementing blended learning (Anthony et al., 2020; Farahiza Zaihan Azizan, 2010), e-learning (Al-Rahmi, Othman, & Yusuf, 2015; Nour Awni Albelbisi & Yusop, 2020), and mobile learning are some of the initiatives of the Ministry of Higher Education (MOHE) (Mohammad, 2017; Qureshi, Khan, Ahmad Hassan Gillani, & Raza, 2020). As a result, we can see that most higher education institutions in Malaysia are already struggling to embrace online distance learning in this new era of teaching and learning environments (ODL).

Online distance learning is a type of virtual instruction that uses the Internet and digital technologies to connect teachers and students through computer communication (Khairuddin & Khairuddin, 2020). According to Engin (2017), this kind of virtual learning can be viewed as a process of self-knowledge, self-efficacy, and self-learning. It is believed that pupils have more learning flexibility and have the freedom to select the material to access and the classification scheme for that knowledge. Students can interact digitally with their friends and teachers while keeping track of their academic achievement and course schedules.

However, the switch from a traditional face-to-face classroom to a virtual one powered by computers has created a wide range of radical and complex learning issues. Due to the abrupt move to e-learning, students have trouble adapting. access to cellphones, browsers, and operating systems that are incompatible. Since technology has such a strong hold over online learning, it might hinder teacher-student engagement and foster a sense of isolation.

Additionally, Markova, Glazkova, and Zaborova (2017) believe that motivation is a crucial component of the distant learning process due to the largely self-directed nature of online education programmes. They also mentioned the importance of motivation since, when students are highly motivated in an online course, they occasionally manage to overcome all the difficulties. Keskin & Yurdugül (2020) argued that social skills, knowledge, physical likelihood, and personality traits of students are other intrinsic factors that are important in preparing for and overcoming challenges in the ODL classes in addition to the motivational factor as an influential factor for the success of online learning. Researchers like Xu, Chen, and Chen (2020) contend that the quality and quantity of students' psychological states during online classes can be used to predict how well they will learn. This is another challenge for the adoption of the ODL, according to these researchers. As a result, it is anticipated that teachers and students would encounter a variety of obstacles when implementing the ODL because this psychological factor may have an effect on the teaching and learning processes as well as students' performance (A. Patricia Aguilera-Hermida, 2020).

It is interesting to note that Borotis and Poulymenakou (as cited in Engine, 2017) have emphasised the importance of students' preparedness for the ODL environment, which can have a significant effect on their performance. Hamzah et al., 2020, also discovered that students' preparedness is the most essential aspect for blended learning to be successful. Being physically and intellectually prepared for some online learning experiences and actions is regarded as readiness for online learning. Student readiness, according to Bloom (as cited in Engine, 2017), is crucial to the education-instruction process and significantly affects the learning-education and performance system. The degree of preparation for the learning process, which can vary from student to student, is likely to be indicated by a significant change in the student's learning behaviour, he added. The environment of ODL is influenced by a variety of elements that affect student preparation.

The purpose of the study is to identify the aspect of student readiness that has the greatest impact on students' performance in the ODL system. In addition, the study will propose a conceptual framework that will offer novel insights into how to facilitate students' preparatory variables and improve students' academic accomplishment in the ODL system.

2. Methodology

2.1 Data and Preliminary Study

This study will employ a quantitative research approach. This study's objectives were accomplished using the structural equation modelling (SEM) technique. A statistical technique known as structural equation modelling (SEM) is utilised to quantify and investigate the linear causal relationship between variables, while concurrently accounting for measurement error and index fitness. SEM was chosen above other methods, such as the regression approach, because it can manage latent variables simultaneously. Students from a public university who used the ODL system during the COVID-19 pandemic onslaught make up the study sample. Figure 1 shows the research methodology stages.

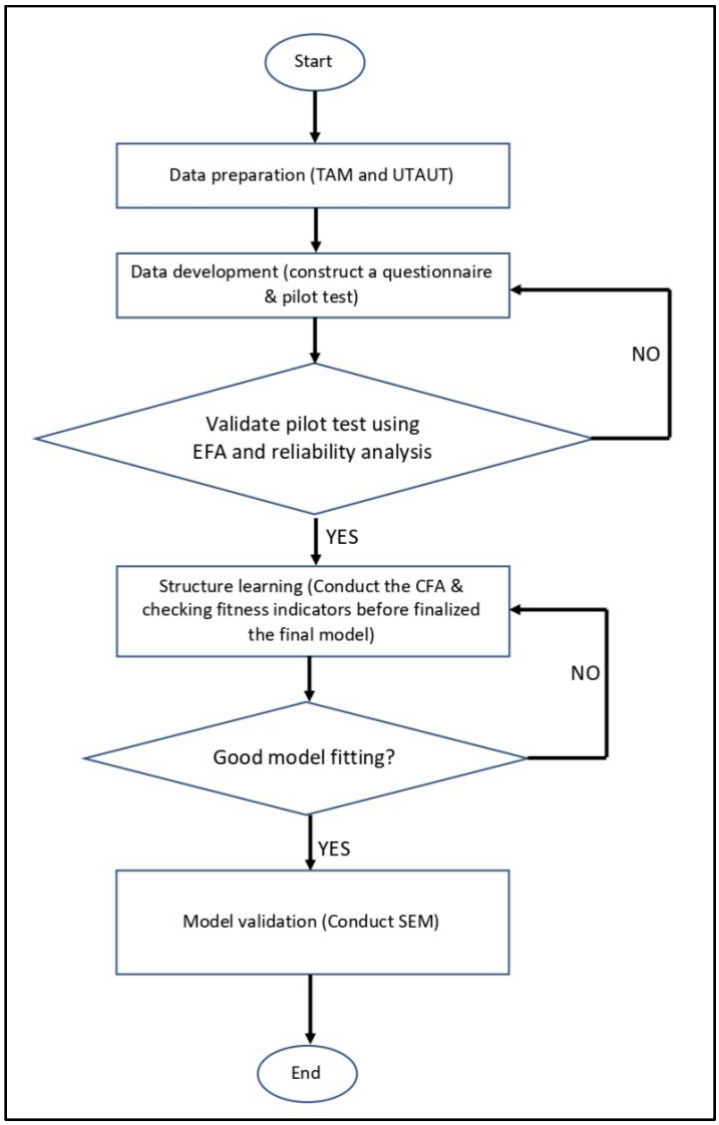

Fig. 1 Research methodology stages

2.2 Data Collection Method

The four steps of the study research procedure were as follows. The efficacy of the ODL system during the pandemic onslaught Covid-19 served as the basis for the first phase. A small sample of respondents (23 students utilizing the ODL approach) were given the questionnaire before it was used to make sure there were no semantic problems. On the basis of the feedback collected, ambiguity and

imprecision, such as question clarification, instrument length, content completeness, and structure, were resolved.

In the second stage, a pilot study in May 2020 used the pre-test procedure to test the instrument. An exploratory factor analysis (EFA) was conducted after the test was completed to examine the items (questions) and dimensions between variables (factors) and responses. EFAs are used to choose the items to measure the constructs and evaluate reliability. The final stage involved conducting the questionnaire as a web-based survey between June and July 2020 once all pertinent tests had been completed and verified. The convenience sampling technique was then applied in this investigation.

Social media platforms like Facebook, WhatsApp, and Telegram were used to distribute a web-based survey questionnaire. There were 260 respondents that returned the questionnaire via the online survey. Due to invalid responses, 27 respondents were disqualified, leaving 233 respondents (a response rate of 10.38%) for empirical analysis. The readiness of online distance learning (ODL) among students from Malaysian public institutions during the Covid-19 worldwide pandemic was assessed using a questionnaire. Table 1 displays the responses' demographic findings.

Table 1. Descriptive analysis

Item	**Number of Items N=233**	**Percentage (%)**
Gender		
Female	125	53.6
Male	108	46.4
Study place		
IPTA	214	91.8
IPTS	19	8.2
Experience using Internet		
No	3	1.3
Yes	230	98.7
Are you familiar with ODL		
No	46	19.7
Not sure	44	18.9
Yes	143	61.4

2.3 Measurement Development

The characteristics and interrelationships indicated for the student readiness to implement online distant learning were evaluated in this study using a structured web-based questionnaire (ODL). The survey was created by adapting the questions from a number of other surveys (Mousa, Aldeen, Nasir, & Hamdi, 2020; Sarkam, 2019a). The factors that are suggested in this study are effort expectancy, attitude, performance expectancy, social influence, and facilitating conditions. Table 2 provides a description of each factor. 47 items served as the basis for the survey. The questionnaire was divided into two sections: demographic and student readiness factors. A Likert scale of ten points was employed from strongly disagree (1) to strongly agree (10).

Table 2. Description of student's readiness factors

Factor	Description
Effort expectancy	Level of ease associated to the use of ODL
Attitude	To what extent did students' emotions, beliefs, and behaviour influence them during ODL deployment?
Performance expectancy	The student has confidence that deploying ODL will help him or her to improve and achieve high performance.
Social influence	The extent to which each student feels that their close relationships, such as their family and friends, support their decision to keep utilizing the ODL system
Facilitating conditions	How much the building/devices and accessibility to amenities serve as a bridge for performance achievement when using ODL

Sources from TAM (Davis, 1989); (Venkatesh, Morris, Davis, & Davis, 2003)

These factors are based on the Technology Acceptance Model (TAM) and the Unified Theory of Technology Acceptance and Technology Use (UTAUT) models, which are widely used and widely accepted in e-learning studies (Mousa et al., 2020; Rohayani, Kurniabudi, & Sharipuddin, 2015); blended learning (Sarkam, 2019a); mobile learning (Azam & Bhatti, 2020) as well as ODL (Mtebe & Raisamo, 2014; Razak, Shariffuddin, Padil, & Hanafi, 2017; Samat, Awang, Hussin, & Nawi, 2020), user acceptance and readiness studies. Four elements from the UTAUT model were used in this study: effort expectancy, facilitating conditions, performance expectancy, and social influence. The attitude instrument from the TAM model was used to complement these elements because it has been established that the attitude of university students as an individual has a significant impact on how well e-learning works (Mousa et al., 2020). Figure 2 displays the framework for developing the factor measurements used in this investigation. Then, we design a new framework with these components that can change based on how prepared students are for the ODL.

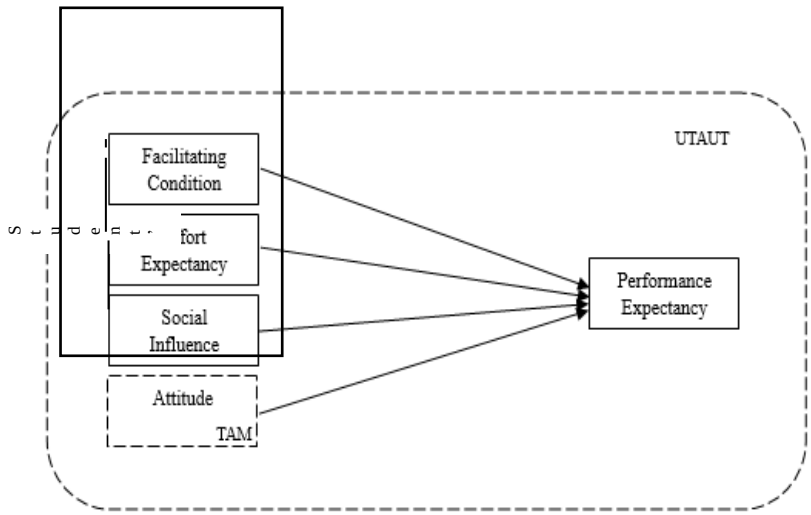

Fig. 2 Student's readiness factors measurement development frameworks for ODL

2.4 Measurement Model

Confirmatory factor analysis (CFA), a method for validating measurement models, is used to examine structural equation modelling (SEM). Each construction's indication is specified using the measurement model, and each construct's dependability in estimating the causal link is evaluated. In terms of reliability, the average variance extracted and composite reliability (CR) must both be satisfied

(AVE). To do this, a CR value of 0.6 and an AVE value of 0.5 are needed (Awang, 2015).

However, one of the needs is the fitness indexes. Once the components are placed in the model, it provides information for measurement (Ramli, Talib, Hassan, & Manaf, 2020). The model can accommodate the appropriate cut-off values from each category. Table 3 demonstrates the fitness indexes and cut-off values.

Table 3. The fitness indexes

Name of Index	Level of Acceptance
Root Mean Square of Error Approximation (RMSEA)	RMSEA < 0.1
Goodness of Fit Index (GFI)	GFI > 0.85
Comparative Fit Index (CFI)	CFI > 0.85

Sources from (Awang, 2015)

2.5 Structural Model Development

After reporting the unidimensionality, validity, and reliability of all study components, the next step is to include these constructs into a structural model for analysis using structural equation modelling (SEM). The structural model is a set of one or more interdependence links connecting the hypothesised model's construct to the structural model.

3. Results and Discussion

3.1 Measurement Model Analysis

The reliability test was undertaken to assess the consistency of the study questions. Cronbach's alpha was utilized to perform the analysis of reliability. Using the Cronbach alpha reliability coefficient, the internal consistency of each instrument has been estimated.

The results of Cronbach's alpha coefficient for all variables are shown in Table 4. Effort expectation (= 0.910), Attitude (= 0.957), Performance expectation (= 0.959), Social influence (= 0.772), and Facilitating condition (= 0.907) comprise the Cronbach alpha coefficient for all variables (= 0.976). Here, the result of the reliability analysis for this study is satisfactory, demonstrating that the questionnaire items are dependable.

Table 4. Cronbach alpha coefficient

Item	Number of Items	Cronbach alpha, α n=233
Overall	**47**	**0.976**
Effort Expectancy	8	0.910
Attitude	20	0.957
Performance Expectancy	8	0.959
Social Influence	4	0.772
Facilitating Conditions	7	0.907

Using the final indicators of exploratory factor analysis, AMOS was adopted to create the first ODL measurement model (EFA). To integrate the student readiness level in the ODL system, a new ODL measurement model was created and dubbed the ODL students' readiness measurement model. This analysis seeks to validate the latent constructs and establish that the data for each category is sufficient. This step occurs after the EPT satisfies the criterion and is known as confirmatory factor analysis (CFA). CFA approaches can assess reliability and validity, discriminant validity, and measures of fitness. Based on the CFA results presented in Table 5, it was determined that social influence does not belong in this study. This is owing to the fact that only two of the four elements (questionnaire

questions) of the Social Influence factor were consistent with the development of the SEM instrument. According to (Awang, 2015), unsatisfactory factor loading (factor loading value less than 0.6) should be eliminated from the model. Due to the fact that Attitude (2,3,5,11,14, and 18), Performance Expectancy (5 and 6), Effort Expectancy (2 and 3), and Facilitating Condition (1 and 2) did not match the requirement, they have been removed from the model. In addition, the Social Influence factor cannot be considered a latent variable because of the remaining elements. This is due to the fact that the minimum necessary item count for latent variables must be more than two. Thus, the Social Influence element has been removed from the readiness measurement model for ODL pupils.

Table 5. Factor loading coefficient for item reliability during CFA

Factor	Items	Reliability	Validity (>0.6)
Social Influence	**S1_1**	**0.43**	**No**
	S1_2	**0.52**	**No**
	S1_3	0. 84	Yes
	S1_4	0.880	Yes
Attitude	ATT_1	0.751	Yes
	ATT_4	0.755	Yes
	ATT_6	0.725	Yes
	ATT_7	0.640	Yes
	ATT_8	0.609	Yes
	ATT_9	0.828	Yes
	ATT_10	0.861	Yes
	ATT_12	0.703	Yes
	ATT_13	0.793	Yes
	ATT_15	0.702	Yes
	ATT_17	0.672	Yes
	ATT_19	0.794	Yes
Performance Expectancy	PE_1	0.790	Yes
	PE_2	0.930	Yes
	PE_3	0.902	Yes
	PE_4	0.900	Yes
	PE_7	0.728	Yes
	PE_8	0.882	Yes
Effort Expectancy	EE_1	0.805	Yes
	EE_4	0.761	Yes
	EE_5	0.812	Yes
	EE_6	0.875	Yes
	EE_7	0.839	Yes
Facilitating Condition	FC_3	0.612	Yes
	FC_4	0.723	Yes
	FC_5	0.873	Yes
	FC_6	0.742	Yes
	FC_7	0.915	Yes

The results of reliability and validity of composite reliability (CR) and average variance extracted (AVE) after social influence was eliminated from the ODL measurement model are

summarized in Table 6. To determine the minimum value of CR is 0.6 and AVE is 0.5 (Awang, 2015; Sarkam, 2019b). The CRs for the constructs of the final ODL students' readiness measuring model ranged from 0.736 to 0.855, and the AVE ranged from 0.884 to 0.943. Consequently, the ODL students' readiness measurement model passed the convergent validity test. The diagonal value (in bold) represents the square root of the AVE of the corresponding construct, whereas the other values represent the correlation between the respective constructions. When the diagonal bold value exceeds the correlation between variables, discriminant validity is supported for all constructs (Fornell & Larcker, 1981). The internal and external validity of the measuring instrument and scales were established by the unidimensionality, reliability, convergence, and discriminating validity tests. Accordingly, the global model of fitness indexes for the measurement model was estimated. Table 7 displays the results for the fitness indexes. All fitness index indicators are achieved.

Table 6. The ODL students' readiness measurement model validation results

	CR	AVE	Correlation (discriminant validity)			
	> 0.6	> 0.5	EE	ATT	PE	FC
EE	0.818	0.911	**0.954**			
ATT	0.736	0.939	0.554	**0.969**		
PE	0.855	0.943	0.788	0.589	**0.970**	
FC	0.773	0.884	0.835	0.762	0.925	**0.940**

EE=Effort Expectancy; ATT= Attitude; PE=Performance Expectancy; FC= Facilitating Conditions

Table 7. The fitness indexes for ODL students' readiness measurement model

Fit Index	X^2	df	X^2/df	RMSEA	CFI	TLI
Index value	1602.149	582	2.753<5.00	0.093<1.0	0.874>0.85	0.862>0.85

3.2 Structural Model Analysis

Using structural equation modelling, the structural model was developed to simultaneously examine the link between components (SEM). The fitness indexes for the structural model are displayed in Table 8. Results reveal that all fitness index indicators are met. The coefficient of determination R2 suggests that 85.9% of the variance in the performance expectation for students' preparedness can be explained by attitude, enabling factors, and effort expectation.

Table 8. The fitness indexes for measurement model

Fit Index	X^2	Df	X^2/df	RMSEA	CFI	TLI
Index value	1044.929	370	2.824<5.00	0.093<1.0	0.874>0.85	0.862>0.85

The final structural model (Figure 3) illustrates the relationship between all factors (Attitude, Effort Expectancy, and Facilitating Condition) and performance expectation; we refer to this model as the readiness structural model for ODL students. It was determined that the relationship between Facilitating Condition and Effort Expectation (r=0.83, p0.05) was statistically significant and positive. This implies that if the quality of the supporting conditions improves, pupils will exert greater effort in their performance. There is also a moderately significant link between Attitude and Facilitation Condition (r=0.68, p0.05) and Effort expectation (r=0.55, p0.05). This indicates that Facilitating Condition substantially affects Attitude in terms of enhancing student performance. When Facilitating Condition (FC) increases, the student's attitude is positive, and he or she will learn and perform well in the ODL environment. If FC decreases, students' moods and attitude toward the learning process will be negatively affected, and their academic performance in the ODL environment will not improve.

When testing the impact of three components (Facilitating Condition, Effort Expectancy, and Attitude) on Performance Expectancy, it was discovered that Facilitating conditions (=1.315; p0.001) have a substantial impact on Performance Expectancy (PE). This result is consistent with the findings

of (Fornell & Larcker, 1981; Saidi et al., 2021; Samat et al., 2020), which concluded that Facilitating Condition could act as an adoption enabler if adequate resources and facilities were available, and that people can therefore demonstrate favourable attitudes toward the use of virtual lectures. This study has identified the significance of the Facilitating Condition in terms of the physical support offered by the institution, the availability of resources, knowledge of how to utilise the ODL system, and assistance in the event of any problems or emergencies.

As for the EE and Attitude factors, it was determined that they had no bearing on PE. This is as a result of the fact that both the EE (=0.049; p>0.05) and Attitude (result) p values are greater than the standard significance level of 0.05. (Awang, 2015; Sarkam, 2019). These two criteria take into account critical thinking abilities and effective strategies and procedures, requiring the participation of both students and teachers in the learning process. This indicates that these two elements (EE and Attitude factors) cannot alter PE without the physical support of FC, as described in the preceding study.

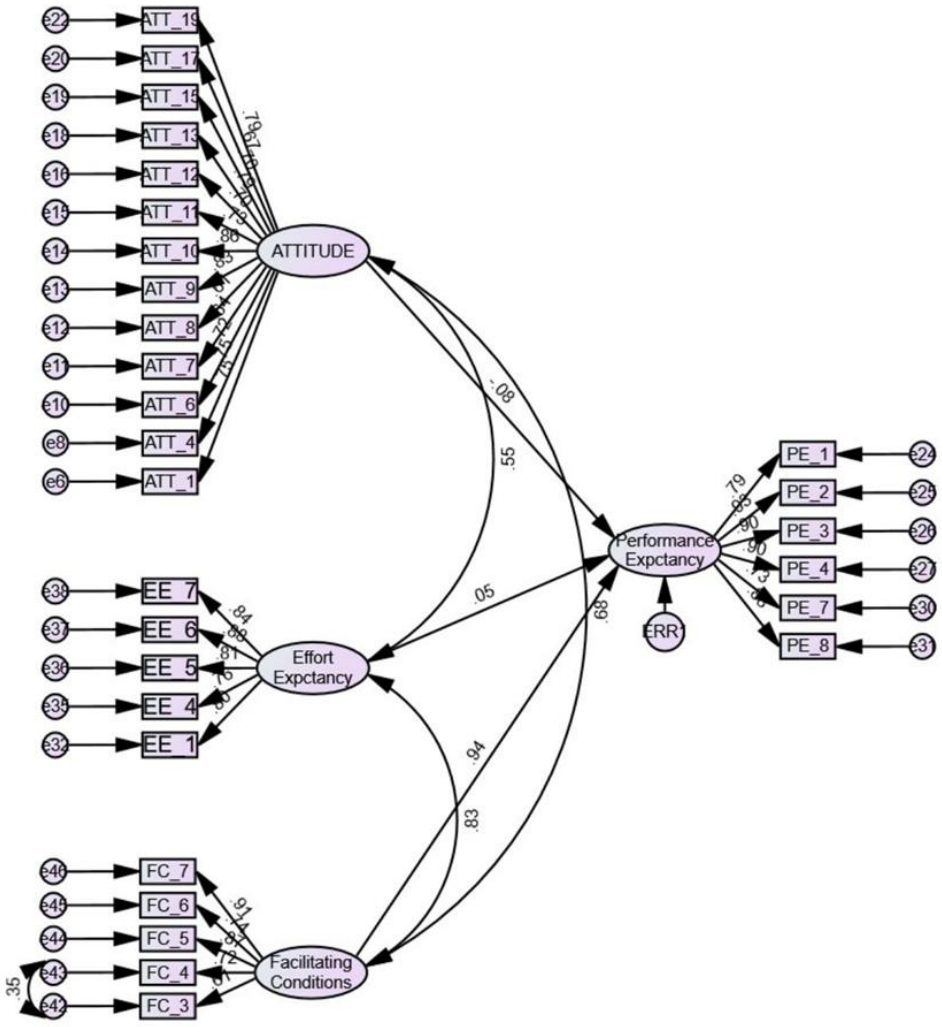

Fig. 3 The Regression path coefficient among constructs in the ODL students' readiness structural model

3.3 ICT Tools Used

As pupils progress towards the IR 4.0 epoch, a fundamental shift prevails. Consequently, it navigates towards the future of the educational ecosystem in a new scenario in which students now value learning via flexibility, voice, connectivity, and others. ICT tools are part of the condition component that facilitates. We conduct a special study of ICT tools due to the technologically demanding nature of online education (Kember, 2007). Once the student's most desired and convenient

platform for implementing the ODL has been identified, a plan and action may be established to enhance the quality of this particular tool in order to improve the implementation of the ODL. Intriguingly, we solicited student comments on their preferred ICT tools utilized in the ODL implementation during Covid-19, with the lowest and maximum number of responses shown in bold in Table 9.

Table 9. Descriptive – Preferred ODL methods

Item	Number of respondents
Post material to student/lecturer using courier service (E.g.: POS Malaysia and J&T service)	37
Telephone call	25
Radio/TV	**2**
Email	75
Social network (E.g.: Facebook, twitter and linkedln)	39
Media sharing networks (E.g.: Instagram, snapchat, youtube and Vimco)	126
Blogging and publishing networks (E.g.: wordpress, wixsite, blog and tumblr)	43
Messaging apps (E.g.: WhatsApp, telegram and Line)	185
Learning management system (E.g.: iLearn, iClass and Google classroom)	**203**
Video Conference Application (E.g.: Google meet, webinar and zoom)	197

The majority of respondents choose to use Learning Management Systems (LMS) such as iLearn, iClass, and Google classrooms for online learning, as shown in Table 9. It conforms to the findings of the study done by (Saidi et al., 2021; Chung et al., 2020). According to the study, the LMS features that allow self-regulated learning in any ODL setting are a result of their availability (Araka, Maina, Gitonga, Oboko, & Kihoro, 2021). As a result of the LMS's support for the majority of the facilitating conditions components, students can communicate with educators and universities to assist them in addressing ODL issues. Learning management system resources are readily accessible. Before COVID-19, the LMS was utilized in blended-learning lessons, so students are comfortable with it. In addition, the LMS allows for flexible participation in the learning session and facilitates the submission of assignments. In other words, the investment of higher education institutions in the provision of high-quality ICT infrastructure, functionality, and modules in the LMS project has been compensated, despite a significantly lower number of radio/television feedback during ODL implementation. However, radio and television continue to be utilized to disseminate knowledge and information to pupils in rural places, even if Internet connectivity is limited or nonexistent.

4. Conclusion and Recommendations

This study discovered that the Learning Management System (LMS) platform, including Google classroom, iLearn, and iClass system, is the most chosen ICT tool for implementing the ODL (Table 9). This online learning tool is meant to enhance students' learning experiences and the formation of their misconceptions about specific subjects. LMS platform may help students retrieve learning information via their course outlines, course syllabus, retrieving and downloading materials for their studies, submitting and uploading their assignments, and as a medium for teachers and students to engage in active engagement. In short, the extensive usage of the LMS platform has a significant impact on students' preparation and performance since the network facilitates connections between teachers and students as well as students and the learning tool.

This study suggests that if the ODL is to be consistently implemented and promoted, the MOHE and higher education institutions should devote funds to improve the enabling conditions at the universities. The report also suggests that MOHE and HEI offer students the chance to acquire their own educational equipment, such as cell phones, laptops, and even desktop PCs, through financial aid, discounts, and rental alternatives. In addition to a desktop computer or laptop at home and school, the smartphone is the most popular ODL device among children, according to our observations. Therefore, students must have access to technical support and equipment that enables them to utilise fundamental

software tools and the Internet for social media (Facebook, Twitter), search engines, web surfing, web videos (such as YouTube), and text chat. As stated earlier, attractive environments, particularly ICT facilities, are a critical aspect of student preparation that can have a substantial impact on academic success in an ODL setting. This research aims to develop a conceptual model of student preparation that can facilitate the ODL system's implementation.

Importantly, the research also revealed that the relationship between three components, namely attitude, effort expectation, and facilitating conditions, has a moderate to strong association to performance expectation in preparing students for ODL. The most influential aspect on the success of pupils in the ODL during the Covid-19 is conducive settings. The Facilitating Condition includes good institutional support, the availability of resources, knowledge of how to use the ODL system, aid during challenges, schedule flexibility, and ICT facilities to enhance the learning outcome. Since Malaysia's higher education institutions are at the forefront of technological adaptation in education and have experience with blended learning, mobile learning, and e-learning prior to the Covid-19 era, these institutions appear to be prepared for full ODL implementation, and the majority of facilitating condition components are effectively managed.

Figure 4 summarises the overall results of this study. It covers in detail the flow of this study's research and the forms of functional actions that can be deployed by the three most relevant student preparation components (EE, Attitude, and FC) to confirm or ensure the attainment of a Performance Expectation (PE) goal.

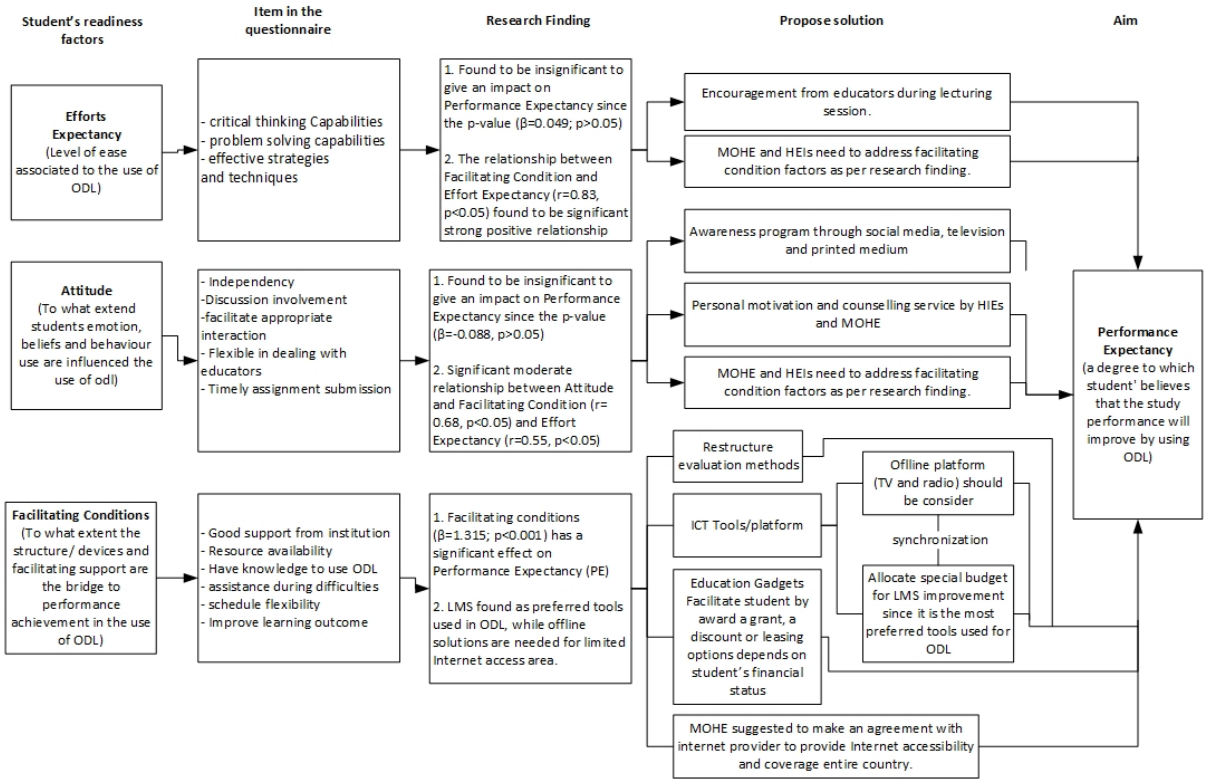

Fig. 4 The research flow of student's readiness factors in ODL implementation

This research will hopefully assist MOHE and higher education institutions to comprehend the student preparation variables necessary for the implementation of the ODL. After Covid-19, it serves as the foundation and reference for enhancing the implementation of the ODL system in Malaysia. It can assist the MOHE, as the driving force and leader of Malaysia's education plan, in establishing a more robust, comprehensive, and successful implementation of the ODL and a thorough course evaluation plan. Once all student readiness factors have been addressed, ODL implementation will be more visible, student performance will improve, and a superior learning outcome will be achieved.

5. Limitation

This study has some limitations that must be addressed for future research possibilities. It is possible to do research on the readiness of instructors and the infrastructure of higher education institutions. Future research should explore if educators have received appropriate training and technological support to determine their readiness to implement the ODL system. In addition, further research is required to determine if the infrastructure of higher education institutions was adequately prepared and managed to support the ODL adoption. Consequently, reflection groups should be considered in order to decrease gaps in the ODL process.

6. Co-Author Contributions

Nur Hasni Nasrudin, Nor Faezah Mohamad Razi, and Rosida Ahmad Junid all contributed to the research's design and implementation, as well as its analysis and writing. The published version of the manuscript was read and approved by all authors.

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