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The influence of online distance learning and digital skills on digital literacy among university students post Covid-19

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Editorial Board

ABSTRACT

Online distance learning policies were formulated and implemented among some Malaysian universities long ago, but their value emerged since COVID-19. Emanating from the diffusion of innovation theory, this study examined the perception of higher education students on the influence and relationship between six independent variables (compatibility, observability, relative advantage, complexity, trialability, and digital skills) and one dependent variable (digital literacy). A total of 524 respondents were sampled, comprising students from six public and private Malaysian universities. The findings from the correlation analysis show a significant positive relationship between the six independent variables and the dependent variable. Meanwhile, in the regression analysis, three of the independent variables (observability, trialability, and digital skill) have a significant and positive effect on digital literacy. This study placed the diffusion of innovation in a specific context that supports designing online distance learning and digital literacy policies.

Keywords: *online distance learning, digital skills, digital literacy, characteristic of innovation, university students.*

INTRODUCTION

Malaysia was one of the countries that implemented online distance learning, especially after the Movement Control Order (MCO) decision by the Malaysian Government (Arandas, Loh & Chiang; 2021; Ayub et al., 2022; Salim et al., 2020). The closure of educational institutions due to the COVID-19 outbreak required a tremendous response and forced them to adopt online learning (Adedoyin & Soykan, 2020; Kamal et al., 2020; Pal, Vanijja & Patra 2020).

The unpredictable scenario of the pandemic caused dramatic changes to the education system and has accelerated online learning methods (Aperribai et al., 2020; Li & Lalani, 2020). Accelerating the digitization of the learning process through distance learning (DL) reduced the effect of closing educational institutions and supported the continuity of the learning process (Amir et al., 2020; Di Pietro et al., 2020; Pal, Vanijja & Patra 2020; Salman, 2021). Due to the infeasibility of traditional classrooms, using programs of distance learning became totally recommended (Samat et al., 2020). This step was necessary to mitigate the sharp influence of the pandemic (United Nations, 2020).

The web-based and online learning platforms became dramatically common. Re-adjusting the preparedness of instructors and learners to tackle the challenges of shifting from offline to online learning has become necessary (Kamal et al., 2020). Albeit the unfavorable pandemic COVID-19 results, it has provided several opportunities for cultural transformation in the educational system (Amir et al., 2020). It has also tested the investment of institutions in online learning and the preparedness to deal with advanced technology to create effective online learning (Mukhtar et al., 2020). Post-COVID-19 pandemic some educational institutions returned to physical classes, while others shifted to blended learning or continued online distance learning.

In the post-COVID era, there were calls for an immediate retreat to physical classes, while other calls were for a shift to online education (Lockee, 2021). Hence, in the post-COVID-19 pandemic, some universities reversed to face-to-face learning while others have maintained or combined, but modified teaching and learning, by implementing blended learning (Jamilah & Fahyuni, 2022; Lockee, 2021). In either case, instructors must consider both the constraints and affordances of each learning method to create practical and feasible learning experiences (Lockee, 2021).

Students and lecturers needed to adopt online learning platforms after a dramatic shift from face-to-face to online learning. The heavy reliance on online learning since COVID-19 has driven the necessity to study the factors influencing the adoption process of students and the influence of these factors on digital literacy. Thus, a better understanding of the adoption of the online learning process by Malaysian institutions of higher education after the COVID-19 pandemic and how they tried to cope with it is needed.

Students' feedback would be valuable for the attributes of online learning platforms, which would allow the developers of these platforms to develop their technical features and design in this competitive market. The evaluations of participants and the integration of their ideas on innovations provide potential opportunities for these platforms to reassess their capabilities in this highly competitive market. Assessing the perceptions of lecturers and students provides new insights into the mechanisms of better delivery of online learning courses. Besides, the study helps to converge the perceptions of lecturers and students on the online learning process, which is reflected positively in its development.

Identifying the needs, expectations, and difficulties faced by students allows their universities to serve them better and gain satisfaction. Thus, will help the universities and their students have interchangeability and mutual benefits (Arandas, Ling & Sannusi 2019).

This study examined the perception of higher education students on the relationship and influence of independent variables including the five characteristics of innovation, namely compatibility, observability, relative advantage, complexity, trialability, and digital skills on the dependent variable, digital literacy.

LITERATURE REVIEW

Online distance learning during and post-COVID-19

Rapidly, open and distance learning is an indispensable and accepted part of educational systems in the world. This growth came through encouraging educators to use multimedia and Internet-based technologies, and by recognizing the need to reinforce innovative methods in education (Mariana & Evgueni, 2002). Over the years the definitions, nature, and forms of distance education were various (Saykili, 2018). The concept of distance learning is considered similar and is used interchangeably with other concepts such as virtual learning, e-learning, online learning, and blended

learning (Allam et al., 2020; Traxler, 2018). Usually, open and distance learning is contrasted with face-to-face or 'conventional' campus education (Mariana & Evgueni, 2002; Traxler, 2018). However, the difference between online and distance learning is the physical presence of educators and learners in the same place, since both can be at the same place while using online learning facilities.

Online distance learning depends on the use of internet tools and little or no physical social interaction with educators (Allam et al., 2020). Online learning or e-learning is a learning system that can be implemented using several electronic devices such as laptops and mobiles with Internet access (Abdelmola at al., 2021; Dhawan, 2020). Open learning refers to an organized educational activity depending on the teaching material used by minimizing the study constraints regarding study method, access, pace, place, and time, or a set of them (Jimoh, 2013).

Communication between educators and learners in distance education or distance learning can be synchronous or asynchronous. Synchronous is a real-time interaction between educators and learners who are geographically distanced compared to asynchronous, which includes delayed interaction between them (Al-Arimi, 2014; Dhawan, 2020; Mariana & Evgueni, 2002). Although distance learning has been common among students and is not new, there is an essential difference in the recent scenario of COVID-19 compared to the pre-COVID-19 period (Pal & Patra, 2021). During the COVID-19 pandemic, most educational institutions implemented online distance learning using digital platforms such as Google Meet, Zoom, Microsoft Teams, etc. However, these platforms have their own strengths and weaknesses (Wiradharma, 2020; Pal & Patra, 2021). Around the world, the COVID-19 issue has revealed emerging vulnerabilities in educational systems. Facing unpredictable futures requires more resilient and flexible education systems (Ali, 2020).

In the post-COVID-19 pandemic, some countries planned to extend e-learning practices (Prasetyanto, Rizki, & Sunitiyoso, 2022). Following the COVID-19 pandemic, the prevalence of in-person instruction declined. The students experienced unique influences due to the prompt adoption of distance teaching methods, which caused significant changes in their post-COVID-19 learning environment (Estelami & Bezzone, 2022).

Digital literacy and education

Media literacy and digital literacy refer to specific literacy concepts that coexist within a growing conceptual environment. Media literacy and digital literacy concepts are prominent in media education and appear to be the most widely mobilized literacies (Wuyckens, Landry & Fastrez, 2022). Discussions about digital literacy mostly come in the context of media literacy (Boyd, 2014). Digital literacy is a subfield of media literacy (Mihailidis et al., 2021). The concepts of media and digital literacy are the most prevalent in focusing on critical approaches to media messages. The digital literacy concept is composed of various literacies; thus, there is no need to search for differences and similarities with other literacy types (Koltay 2011).

Digital media literacy refers to people's qualifications to cope with socially applied aspects of communication technologies and the new digital environment (Peicheva & Milenkova, 2017). Digital literacy is a group of basic skills that include information retrieval and processing, production and use of digital media, a wide range of professional computing skills, and participation in social networks for knowledge creation and sharing (Karpati, 2011). Digital literacy provides people with the essential ability to gain valued outcomes in life. It promotes employment opportunities through the ability to access online services and digital content (Chetty et al., 2018).

Digital literacy is the degree of knowledge, capacity, process, and competence to access, motivate, and understand information to gain benefits using digital technologies, such as applications, Internet computers, and mobile devices (Beaunoyer, Dupéré & Guitton, 2020). Digital literacy is related to digital competence and knowledge compared to traditional literacy, which focuses on the ability to use, read, and write text (Littlejohn, Beetham & McGill, 2012). Digital literacy influences the basic competencies and skills required for successful learning (Tohara et al., 2021). Digital literacy is the competence of staff in enhancing and utilizing digital technologies to perform their work (Cetindamar, Abedin & Shirahada, 2021).

Worldwide, a variety of terms describe the competencies of digital and media literacy. The European Union prefers to use the digital competence term instead of the digital literacy term (Rasi, Vuojärvi & Ruokamo, 2019). The European digital competence framework was developed by the European Commission in 2006 for lifelong learning (Cortoni, Lo Presti & Cervelli, 2015; Parola & Ranieri, 2011). This

framework includes attitudes, skills, and knowledge related to digital competencies. Experience with technology and age influence digital literacy skills (Rasi, Vuojärvi & Ruokamo, 2019). The definition of digital competencies was extended to include soft skills (connected with skills and attitudes) and basic skills (connected with knowledge). Digital competence is considered a strategic action in spreading active digital participation (Cortoni, Lo Presti & Cervelli, 2015). Digital competencies are crucial to learning and teaching. There is a need to develop critical skills as an essential part of digital competence (Beilmann et al., 2023).

As part of digital literacy development, the European Framework for the Digital Competence of Educators has six areas that focus on various aspects of educators' professional activities: (1) *Professional Engagement*: The ability to use digital technologies for professional development and interactions, communication, and collaboration. (2) *Digital Resources*: Creating, sourcing, and sharing digital resources. (3) *Teaching and Learning*: Coordinating and managing the digital technologies used in teaching and learning. (4) *Assessment*: Digital strategies and technologies are used to enhance assessment. (5) *Empowering Learners*: Using digital technologies to enhance learners' personalization, inclusion, and active engagement. (6) *Facilitating Digital Competence of Learners*: Enabling learners to responsibly and creatively use digital technologies for communicating information, problem solving, content creation, and well-being (Redecker, 2017).

In several countries, educational policies to develop digital literacy first emphasized developing infrastructure rather than motivating or training educators to use it efficiently (Karpati, 2011). Mastering digital literacy by students prepares them for online learning, allowing them to cope with the pandemic, making them more employable, and also participative citizens and lifelong learners (Vodă et al., 2022). Digital literacy enables students to access, manage, evaluate, integrate, create, and communicate information more easily, both individually and collaboratively (UNESCO, 2011). Learning in the 21st century requires students to have media literacy skills, knowledge, and life skills. In the digital age, digital literacy skills are critical for influencing students' performance and developing them as independent learners (Tohara et al., 2021).

Moreover, inequality in digital skills might limit the potential influence of media literacy education worldwide. Educators of media literacy tend to use innovative pedagogical approaches to help students gain through Internet skills, communication, creativity, critical thinking, and collaborative activities. Innovation in media literacy education is highly contextual and situational (Mihailidis et al., 2015). Historically, media literacy education has focused on developing the critical capacities of citizens, but recently, it has focused on the skills of digital media production (Notley & Dezuanni, 2019). Media education promotes the deployment of desirable media practices and uses within communities (Wuyckens, Landry & Fastrez, 2022). Media literacy education supports people in developing sufficient media literacy and many closely interrelated competencies such as media literacy, digital literacy, information literacy, and news literacy (Rasi, Vuojärvi & Ruokamo, 2019).

THEORETICAL FRAMEWORK

The diffusion of innovation theory is found suitable to guide this study. This theory discusses the introduction and adoption of innovation by several communities (Baran & Davis, 2015). It originated from Roger (1983). Diffusion is the process by which innovation is communicated over time through specific channels among social system members. It is a type of communication concerning new ideas through messages (Roger, 1983). The channels of mass media and communication help inform a potential adopter's audience about the innovation and create their awareness (Rogers, Singhal & Quinlan, 2009).

The perceived characteristics of innovation by individuals are (1) *Relative advantage*: It depends on how it is perceived by individuals rather than its real advantage. It is mainly measured using satisfaction, social prestige, and convenience. (2) *Compatibility*: The degree to which an innovation is perceived as consistent with potential adopters' needs, past experiences, and existing values. This new idea should be compatible with the prevalent norms and values of a social system. (3) *Complexity*: The degree of perceived ease or complexity of innovation. (4) *Trialability*: This is the degree of experimenting with innovation on a limited basis. (5) *Observability*: Degree of innovation visibility by others. Opportunity for adoption increases after seeing innovations (Rogers, 1983).

However, a lack of awareness and limited resources hinder innovation adoption. In addition, there is a low rate of low computer literacy, lack of access to Internet skills, low socio-economic status, perceived advantages

of ease of use, trust in a person, and preference for communication (Zhang et al., 2010).

HYPOTHESES

In building the hypotheses of this study, the literature review and theory serve as the bases for the hypotheses. Hypotheses one to six tested the relationship between the independent and dependent variables, while hypotheses seven to twelve tested the influence of independent variables on the dependent variable as follows:

H1. There is a significant relationship between the relative advantage of online distance learning and digital literacy.

H2. There is a significant relationship between the compatibility of online distance learning and digital literacy.

H3. There is a significant relationship between the complexity of online distance learning and digital literacy.

H4. There is a significant relationship between the trialability of online distance learning and digital literacy.

H5. There is a significant relationship between the observability of online distance learning and digital literacy.

H6. There is a significant relationship between digital skills and digital literacy.

H7. Relative advantage of online distance learning has a significant influence on digital literacy.

H8. Compatibility of online distance learning has a significant influence on digital literacy.

H9. Complexity of online distance learning has a significant influence on digital literacy.

H10. Trialability of online distance learning has a significant influence on digital literacy.

H11. Observability of online distance learning has a significant influence on digital literacy.

H12. Digital skills of has a significant influence on digital literacy.

METHOD

This quantitative study was implemented through a self-administered questionnaire. The sample included 524 respondents, 242 online via Google fForms and 282 via face-to-face. The sample included six public and private Malaysian universities located in five Malaysian peninsular regions, namely Johor (south), Selangor, Wilayah Persekutuan, Perak (central), and Penang (north). The three public universities were Universiti Kebangsaan Malaysia (UKM), International Islamic University Malaysia (IIUM), and Universiti Pendidikan Sultan Idris (UPSI), and the three private universities were Southern University College (SUC), International University of Malaya Wales (IUMW), and INTI International College Penang (IICP). The data collection was for the two methods which took around a two-month period from 1 Nov 2022 to 31 Jan 2023. Completing the questionnaire took around 15 minutes.

The questionnaire included six sections divided into 73 items of open and close-ended questions. Section (A) included close-ended questions, while all the other five sections used a 5-point Likert scale to measure the agreement of respondents ranging from 1=strongly disagree, 2=disagree, 3=somewhat agree, 4=agree, and 5=strongly agree.

Section (A) contained 13 items of demographic information such as gender, education level, race, age, university, residential area, social media daily usage, monthly income, etc. Section (B) included eight items on ownership of devices and technologies, adopted from (Cote & Milliner, 2018; Juurakko-Paavola, Nelson & Rontu, 2018; Yu, Ndumu, & Mon 2018). Section (C) included 26 items on the perceived characteristics of online distance learning and digital learning platforms adopted (Atkinson, 2007; McCann, 2007; Pinho, Franco & Mendes 2020; Rogers 1983). Section (D) contained 14 items on digital literacy and skills adopted from (Benson 2019; Cote & Milliner 2018; Muthuprasad, Aiswarya, Girish 2020; Qolamani 2022; Santos, Azevedo & Pedro, 2013; Toland, 2022; Yashashwini, 2021). Section (E) six items on advantages of online digital learning platforms, adopted from (Davis, 1989; Dhawan 2020; Gopal et al., 2021; Muthuprasad, Aiswarya & Girish, 2020). Section (F) included six items on the disadvantages adopted by (Abdelmola et al., 2021; Khalil et al., 2020; Musingafi et al., 2015; Muthuprasad, Aiswarya & Girish 2020; Snoussi & Radwan, 2020).

To ensure the validity and measurement accuracy of the questionnaire, two academic experts have been consulted and some amendment has been made. Then the pilot study was conducted prior to the actual final data collection to measure the reliability and validity of the questionnaire. The Cronbach's alpha coefficient of the pilot study was .922.

The questionnaires were analysed using the Statistical Package for the Social Sciences (SPSS). Descriptive and inferential statistics were applied. Correlation and regression analyses were conducted to

identify the factors that have a relationship and influenced the digital literacy of students while using online learning.

The reliability coefficient test for all the variables in the questionnaire was excellent (.956). The relative advantage was .926, followed by trialability, observability, complexity, and compatibility with .880, .839, .837, and .836 respectively. The reliability of digital literacy and digital skills was .919 and .887, respectively.

FINDINGS

This section presents the findings of the study beginning with the demographic background of the respondents of the study, and the correlation and regression analysis of the study.

Demographic background of the respondents

This study included 524 undergraduate student respondents from six universities in Malaysia. As presented in Table 1, the female respondents were (67.6%), and the male respondents were (32.4%). The table shows a more significant percentage of bachelor's students (73.7%) than foundation/diploma students (26.3%). The data indicate Chinese participants were (44.0%), Malay were (39.6%), Indian were (11.3%), and other ethnic participants were (5.2%). The data show the vast majority of respondents belong to Generation Z (90.1%), those aged 18-21 years (58.6%), and from 22-25 years (31.5%). Then the millennial generations from 26-41 years were (8.3%), and other generations from 42 years & above were (1.7%).

The highest percentage of respondents was (21.9%) from Southern University College, and the lowest was (9.2%) from INTI International College Penang. A total of (84.7%) were living in urban areas / Within City, compared to (15.3%) in rural areas / Outside City. The Respondents were asked about their daily social media usage. The most reported usage was more than 5 hours (42.0%), followed by 3.1- 4 hours daily usage (20.2%), and the least reported usage was less than 1 hour (1.7%). Finally, the average monthly income was measured by income classifications in Malaysia. The respondents who belong to the Bottom 40% (B40) were (54.8%), those who belong to the Middle 40% (M40) were (33.3%), and those who belong to the Top 20% (T20) were (11.9%).

Usage of online digital learning platforms

This usage is presented in Table 2. Among the respondents, those who received training on online digital learning platforms were (53.1%), compared to (46.9%) who did not receive training. The respondents who used these platforms pre-covid19 were (64.1%), while those who did not use them were (35.9%). The most used platform by students was google classroom (46.9%) followed by (40.6%) and (8.4%) Microsoft teams and Zoom respectively.

Other platforms (4.0%) included Blackboard Learn, Webex by Cisco, DingTalk, Tencent, and WhatsApp. Most preferred platform was Microsoft teams (46.2%) followed by google classroom (38.9%) and Zoom (12.8%), then Other platforms (2.1%). It can be seen that although most of the students used Google classroom as chosen by their lectures they mostly preferred Microsoft teams. Finally, a total of (54.5%) of respondents preferred face-to-face classes compared to (45.5%) who preferred online classes.

Table 1. *Demographic profile of respondents*

Items	Category	Frequency	Percentage
Gender	Female	354	67.6
	Male	170	32.4
	Total	524	100.0
Educational level	Bachelor Degree	383	73.7
	Foundation/ Diploma	137	26.3
	Total	520	100.0
Race	Chinese	230	44.0
	Malay	207	39.6
	Indian	59	11.3
	Others	27	5.2
	Total	523	100.0

Items	Category	Frequency	Percentage
Age	18-21	307	58.6
	22-25	165	31.5
	26-29	14	2.7
	30-33	16	3.1
	34-37	4	.8
	38-41	9	1.7
	42 & above	9	1.7
	Total	524	100.0
University	Southern University College	115	21.9
	Universiti Kebangsaan Malaysia	98	18.7
	International University of Malaya-Wales	92	17.6
	Universiti Pendidikan Sultan Idris	92	17.6
	International Islamic University Malaysia	79	15.1
	INTI International College Penang	48	9.2
	Total	524	100.0
Residential area	Urban/ Within City	443	84.7
	Rural/ Outside City	80	15.3
	Total	523	100.0
Daily social media usage	Less than 1hour	9	1.7
	1- 2 hours	44	8.4
	2.1-3 hours	63	12.0
	3.1- 4 hours	82	15.6
	4.1-5 hours	106	20.2
	more than 5 hours	220	42.0
	Total	524	100.0
Average monthly income	Less than RM2500 (B40)	126	24.1
	RM2500- RM3169 (B40)	75	14.4
	RM3170- RM3969 (B40)	37	7.1
	RM3970- RM4849 (B40)	48	9.2
	RM4850 RM5879 (M40)	46	8.8
	RM5880- RM7099 (M40)	47	9.0
	RM7110- RM8699 (M40)	33	6.3
	RM8700- RM 10959 (M40)	48	9.2
	RM10960- RM15039 (T40)	26	5.0
	RM15040 or more (T40)	36	6.9
	Total	522	100.0

Table 2. *Online digital learning platforms*

Items	Category	Frequency	Percentage
Trained on online platforms	Yes	278	53.1
	No	246	46.9
	Total	524	100.0
Using online platforms pre-COVID	Yes	336	64.1
	No	188	35.9
	Total	524	100.0
Most used platforms	Google classroom	246	46.9
	Microsoft teams	213	40.6
	Zoom	44	8.4
	Others	21	4.0
	Total	524	100.0
Most preferred online platforms	Microsoft teams	242	46.2
	Google classroom	204	38.9
	Zoom	67	12.8
	Others	11	2.1
	Total	524	100.0
Preferred communication medium	Face-to-face classes	286	54.5
	Online classes	238	45.5
	Total	523	100.0

Reliability, means, and standard deviation

This reliability coefficient test for all variables in the questionnaire was excellent (.956). The relative advantage was .926, followed by trialability, observability, complexity, and compatibility with .880, .839, .837, and .836 respectively as mentioned in Table 3.

Table 3. *Mean and standard deviation of the variables*

Variables	Mean	Std. Deviation	N	Cronbach's Alpha
Relative advantage	3.5778	.85490	524	.926
Compatibility	3.6355	.85827	524	.836
Complexity	3.7839	.77369	522	.837
Trialability	3.8252	.76389	524	.880
Observability	3.9555	.80486	523	.839
Digital skills	3.8245	.77262	523	.887
Digital literacy	4.0176	.67827	523	.919

Besides, digital literacy, digital skills, advantages, and disadvantages were .919, .887, .874, and .869 respectively. On the other hand, the mean standard deviation, and the number of respondents are represented also in the Table 3. The mean for all the independent variables below was positive, and it was very positive for the dependent variable which is digital literacy. Besides, the standard deviation was reliable with low dispersion for all six independent variables and one dependent variable.

Correlation analysis of the independent variables and digital literacy

The correlation analysis was implemented to determine the relationship between six independent variables (relative advantage, compatibility, complexity, trialability, observability, and digital skills) and one dependent variable (digital literacy).

Table 4 shows that all the hypotheses were supported and a significant positive correlation was found between all six independent variables and the one dependent variable. The significance of the correlation was at the level of $p < 0.01$. The result revealed a moderate positive significant relationship between relative advantage and digital literacy ($r = .467$; p = .000).

Correlation test showed a moderate positive significant relationship between compatibility and digital literacy ($r = .500$; $p = .000$). Assessing the relationship between complexity and digital literacy revealed a strong positive significant relationship ($r = .613$; $p = .000$).

Besides, a strong positive significant relationship shown between trialability and digital literacy ($r = .666$; $p = .000$). Then, the relationship between observability and digital literacy was strongly positive significant ($r = .665$; $p = .000$). Finally, a very strong positive significant relationship was found between digital skills and digital literacy ($r = .860$; $p = .000$).

Table 4. *Correlations of the (IVs) and the (DV)*

Variables	1	2	3	4	5	6
1. Relative advantage	-					
2. Compatibility	.758**	-				
3. Complexity	.675**	.701**	-			
4. Trialability	.634**	.653**	.728**	-		
5. Observability	.558**	.569**	.652**	.706**	-	
6. Digital Skills	.402**	.401**	.536**	.553**	.483**	-
7. Digital Literacy	.467**	.500**	.613**	.666**	.665**	.860**

Table 5. *Model summary*

					Change Statistics				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change
1	.787[a]	.619	.614	.42071	.619	139.142	6	514	.000

a. Predictors (Constant), digital skills, compatibly, observability, relative advantage, complexity, trialability.

Regression analysis of the variables

Multiple regression is an extension of simple linear regression. It is used when we want to predict the value of a variable based on the value of two or more other variables. The variable we want to predict is called the dependent variable (or, sometimes, the outcome, target, or criterion variable). The variables we are using to predict the value of the dependent variable are called the independent variables (or sometimes, the predictor, explanatory, or regressor variables). For this study, there are six independent variables acting as predictors for the dependent variable, Digital Literacy as stated in Table 5. From the Model Summary and ANOVA Tables, the relationship (R) between the predictors and the dependent variable indicates a good level of prediction (r = 0.78). Meanwhile, the R square of 0.619 means that the predictor variables contribute or explain 61.9 percent of the variations in the dependent variable, digital literacy.

In terms of statistical significance, Table 6 shows that the F-ratio in the ANOVA table (see below) tests whether the overall regression model is a good fit for the data. The table shows that the independent variables statistically significantly predict the dependent variable, F (6, 514) = 139.142, p <.000. This indicates the regression model is a good fit for the data.

Multiple regression was run to predict digital literacy from digital skill, compatibility, observability, relative advantage, complexity, and trialability. These variables statistically significantly predicted digital literacy F (6, 514) = 139.142, p < .000, $R2$ = .614. All four variables added statistically significantly to the prediction, p < .00 as seen in Table 7.

Table 6. *ANOVA analysis*

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	147.768	6	24.628	139.142	.000[b]
	Residual	90.978	514	.177		
	Total	238.746	520			

a. Dependent Variable: Digital Literacy

b. Predictors: digital skills, compatibly, observability, relative advantage, complexity, trialability

Table 7. *Multiple regression analysis*

	Unstandardized Coefficients		Standardized Coefficients		
Model	*B*	*SE*	*Beta*	*T*	*Sig.*
Constant	.924	.111		8.294	.000
Relative Advantage	-.077	.035	-.098	-2.200	.028
Compatibility	.065	.036	.082	1.776	.076
Complexity	.008	.041	.009	.202	.840
Trialability	.144	.042	.162	3.438	.001
Observability	.333	.034	.396	9.737	.000
DGTLSKL	.325	.030	.370	10.960	.000

a. Dependent Variable: Digital Literacy

Furthermore, it is important to analyze the effect or impact of the independent variables on digital literacy. The beta, t, and collinearity statistics need to be analyzed to understand the coefficients statistics. The standardized coefficient (the Beta) can be interpreted as a "unit-free" measure of effect size, one that can be used to compare the magnitude of the effects of predictors measured in different units. Here Beta which has positive effects ranges from 0.16 to 0.39 representing the predicted change in the number of standard deviations of trialability, observability, and digital skill for an increase in standard deviation in digital literacy. Observability (*Beta* = 0.39) has the highest effect on digital literacy.

For a good *t*-value in regression, generally, any *t*-value greater than +2 or less than - 2 is acceptable. The higher the t-value, the greater the confidence we have in the coefficient as a predictor. Low *t*-values are indications of the low reliability of the predictive power of that coefficient. Since the *t* values for the three

predictors are greater than +2, it indicates greater confidence in the coefficients as predictors and also shows high reliability of the predictive power of the three coefficients.

Multicollinearity is an indication that several independent variables in a model are correlated resulting in less reliable statistical inferences. Generally, a VIF above 4 or tolerance below 0.25 indicates that multicollinearity might exist, and further investigation is required. When VIF is higher than 10 or tolerance is lower than 0.1, there is significant multicollinearity that needs to be corrected. In the present study, the VIFs for all three predictors are below 4. Meanwhile, the tolerance values are above 0.25 indicating there is no issue of multicollinearity, thereby establishing reliability in statistical inferences.

DISCUSSION AND CONCLUSION

The findings from the correlation analysis show that there exists a significant positive relationship between the six independent variables (relative advantage, compatibility, complexity, trialability, observability, and digital skills) and the dependent variable (digital literacy). The result revealed a moderate positive significant relationship between relative advantage and digital literacy (r = .467; p = .000), compatibility and digital literacy (r = .500; p = .000). Also, a strong positive significant relationship was found between complexity, trialability, and observability with digital literacy (r = .613; p = .000), (r = .666; p = .000), and (r = .665; p = .000) respectively. Meanwhile, assessing the relationship between digital skills and digital literacy (r = .860; p = .000), revealed a strong positive relationship.

All six hypotheses were supported and came in line with previous research. The study by (Genlott, Grönlund & Viberg, 2019) found that the five characteristics of innovation have a positive significant correlation with digital literacy. Additionally, the five characteristics/ attributes of innovation enhance digital literacy among teachers and students (Raman, 2014). Besides, the uptake and adoption of digital technologies support the uptake of digital literacy (Ollerenshaw, Corbett & Thompson, 2021). Also, the attitudes of users towards innovation were related to digital literacy (Elhajjar & Ouaida 2019). Finally, a positive relationship between the digital skills of students and their digital literacy/ competence was reported by Vodă et al., (2022).

The findings from regression analysis stated that six independent variables acted as predictors for the dependent variable, Digital Literacy. The relationship (R) between the predictors and the dependent variable indicates a good level of prediction (r = 0.78). Meanwhile, the R square of 0.619 means that the predictor variables contribute or explain 61.9 percent of the variations in the dependent variable, Digital Literacy. This indicates the choice of variables to test their effect on digital literacy is appropriate. However, only three of the independent variables (observability, trialability, and digital skill) have a significant and positive effect on digital literacy. Meanwhile, observability (*Beta* = 0.39) has the highest effect on digital literacy. This finding is supported by (Matyunina, 2019; Yates, 2001). This is congruent with the findings by Ntemana and Olatokun (2012) that observability positively affects the attitude of lecturers toward using technology, which is an aspect of digital literacy.

The attitudes toward adopting innovations have an influence on forming digital literacy (Cirus & Simonova, 2021). Additionally, the characteristics of adopting innovation help to facilitate and support the digital literacy of students (Gunter, 2018). Overall digital literacy is increased through the diffusion of innovation (Matyunina, 2019). The attributes/ characteristics of innovation influence the adoption of digital media literacy (Yates, 2001). Besides, (Cirus & Simonova, 2021; Vodă et al., 2022) results also stated the influence of digital skills on digital literacy or competence.

On the other hand, the findings came in line with Richardson's (2011) study which revealed that the inability in understanding the advantages of technologies, hardware incompatibility, and complexity was among the biggest challenges in adopting new technologies.

In implementing online learning, digital literacy is crucial. The findings have proven that the three aspects viz. observability, trialability, and digital skill should be given prominence for a successful digital literacy initiative that forms the bedrock of online learning and teaching. In other words, online education. Benson and Kolsaker (2015) affirmed that digital technology has become an integrated part of education.

Besides, technology usage makes the process of education and learning more effective and it is one of the significant factors in modern classrooms. Advancement in education technology aims at utilizing modern technology to improve the learning environment in classrooms and help educators and students to achieve quality means of education (Nazir, 2020). The use of technologies and the advantages of the technological revolution are reflected in the process of education

(Gracia, Avila, & Gracia, 2020). The learning process is significantly affected by rapid technological development (Hamid et al., 2019). Digital technology is changing the ways today's students learn (Coccoli et al., 2014).

This study found a significant positive relationship between the six independent variables (relative advantage, compatibility, complexity, trialability, observability, and digital skills) and the dependent variable (digital literacy). Besides, only three independent variables (observability, trialability, and digital skill) significantly influence digital literacy. The study fills a significant academic gap by placing the diffusion of innovation theory in a specific context by examining the relationship and influence of characteristics of innovation and digital skills on digital literacy. Based on the findings of this study, it is suggested for policymakers and educational institutions arrange comprehensive training sessions on using online digital learning platforms. The training will allow students to observe, experiment, and try online learning platforms as well as enhance their digital skills, thus improving their digital literacy.

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REFERENCES

Adedoyin, O. B., & Soykan, E. (2023). Covid-19 pandemic and online learning: the challenges and opportunities. *Interactive learning environments, 31*(2), 863-875.

Abdelmola, A. O., Makeen, A., & Makki, H. (2021). E-learning during COVID-19 pandemic, faculty Perceptions, challenges, and recommendations. *MedEdPublish*, *10*, 1-15.

Al-Arimi, A. M. A. K. (2014). Distance learning. *Procedia-Social and Behavioral Sciences*, *152*, 82-88.

Ali, W. (2020). Online and remote learning in higher education institutes: A necessity in light of COVID-19 pandemic. *Higher education studies, 10*(3), 16-25.

Allam, S. N. S., Hassan, M. S., Mohideen, R. S., Ramlan, A. F., & Kamal, R. M. (2020). Online distance learning readiness during Covid-19 outbreak among undergraduate students. *International Journal of Academic Research in Business and Social Sciences*, *10*(5), 642-657.

Amir, L. R., Tanti, I., Maharani, D. A., Wimardhani, Y. S., Julia, V., Sulijaya, B., & Puspitawati, R. (2020). Student perspective of classroom and distance learning during COVID-19 pandemic in the undergraduate dental study program Universitas Indonesia. *BMC medical education*, *20*(1), 1-8.

Aperribai, L., Cortabarria, L., Aguirre, T., Verche, E., & Borges, Á. (2020). Teacher's physical activity and mental health during lockdown due to the COVID-2019 pandemic. *Frontiers in Psychology*, *11*, 1-14.

Arandas, M. F., Ling, L. Y., & Sannusi, S. N. (2019). Exploring the needs and expectations of international students towards the national university of Malaysia (UKM). *Jurnal Personalia Pelajar*, *22*(2), 137-144.

Arandas, M. F., Loh, Y. L., & Chiang, L. Y. (2021). Media Credibility, Misinformation, and Communication Patterns during MCO of COVID-19 in Malaysia. *International Online Journal of Language, Communication, and Humanities*, *4*(2), 26-40.

Atkinson, N. L. (2007). Developing a questionnaire to measure perceived attributes of eHealth innovations. *American journal of health behavior*, *31*(6), 612-621.

Ayub, S. H., Omar, N. H., Raja, R. P. N. Murad, Khairudin., Saabar , S. S., & Faizal, S. (2022). Perceptions and engagement of Klang Valley urbanites on COVID-19 PSAs during the pandemic. *SEARCH Journal of Media and Communication Research, 14*(3), 75-89.

Baran, S. J., & Davis, D. K. (2015). *Mass communication theory: Foundations, ferment, and future*. Cengage Learning.

Beaunoyer, E., Dupéré, S., & Guitton, M. J. (2020). COVID-19 and digital inequalities: Reciprocal impacts and mitigation strategies. *Computers in human behavior*, *111*, 106424.

Beilmann, M., Opermann, S., Kalmus, V., Vissenberg, J., & Pedaste, M. (2023). The role of school-home communication in supporting the development of children's and adolescents' digital skills, and the changes brought by COVID-19. *Journal of Media Literacy Education, 15*(1), 1-13.

Benson, V., & Kolsaker, A. (2015). Instructor Approaches to Blended Management Learning: A

Tale of Two Business Schools. *International Journal of Management Education*, *13* (3), 316-325.

Boyd, D. (2014). *It's complicated: The social lives of networked teens*. London: Yale University Press.

Cetindamar, D., Abedin, B., & Shirahada, K. (2021). The role of employees in digital transformation: a preliminary study on how employees' digital literacy impacts use of digital technologies. *IEEE Transactions on Engineering Management*, 1-12

Chetty, K., Qigui, L., Gcora, N., Josie, J., Wenwei, L., & Fang, C. (2018). Bridging the digital divide: measuring digital literacy. *Economics*, *12*(1), 1-17.

Cirus, L., & Simonova, I. (2021). Pupils' digital literacy reflected in teachers' attitudes towards ICT: Case study of the Czech Republic. *SN Computer Science*, *2*(3), 231.

Coccoli, M., Guercio, A., Maresca, P., & Stanganelli. L. (2014). Smarter Universities: A Vision for the Fast Changing Digital Era. *Journal of Visual Languages and Computing*, *25*, 1003-1011.

Coman, C., Țîru, L. G., Meseșan-Schmitz, L., Stanciu, C., & Bularca, M. C. (2020). Online teaching and learning in higher education during the coronavirus pandemic: Students' perspective. *Sustainability*, *12*(24), 10367.

Cortoni, I., Lo Presti, V., & Cervelli, P. (2015). Digital Competence Assessment. A Proposal for Operationalizing the Critical Dimension. *Journal of Media Literacy Education, 7*(1), 46-57.

Cote, T., & Milliner, B. (2018). A survey of EFL teachers' digital literacy: A report from a Japanese university. *Teaching English with Technology*, *18*(4), 71-89.

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS quarterly*, *13*(3), 319-340.

Dhawan, S. (2020). Online learning: A panacea in the time of COVID-19 crisis. *Journal of educational technology systems*, *49*(1), 5-22.

Di Pietro, G., Biagi, F., Costa, P., Karpiński Z., & Mazza, J. (2020). *The likely impact of COVID-19 on education: Reflections based on the existing literature and international datasets*. https://publications.jrc.ec.europa.eu/repository/handle/JRC121071

Dreesen, T., Akseer, S., Brossard, M., Dewan, P., Giraldo, J. P., Kamei, A., ... & Ortiz, J. S. (2020). *Promising Practices for Equitable Remote Learning Emerging Lessons from COVID-19 Education Responses in 127 Countries*. UNICEF Office of Research. https://www.unicef-irc.org/publications/pdf/IRB%202020-10.pdf

Dzakiria, H., M Idrus, R., & Atan, H. (2005). Interaction in open distance learning: Research issues in Malaysia. *Malaysian Journal of Distance Education*, *7*(2), 63-77.

Elhajjar, S., & Ouaida, F. (2020). An analysis of factors affecting mobile banking adoption. International *Journal of Bank Marketing, 38*(2), 352-367.

Estelami, H., & Bezzone, A. (2022). The Post-Pandemic Effects of Distance Education on Business Students: A Review of Expert Reports. *World Journal of Education*, *12*(1), 34-44.

Genlott, A. A., Grönlund, Å., & Viberg, O. (2019). Disseminating digital innovation in school–leading second-order educational change. *Education and Information Technologies*, *24*, 3021-3039.

Gopal, R., Singh, V., & Aggarwal, A. (2021). Impact of online classes on the satisfaction and performance of students during the pandemic period of COVID 19. *Education and Information Technologies*, *26*(6), 6923-6947.

Gunter, G. A., & Braga, J. D. C. F. (2018). Connecting, swiping, and integrating: mobile apps affordances and innovation adoption in teacher education and practice. *Educação em Revista*, *34*, 1-22.

Gracia, T. J. H., Avila, D. D., & Gracia, J. F. H. (2020). The Phubbing: The interference in communication within the classroom. *Journal of Administrative Science*, 2(3), 12-17.

Hamid, A., Setyosari, P., Saida, U. L. F. A., & Kuswandi, D. (2019). The implementation of mobile seamless learning strategy in mastering students' concepts for elementary school. *Journal for the Education of Gifted Young Scientists*, *7*(4), 967-982.

Jamilah, J., & Fahyuni, E. F. (2022). The Future of Online Learning in the Post-COVID-19 Era". *International Conference on Intellectuals' Global Responsibility* (pp. 497-505). Sidoarjo: KnE Social Sciences.

Jimoh, M. (2013). An appraisal of the open and distance learning programme in Nigeria. *Journal of Education and Practice, 4*(3), 1-8.

Juurakko-Paavola, T., Rontu, H., & Nelson, M. (2018). Language teacher perceptions and practices of digital literacy in Finnish higher education. *AFinLAn vuosikirja*, *76*, 41-60.

Kamal, A. A., Shaipullah, N. M., Truna, L., Sabri, M., & Junaini, S. N. (2020). Transitioning to online learning during COVID-19 Pandemic: Case study of

a Pre-University Centre in Malaysia. *International Journal of Advanced Computer Science and Applications*, *11*(6), 217-223.

Karpati, A. (2011). *Digital literacy in education*. UNESCO. https://unesdoc.unesco.org/ark:/48223/pf0000214485

Koltay, T. (2011). The media and the literacies: Media literacy, information literacy, digital literacy. *Media, culture & society, 33*(2), 211-221.

Khalil, R., Mansour, A. E., Fadda, W. A., Almisnid, K., Aldamegh, M., Al-Nafeesah, A., ... & Al-Wutayd, O. (2020). The sudden transition to synchronized online learning during the COVID-19 pandemic in Saudi Arabia: a qualitative study exploring medical students' perspectives. *BMC medical education*, *20*, 1-10.

Li, C., & Lalani, F. (2020). *The rise of online learning during the COVID-19 pandemic*. World Economic Forum. https://www.weforum.org/agenda/2020/04/coronavirus-education-global-covid19-online-digital-learning/

Littlejohn, A., Beetham, H., & McGill, L. (2012). Learning at the digital frontier: A review of digital literacies in theory and practice. *Journal of computer assisted learning, 28*(6), 547-556.

Lockee, B. B. (2021). Online education in the post-COVID era. *Nature Electronics*, 4(1), 5-6.

Mariana, P., & Evgueni, K. (2002). *Open and distance learning: trends, policy and strategy considerations*. UNESCO. https://unesdoc.unesco.org/ark:/48223/pf0000128463

Matyunina, M. V. (2019). Diffusion of innovation in the digital economy. *IV All-Russian scientific and practical conference with international participation" Information Systems and Technologies in Modeling and Control" (ISTMC2019)* (pp. 26-32). Association for Computing Machinery.

Maunonen-Eskelinen, I. (2015). Open and distance learning as a training model and an educational method. In Maunonen-Eskelinen, I., & Leppänen, T (eds.), (pp. 11- 20). *Open and distance learning: Developing learning opportunities in the teacher education in Nepal*. Jyväskylä: JAMK University of Applied Sciences.

McCann, A. L. (2007). The identification of factors influencing the diffusion of an assessment innovation on a university campus. (Doctoral dissertation). Available from the University of Nebraska-Lincoln.

Mihailidis, P., Hobbs, R., McDougall, J., & Berger, R. (2015). Building a Global Community for Media Education Research. *Journal of Media Literacy Education, 7*(1), 1-3.

Mihailidis, P., Ramasubramanian, S., Tully, M., Foster, B., Riewestahl, E., Johnson, P., & Angove, S. (2021). Do media literacies approach equity and justice. *Journal of Media Literacy Education, 13*(2), 1-14.

Mukhtar, K., Javed, K., Arooj, M., & Sethi, A. (2020). Advantages, Limitations and Recommendations for online learning during COVID-19 pandemic era. *Pakistan journal of medical sciences*, *36* (COVID19-S4), 1-5.

Musingafi, M. C., Mapuranga, B., Chiwanza, K., & Zebron, S. (2015). Challenges for open and distance learning (ODL) students: Experiences from students of the Zimbabwe Open University. *Journal of Education and Practice*, *6*(18), 59-66.

Muthuprasad, T., Aiswarya, S., Aditya, K. S., & Jha, G. K. (2021). Students' perception and preference for online education in India during COVID-19 pandemic. *Social sciences & humanities open*, *3*(1), 100101.

Nazir, T. (2020). Impact of classroom phubbing on teachers who face phubbing during lectures. *Psychology Research on Education and Social Sciences*, *1*(1), 41-47.

Notley, T., & Dezuanni, M. (2019). Advancing children's news media literacy: learning from the practices and experiences of young Australians. *Media, Culture & Society, 41*(5), 689-707.

Ntemana, T. J. & Olatokun, W. (2012). Human Technology. *An Interdisciplinary Journal on Humans in ICT Environments*, *8* (2), 179–197

Ollerenshaw, A., Corbett, J., & Thompson, H. (2021). Increasing the digital literacy skills of regional SMEs through high-speed broadband access. *Small Enterprise Research*, *28*(2), 115-133

Pal, D., Vanijja, V., & Patra, S. (2020). Online learning during COVID-19: Students' perception of multimedia quality. *11th International Conference on Advances in Information Technology* (pp. 1-6). Bangkok: Association for Computing Machinery.

Pal, D., & Patra, S. (2021). University students' perception of video-based learning in times of COVID-19: A TAM/TTF perspective. *International*

Journal of Human–Computer Interaction, *37*(10), 903-921.

Peicheva, D., & Milenkova, V. (2017). Knowledge society and digital media literacy: foundations for social inclusion and realization in Bulgarian context. *Calitatea Vieții, 28*(1), 50-74.

Pinho, C., Franco, M., & Mendes, L. (2021). Application of innovation diffusion theory to the E-learning process: higher education context. *Education and Information Technologies*, *26*, 421-440.

Prasetyanto, D., Rizki, M., & Sunitiyoso, Y. (2022). Online learning participation intention after COVID-19 pandemic in Indonesia: Do students still make trips for online class?. *Sustainability*, 14(4), 1982.

Qolamani, K. (2022). Effectiveness of Online Teaching & Learning during Covid-19 Pandemic-Social Studies Students' Perspective. *Humanities Journal of University of Zakho*, *10*(3), 856-862.

Raman, R., Vachhrajani, H., Shivdas, A., & Nedungadi, P. (2014). Low cost tablets as disruptive educational innovation: modeling its diffusion within Indian K12 system. *IEEE Innovations in Technology Conference* (pp. 1-5). Institute of Electrical and Electronics Engineers.

Redecker, C. (2017). *European Framework for the Digital Competence of Educators: DigCompEdu*. Joint Research Centre. https://joint-research-centre.ec.europa.eu/digcompedu_en

Richardson, J. W. (2011). Challenges of adopting the use of technology in less developed countries: The case of Cambodia. *Comparative Education Review*, *55*(1), 008-029.

Rogers, E. M. (1983). *Diffusion of innovations*. Free Press.

Rogers, E. M., Singhal, A., & Quinlan, M. M. (2009). Diffusion of innovations. In Stacks, D., & Salwen, M. (Eds). *An integrated approach to communication theory and research* (pp. 418-432). Routledge.

Salim, N., Chan, W. H., Mansor, S., Bazin, N. E. N., Amaran, S., Faudzi, A. A. M., ... & Shithil, S. M. (2020). COVID-19 epidemic in Malaysia: Impact of lockdown on infection dynamics. *Medrxiv*, 1-27.

Salman, A. (2021). Media dependency, interpersonal communication and panic during the COVID-19 Movement Control Order. *SEARCH Journal of Media and Communication Research*, 13(1), 79-91.

Samat, M. F., Awang, N. A., Hussin, S. N. A., & Nawi, F. A. M. (2020). Online Distance Learning amidst COVID-19 Pandemic among University Students: A Practicality of Partial Least Squares Structural Equation Modelling Approach. *Asian Journal of University Education, 16*(3), 220-233.

Santos, R., Azevedo, J., & Pedro, L. (2013). Digital divide in higher education students' digital literacy. *European Conference on Information Literacy, ECIL 2013* (pp. 178-183). Springer International Publishing.

Saykili, A. (2018). Distance education: Definitions, generations and key concepts and future directions. *International Journal of Contemporary Educational Research*, *5*(1), 2-17.

Snoussi, T., & Radwan, A. F. (2020). Distance E-learning (DEL) and communication studies during covid-19 pandemic. *Utopia y Praxis Latinoamericana*, *25*(10), 253-270.

Toland, S. (2022). A Mixed-Method Study on the Online Learner Readiness Questionnaire Instrument at a Midwest University. (Doctoral dissertation). Available from Education Resources Information center (ERIC).

Trade Union Advisory Committee (TUAC) (2020). *Impact and Implications of the COVID 19-Crisis on Educational Systems and Households*. https://tuac.org/wp-content/uploads/2020/04/2004t_Impact-of-COVID-19-on-Educational-Systems_TUAC-Briefing_final-1.pdf

Traxler, J. (2018). Distance learning - Predictions and possibilities. *Education Sciences*, *8*(1), 35.

United Nations (2020). *Policy Brief: Education during COVID-19 and beyond*. https://www.un.org/development/desa/dspd/wpcontent/uploads/sites/22/2020/08/sg_policy_brief_covid-19_and_education_august_2020.pdf

Vodă, A. I., Cautisanu, C., Grădinaru, C., Tănăsescu, C., & de Moraes, G. H. S. M. (2022). Exploring digital literacy skills in social sciences and humanities students. *Sustainability*, *14*(5), 2483.

Wiradharma, G. (2020). Google classroom or moodle?: University student satisfaction in distance learning communication during covid-19 pandemic. *Jurnal komunikasi dan bisnis*, *8*(2), 85-99.

Wuyckens, G., Landry, N., & Fastrez, P. (2022). Untangling media literacy, information literacy, and digital literacy: A systematic meta-review of core concepts in media education. *Journal of Media Literacy Education, 14*(1), 168-182.

Yates, BL. (2001). *Adoption of media literacy programs in schools***.** International Communication

Association.
https://files.eric.ed.gov/fulltext/ED453564.pdf

Yashashwini, A. (2021). Students attitude towards online learning. *International Journal of Management and Social Science Research Review, 8* (1), 32-40.

Yu, B., Ndumu, A., Mon, L. M., & Fan, Z. (2018). E-inclusion or digital divide: an integrated model of digital inequality. *Journal of Documentation*, *74*(3), 552-574.

Zhang, L., Wen, H., Li, D., Fu, Z., & Cui, S. (2010). E-learning adoption intention and its key influence factors based on innovation adoption theory. *Mathematical and Computer Modelling*, *51*(11-12), 1428-1432.