Success Factors for e-Learning Satisfaction during COVID-19 Pandemic Lockdown

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ABSTRACT

The research investigates effect of IT characteristicsfactors on students' e-learning satisfaction during the period of COVID 19 pandemic lockdown. Selected factors of IT characteristics are IT complexity, IT pace change and IT presenteeism. The study also investigatesmediating role of perceived value as a second order construct comprising of perceived ease of use, perceived behavioural control and perceived usefulness. The data was collected from 470 student sample selected using convenience sampling through online questionnaire in Malaysia during Movement Control Order (lockdown) period when universities moved classes to online learning platforms. The data was then subjected to purification, normality and reliability assessment followed by confirmatory factor analysis, validity assessment and finally structural equation modelling using IBM SPSS AMOS 24.0. The findings show that all three factors have significant impact on e-learning satisfaction. IT complexity has the most prominent impact on e-learning satisfaction among selected variables. In addition, perceived value fully mediates relationship among all three independent variables and learning satisfaction. Implications, limitations and future research avenues are then discussed.

Key words: Lockdown Learning, COVID 19, Crisis Education, E-learning, Learning Satisfaction, IT Characteristics, Perceived Value.

1. INTRODUCTION

Corona Virus Disease (COVID-19) is the only major discussion topic so far in 2020 across the globe since its outburst in Wuhan, China on 31st December 2019 [1]. On 30 January 2020, World Health Organization (WHO) declared health emergency resulting in restrictions of domestic and international travel, shutting down of all the places of gatherings, shopping malls, public places, offices, schools, colleges and academic institutions to curb the spread of COVID-19 disease. Such lockdown was enforced by many countries around the world including Malaysia.

On 25 January 2020, the earliest COVID-19 cases were found in Malaysia [2]. Since then, number of positive cases went on increasing particularly in March 2020. Malaysian government responded to curb this spread by enacting several measures including implementation of case detection surveillance systems, rapid diagnosis, rigorous contact tracing and quarantine of close contacts of those who have been found confirmed COVID-19 positive. However, to ensure further readiness of the health infrastructure and minimizing the spread of new corona virus, Malaysian government announced implementation of Movement Control Order (MCO) with the aim to isolate the source of the COVID-19 transmission.

One of major sectors affected by such lockdown includes education sector. According to [3] report, over 150 counties have closed all academic institutions including school, colleges, universities which has impacted around 80% of world student population since March 25, 2020 [4]. Many universities across the world had postponed or cancelled academic events such as examinations, conferences, seminars etc. However, this did not stop the education industry from imparting knowledge as a typical number of academic institutions have switched to digital learning platform through the use of latest video conference apps such as ZOOM, CISCO WEBEX, Google Meet, Microsoft Teams etc. Most of the universities trained faculty members to deliver lectures online and converted assessment into contact less form to ensure academic year of students will not go in vein due to the pandemic. The software owners had also taken responsibility to support educational institutions by increasing their capacity. Google offered recordable videoconferencing for up to 250 people for education business accounts since July 1, 2020. Likewise, Microsoft had offered its free premium version of Teams for six months. Zoom application had been upgraded to. The most downloaded application Zoom had uplifted the time limit on its video call for the free version in schools of China, Japan, Italy and US on request [5]. Currently, most of educational institutions have successfully migrated to digital platforms from face to face teaching and students are adapting to these new norms as well [3].

E-learning is not new phenomenon and even before this pandemic, e-learning had significant presence in education industry. Technologies have transformed the way education used to be gained traditionally through usage of digital platforms and artificial intelligence [6]. E-learning is covered under a larger term of technology-based learning through websites, learning portals, video conferencing.Currently; E-learning is enhancing students' knowledge, professional and industry executives' skills through the internet [7].

Although, e-learning in education institutions is new normal and is unavoidable, looking at the aforementioned circumstances, such sudden shift has posed several

doubtson quality of the delivery, infrastructure readiness, sufficient training etc. [8]. Previous literature focused on various aspects of e-learning satisfaction, but those theories needs to be tested against e-learning experience during crisis times. Besides, success factors for imparting e-learning during such situations needs to be investigated on the background of existing theories. There are few researches of late to uncover such factors but most of the countries have still not recovered from adverse impact of the pandemic. Furthermore, studies are sparse in context of Malaysia on identifying e-learning success factors during lockdown. This research focus on to investigate contributing success factors related to IT characterises and perceived value (PV) towards achieving greater e-learning satisfaction.

Hence the aim is to investigate the impact of IT characteristics on e-learning satisfaction mediated by perceived value. The study selects three key IT characteristics namely IT complexity (ITCX), IT presenteeism (ITPN) and IT pace change (ITPC). The study has modelled PV as second order construct comprising of perceived ease of use (PEOU), perceived behavioural control (PBC) and perceived usefulness (PU). Therefore, the objectives are to investigate impact of ITCX on e-learning satisfaction, to investigate impact of ITPN on e-learning satisfaction, to investigate impact of ITPC on e-learning satisfaction, to investigate mediating effect of perceived value among independent variables and e-learning satisfaction (LS).

2. RELATED WORK

There are well established studies related to IT characteristics framework for e-learning satisfaction [9]; [10]. Prior research, e.g.,[11]; [12]; [13] indicated both positive and negativeaspects of the e-learning environments. Technological issues, financial constraints, lack of ICT skills are some of the challenges highlighted in the findings of various literature reviews. Such findings are recorded from the research belonging to both developed as well as developing countries [14]; [15].

[16]'s theory of reasoned action (TRA) is pioneer and well-known model which become foundation for number of studies focusing on predicting human behaviour in various domains. As per TRA model, attitudes are functions of behavioural beliefs linked to intention to perform a defined behaviour. Thereafter, the Technology Acceptance Model (TAM) was proposed by [17] which were derived from TRA for modelling user behaviour related to acceptance of technology. This model consisted constructs of perceived ease ofuse (PEOU), perceived usefulness (PU), attitude toward using (ATU), behavioral intention touse (BI), and actual system use (AU). TAM II was then developed by [18] as an extended version of TAM which included social influence processes (subjective norm, voluntarism, and image) and cognitiveinstrumental processes (job relevance, output quality, result demonstrability, and PEOU),whereas it omits ATU due to weak predictors of either BIor AU.

Satisfaction is a well-established consequence of user acceptance, IT characteristics as well as system characteristics and often used to measure learners'

satisfaction in learning-related studies [19].Prior research one-learning had found that perceived ease of useand perceived value werepositively related to student satisfaction and perceived easeof use was positively related toperceived value [20]; [21]; [22]; [23].

Recently, there is a surge in research articles investigating impacts of COVID-19 on various sectors such as business, finance, environment, job prospects, tourism etc. e.g. [24]; [25]; [26]. There are some studies published related to higher education sector and impact on student mobility[27]; [28]. E-learning is not an exception and some studies can be spotted in this stream as well [29]; [30].

[31]investigated impact of COVID-19 on e-learning for higher education students and compared the impact between gender-based groups as male and female. The findings of the study reveal that males and females have a different level of in terms of usage of towards E-learning portals in Malaysian Universities. E-learning perception of students during lockdown duration was explored as well as investigated its impact on students learning satisfaction by various researchers, see. [20]; [21]. [32] offered tips for rapid migration to digital platforms and highlighted on technological and IT characteristics aspects ate its impact on e-learning satisfaction. However, gap exists in identifying impact of IT characterises on e-learning satisfaction during pandemic learning. Furthermore, what role PV played in mediating such impact during COVID-19 lockdown is also potential research gap needs to be bridged.

In this study, we have selected factors of IT characteristics to measure their impact on e-learning satisfaction during COVID-19 lockdown studies. Overall, this study considers three critical success factors for e-learning as ITCX, ITPN and ITPC. The study has modelled ITCX as reverse phenomenon with user friendly or simplistic aspects of IT platform. This makes respondents easy to interpret and respond to the survey ITPN and ITPC are used as same constructs as defined in existing literature. When it comes to PV, the study has conceptualised it as a second order construct of PEOU, PU and PBC. So corresponding hypotheses are as follows:

H1:ITCX has positive significant impact on e-learning satisfaction

H2:ITPN has positive significant impact on e-learning satisfaction

H3:ITPC has negative significant impact on e-learning satisfaction.

H4: Perceived Value mediates the relationships among selected IT characteristics factors and e-learning satisfaction

3. RESEARCH METHOD

The relationships among independent variables and dependent variable are studied using explanatory research by adopting quantitative technique to answer the research questions. This study is in epistemological stances with positivism and deductive approach. Primary data was

collected using self-administered questionnaire circulated online using google form to university students in Malaysia during the month of March and April 2020 when movement of control order was enforced resulting in lockdown and shifting of university teaching and learning on digital media platform. 470 responses were received which sufficient sample size is considering items per variables [33]. For the questionnaire, a well-structured in a survey format was followed to collect primary data through series of questions. The survey tool consisted of items related toITCX (4 items related to this variable), ITPC (4 items related to this variable), ITPN (4 items related to this variable), PV (12 items) and LS (4 items) and demographic related questions. All the questions are closed-ended and using a Likert1-5 scale to measure the strength of attitudes or opinions. Demographic analysis, normality, and reliability assessments were carried followed by confirmatory factor analysis and structural equation modelling using IBM SPSS AMOS 24. The validity and mediation analyses of the measurement model were also assessed using IBM SPSS AMOS 24. The hypotheses were subsequently tested, and the results were discussed. The procedures recommended by [33]; [34]; [35] were followed.

4. ANALYSIS AND RESULTS

4.1 Demographic Analysis

The online questionnaires were circulated among 500 students. The survey received total 488 responses and total 470 valid responses were considered for analysis after removing missing data and outliers as suggested by [35]. Demographic analysis was then carried out. The data has fair representation related to several aspects such as gender with 58.9% (277) female and 41.1% (193) male, type of higher education institutions with 57.4% (270) studying with public universities and 42.6% (200) studying with private universities and colleges. 57.2% (269) students are from bachelor degree program, 19.4% (91) studying master program followed by 16.8% (79) studying diploma programs with remaining respondent studying various other courses such as professional and certificates. In terms of fields of studies, majority of 31.1% (146) belong to ITC followed by 23.3% (112) belong to social sciences and humanities and then 21.1% (99) Business management. Other responded belongs to other programs such as engineering, medical and religious studies. This analysis section also revealed various aspects as follows. During Malaysian Movement Control Order 75.5% (355) responded were studying from home while rest 24.5% (115) were studying away from home such as hostels, friend's house or rented house. Total of 63% (296) respondents were in urban area while remaining were studying online from rural area. Those who were studying from home or rented house, 48.3% (227) used home Wi-Fi for e-learning while remaining used prepaid data. Fes other aspects were recorded in this section such as number of courses taken and number of hours studied online. Majority of students, 44% (207), taken 4 to 6 courses followed by 36.4% (171) taken 1 to 3 courses. In terms of estimated hours spent for e-learning 31.1% (146) spent 2 to 3 hours, 30% (141) spent 2 hours and 17.2% (81) spent more than four hours, 17% (80) spent 3 to 4 hours per day

for e-learning. All in all, this data sample is rich in its composition, representation and highlights several attributes of lockdown learning.

4.2 Normality Assessment

The assessment used to measure the normality of data is Skewness and Kurtosis [34].Based on the values of Skewness and Kurtosis indicates the collected data is generally relatively normal, and the underlying assumption of testing is fulfilled as the value falls within the acceptable range of -1 to + 1[36].
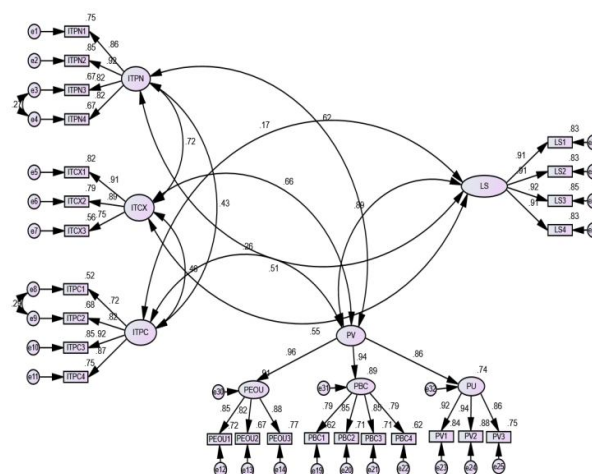
4.3 Measurement Model

Figure1: Measurement Model

The initial measurement model did not attain required model fit resulting in deletion of items with factor loadings less than 0.5. Furthermore, assessment of modification indices resulted in elimination of redundant items with MI threshold more than 15 as suggested by [37]. Such items were deleted one at a time and finally model fit was achieved with elimination of ITCX4, LS5. CFA was re-run after each such amendment, and the final model fit is achieved with this reiterative process. The overall model fit is acceptable by several standard fit measures—the statistic of Chi-square, GFI. CFI and RMSEA are unambiguously supported and accepted model fit. The score of Chi-square is 3.669, GFI is 0.866, CFI is 0.938, TLI is 0.929, NFI is 0.917 and RMSEA is 0.075 in this measurement model. Therefore, the results are competent to proceed for hypothesis testing to evaluate further if there are significant coefficients of relationship existence. The adjusted model displayed in figure 1 thus achieved absolute good fit, parsimonious fit, and incremental fit.

4.4 Validity Assessment

Next, validity assessment is carried out considering evaluation of convergent, divergent and discriminant validity. The convergent validity for the measurement model was achieved when all AVE values exceeded 0.50, whereas the composite reliability was achieved when all CR values exceeded 0.60 [35]; [37]. As shown in table 1 all factor loadings were more than 0.6. The dataset satisfied the validity of the sample. Cronbach's alpha is calculated for each factor to assess construct reliability,

and the value for each variable is within the best level of reliability (> 0.900). Discriminant validity is achieved as displayed in table 3 and table 3. No concerns related to scale reliability, divergent and convergent validity.

Table 1: Convergent and Divergent Validity Assessment

Construct	Loadings	CR	AVE
ITPN	>0.6	0.916	0.733
ITPC	>0.6	0.902	0.7
LS	>0.6	0.953	0.834
ITCX	>0.6	0.888	0.726

	ITPN	ITPC	LS	ITCX	PV
ITPN	**0.856**				
ITPC	0.428	**0.836**			
LS	0.507	0.167	**0.913**		
ITCX	0.724	0.459	0.547	**0.852**	
PV	0.621	0.258	0.893	0.661	**0.919**
PV		>0.6	0.942		0.845

Table 2: Discriminant Validity Assessment – Part I

	CR	AVE	MSV	MaxR(H)
ITPN	0.916	0.733	0.525	0.926
ITPC	0.902	0.7	0.211	0.922
LS	0.953	0.834	0.798	0.953
ITCX	0.888	0.726	0.525	0.907
PV	0.942	0.845	0.798	0.954

Table 3: Discriminant Validity Assessment – Part II

4.5 Structural Equation Modelling

4.5.1 Direct Effect

The direct impact of ITPN, ITCX, and ITPC is assessed on e-learning satisfaction through the structural model omitting the construct of perceived value. The model was considered to be acceptable fit; it achieved an absolute fit (RMEA = 0.080, GFI = 0.910) and incremental fir (CFI = 0.953, TLI = 0.940, NFI = 0.941). The figure 2 shows corresponding structural model.
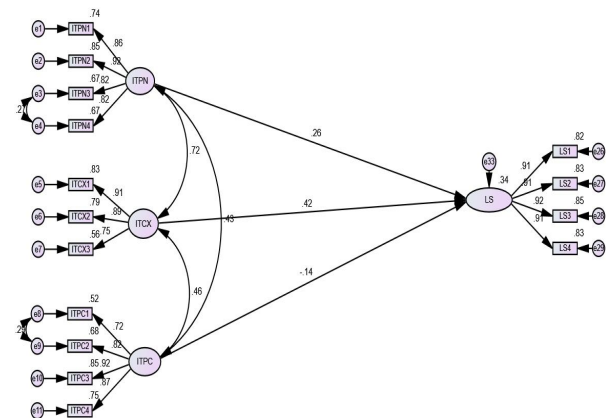

Figure 2: Structural model for direct effects

Table 4: Standardised estimates and significance level

Dependent Variable		Independent Variable	SE	P-Value
LS	<---	ITPN	.258	***
LS	<---	ITCX	.423	***
LS	<---	ITPC	-.137	0.005

As displayed in table 4, impacts of all three variables on e-learning satisfaction are significant (p < 0.05). ITCX has strongest impact of 42.3% (p < 0.01) among three followed by ITPN which is 25.8% (p < 0.01). ITPC demonstrated -13.7% impacts (p < 0.05). ITPC has demonstrated negative effect as against positive effects displayed by other two variables.

4.5.2 Mediating Effect

Mediating effect of perceived value among dependent and independent variables was then assessed. The construct of PV is developed as second order factor comprising PEOU, PBC, and PU. The model as displayed in figure 3 andis considered to be a good fit; it achieved an absolute fit (RMEA = 0.075, GFI = 0.866) and incremental fit (CFI = 0.938, TLI = 0.929, NFI = 0.917).
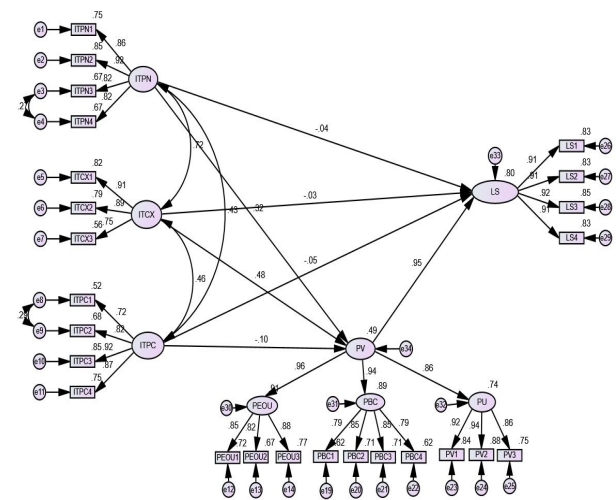

Figure 3: Structural model for mediating effect

Table 5: Standardised estimates and significance level

Dependent Variable		Independent Variable	SE	P-Value
PV	<---	ITCX	.475	***
PV	<---	ITPC	-.096	0.033
PV	<---	ITPN	.318	***
LS	<---	ITPN	-.042	0.370
LS	<---	ITCX	-.032	0.538
LS	<---	ITPC	-.046	0.168
LS	<---	PV	.952	***

The hypothesis results are summarised in table 5. PV has positive significant (P < 0.01) impact on LS. All three independent variables demonstrated insignificant impact on LS and significant impact on PV resulting in conclusion that PV fully mediates relationship among all

three independent variables and LS. ITCX has .475 X .952 = .452 impact on LS through PV which is highest among independent variables. In view of these results all hypotheses are accepted.

5. CONCLUSION

All three selected factors demonstrated significant impact on e-learning satisfaction. ITCX has most dominating positive significant impact followed by ITPN. ITPC has demonstrated significant but negative impact of on e-learning satisfaction. The second order construct of PV made up of perceived ease of use, perceived usefulness and perceived behavioural control fully mediated relationship among all three selected IT characteristics factors and e-learning satisfaction. The findings suggest importance of monitoring ITPC in order to reduce its negative impact on e-learning satisfaction. Higher education institutions and online learning platform providers can focus on enhancing perception towards usability, ease of use and behavioural control aspects.

The research posessome limitations like any other research. Firstly, limited factors are selected to investigate impact on e-learning satisfaction [38]-[41]. Ample of factors are involved when it comes to COVID-19 pandemic lockdown learning satisfaction including learning climate, stress, willingness to study, IT infrastructure availability etc. Secondly, data is collected from students studying with Malaysian public universities which may pose issues related to generalizability of the study [39]. In addition, convenience sampling also adds on the issues related to generalizing the study for larger population. Future studies should consider several other factors as highlighted above. In addition, mediating role of such factors also needs to be investigated. Future studies also can focus on moderating effect of gender, age, teaching style and IT literacy. Future research can also focus on ways to enhance PV related to online learning platforms.

All in all, study contributed by presenting findings based on rich data collected during pandemic time when universities shifted operations to online learning platform. Although some of findings are in line with established studies earlier, one can see greater impact during lockdown learning duration. Also, study presents novel findings by formulating structural model for achieving e-learning satisfaction for uncertain times.

6. ACKNOWLEDGEMENT

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