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RESEARCH ARTICLE

Direct Test Effect of Disruptive Technology Acceptance Model (DTAM) on Massive Online Open Courses (MOOCS) Learners' Satisfaction

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Abstract

Objectives: Higher education learners paid attention to MOOCs in their relevant fields to enhance their skills and knowledge. The purpose of the current study is to find the MOOCs' disruptive technological dimensions of learners' attitudes, learners' usage behavior, and learners' satisfaction. **Methodology:** The current study adopted a descriptive research design, it is a cross-sectional study, with 384 MOOCs learners included in a questionnaire survey during the months of June to August 2022 in the Tamil Nadu. For Data analysis, Frequency statistics, the Kruskal Wallis test, and PLS-SEM were employed. **Findings**: Kruskal Wallis test revealed that there is no mean significant difference between gender, education stream, MOOC preference, and MOOC course mode on attitude to use MOOC, usage behavior, and learners' satisfaction. PLS-SEM results revealed that there exists a positive significant relationship between the dimensions of disruptive technology (perceived usefulness, perceived ease of use, reliability, portability, and economic value) on the attitude, usage behavior, and learners' satisfaction. However, there is no significant relationship (t- statistics with 0.783) found between the perceived ease of use dimension of disruptive technology on user behavior. Managerial implications: MOOC service providers need to concentrate on DT dimensions, which affect users' attitudes, usage behavior, and satisfaction. **Novelty:** The current study introduces the disruptive technological dimensions with the existing TAM model, it helps Edtech companies, higher education institutions and MOOC service providers to understand the learners' usage behavior and the expectations of disruptive technology elements in MOOCs. The DT dimensions introduced in the present study will have adopted by future researchers to make the relationship between the emerging DTs and user satisfaction in the different segments and markets.

Keywords: Disruptive technology; Higher education; MOOCs; Online learning; Behaviour

1 Introduction

COVID-19 disrupts many industries and shows the way to begin a new life. Professor Clay Christensen coined the term disruptive technology in Harvard Business Review. Christensen view of disruptive technology, a new technology with some modification of existing technology disappear the existing technology and create new market. Industry 4.0 relies on the disruptive technologies like augmented reality, digital twins, internet of things, 5G, 3D Printing, Block chain, Robotics, artificial intelligence in the major areas of operations management [(1)]. Disruptive technologies offered low cost products and services to the markets for the traditional customers**.** During COVID -19 online classes disrupts conventional classes, different field of higher education and school education adopted the digital technologies to provide uninterrupted education to the students. Disruptive technologies offer no-frill products and services to the customers, through the adoption of certain no frill services to the demanders in education sector reduce the cost and increase the students' capacity. Education sector witnessed the combination of both online and regular classes during and post COVID-19. Internet, web development and technology bring significant revolution in the educational sector. Different technologies like augmented reality, and the Internet of Things (IOT) adopted many universities to engage with current students and to attract prospective students. In higher education segment Massive Online Open Course (MOOC) is ubiquitous, many universities and colleges are offering online courses to target different set of learners. Blockchain, immersive experiential learning, gamification, STEAM, The internet of things, Augmented reality, case and project based instruction, artificial intelligence, virtual reality, competency based education, chat-based collaboration platforms, and online learning are the various technologies act as a key for future education and it will disrupts the convention education [(2)]. Artificial intelligence, augmented reality, Massive Online Open Courses, and Virtual reality are the disruptive technologies used in the engineering education researches [(3)]. Effective communication, education, Collaboration and integration are the key features of virtual learning enable medical trainees during COVID-19 [(4)]. During COVID-19 pandemic Youtube, Blog, Moodle, Microsoft team, Padlet, Schoology, Facebook, Webex, E-mail, Video call, Google classroom, Edmodo, Google Meets, Zoom, Whatsapp were the online learning media platforms provide uninterrupted education to the students [(5)].

In India higher education institutions have adopted digital technologies for the purpose of learning and teaching. To enhance the performance of higher education, Indian government digital infrastructure Swayam, Swayam Prabha, National Digital Library of India (NDLI), National Academic Depository (NAD), E- PG PAthsala, e-Yantra, Free and Open- Source Software (FOSSEE), E-Shodsindhu, Annual Refresher Programme in Teaching (ARPIT) are the digital environment facilitates the wide learners category. The University Grant Commission (UGC), central government, and various state government authorities of education in India advised colleges and universities to move online classes for uninterrupted education amid COVID-19. In India, the top educational institutes like Netaji Subhas University of Technology (NSIT), Jamia Millia Islamia (JMI), Jawaharlal Nehru University (JNU), Delhi University (DU), and Indian Institute of Technology Delhi (IIT-D) and Anna University stopped their offline mode of operations and started on-line classes and online teaching-learning mode during COVID-19.

1.1 Background of the study

Improvements in existing technology and the advancement of information and communication technology bring desired changes to every industry it includes higher education. The digital education environment enhances e-education opportunities to the students and faculty members of the higher educational institutions. Online education bring many benefits to the stakeholders of educational institutions it includes a substantial reduction of cost on physical infrastructures, transferring economy as a digitally knowledgeable society, fast and simple way of knowledge sharing activities . Universities' effort on online education brings opportunities to integrate their activities with the global educational environment. E-learning facilitates the students to achieve their learning objectives in the simplest and fastest way via mobile or computer devices with the help of the internet. MOOCs cover large set of learners through internet. Higher education learners paid attention on MOOCs in their relevant field helps to enhance their skill and knowledge. MOOCs are not a new, many higher educational institutions and universities offer MOOCs thorough their own website or with the alliance of MOOC providers. E-Learning is an alternate method of physical campus; hence students no need to involve conventional mode and offline classes on campus, Worldwide MOOC is very popular to target different set of learners. COVID-19 disrupted all the sectors in India it includes the education segment hence in India majority of the higher educational institutions put more effort into online classes to facilitate a smooth and uninterrupted learning environment amid the COVID-19 pandemic situation. In future educational institutions and universities may follow combination of online and classes, which is hybrid education model. Among different mode of modern education, MOOCs are very popular for the different set of learners. Hence Edtech companies, universities, and higher educational institution, it is necessary to understand the learners' behaviour on MOOCs. Existing literature covers the part of technology based elements to understand the learners MOOCs usage behaviour and satisfaction. The main aim of the present study is to find the direct effect of MOOCs disruptive technology dimensions on learners' attitude, usage behaviour and satisfaction. The present study will help to answer the following questions:

1) Does the disruptive technology (perceived usefulness, perceived ease of use, reliability, portability, and economic value) influence learners' attitude to use MOOCs?

2) Does the disruptive technology (perceived usefulness, perceived ease of use, reliability, portability, and economic value) influence learners MOOCs usage behaviour?

3) Does the disruptive technology (perceived usefulness, perceived ease of use, reliability, portability, and economic value) influence learners MOOCs learners satisfaction?

2 Methodology

The current study adopted descriptive research design to find a disruptive technology in Higher education - Massive Online Open Courses (MOOCs) learners 'satisfaction in Tamilnadu. Current study targets the different set of learners from higher educational institutions in Tamil Nadu region like arts, engineering, science, management and other categories that's enrolled in MOOC course. It is a cross-sectional study and data were collected through questionnaire survey from the respondents during the months of June to August 2022. In a survey questionnaire each constructs carried 3 items. Total 24 items were scaled by 5 point Likert – type scale, 1 represents strongly disagree and 5 represents strongly agree. According to Krejcie and Morgan sample size calculation were used to determine the sample size for 1000000 assumed populations and the sample size turned 384. Higher educational institutions students in Tamil Nadu region, enrolled in different MOOCs considered as sampling units. 420 questionnaires were distributed, due to the lack of information 36 responses were omitted and 384 valid responses have taken for the purpose of the study. According to the need of the study, the Under Non-probability sampling technique and purposive sampling adopted. To meet research objectives, statistical tools such as frequency distribution, Kruskal Wallis test, and the two step structural equation modelling i.e., (i) measurement model, and (ii) Partial Least Square – Structural Equation Modeling adopted to test the hypotheses used in the study.

Unified Theory of Acceptance and Use of Technology (UTAUT), Technology Acceptance Model (TAM), and the Theory of Planned Behaviour (TPB) are the three models adopted by many researchers to test the variables relevant to the online education and learning. Research on adding the variable of disruptive technology element in MOOC setting is unable to find in the existing studies. Perceived usefulness, perceived ease of use are the variables found in the existing studies from the TAM and UTAUT model. Users' behaviour, users' intention, subjective norms, and attitudes are the variables found in the theory of planned behaviour. A specific disruptive technology elements economic value, reliability, and portability relevant to MOOCs were missing in existing empirical studies. MOOC learners' attitude, MOOC learners' usage behaviour, and MOOC learners' satisfaction were treated as dependent variables. To test the learners' usage behaviour of disruptive technology elements in MOOCs settings, the current study used the perceived usefulness and perceived ease of use variables from TAM, along with portability, reliability and economic value are the disruptive technology dimensions treated as independent variables. To fill the

gap created by the existing literature the current study added the disruptive technology elements to measure the influence of disruptive technology elements on learners' satisfaction, Figure 1 represents the conceptual model used in the study.

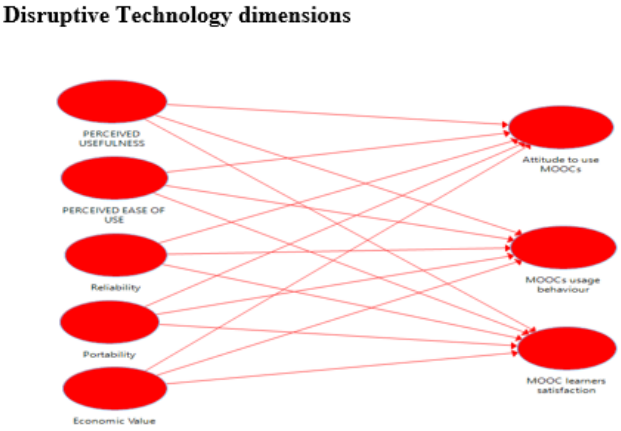

Fig 1. Conceptual framework

Perceived usefulness is the users' belief on specific technologies, when they employ the particular technology can enhance the quality of performance. Perceived ease of use is an extent to which a person thinks to adopt specific technology would be easy. Reliability is the likelihood that a product or service or system will function as intended for a period of time or remain operational in a specific environment without any malfunction. Portability is a standalone technology that fits well in the given environment, it is a compact computing device with a small form factor that is made to be held and used with the hands. Economic value is the consumer willingness to pay for the goods or service, which is typically expressed in terms of money[(6)]. In healthcare sector artificial intelligence plays a role, information technology infrastructure, organizational, operational, and managerial factors influenced the significant and positive effect on perceived usefulness and perceived ease of use variables[(7)]. To enhance the ease of use e-learning system, variables such as computer self-efficacy, system quality, computer playfulness contributed significance. Students' behavioural attention on MOOC is determined by the elements of perceived enjoyment, perceived usefulness and perceived ease of use; perceived quality and usability hold strong and indirect effect on students' intention to use MOOC[(8)]. Innovation diffusion and TAM improved the MOOCs students' performance[(9)]. Relationship found among the variables of perceived resource, perceived ease of use, attitude, behavioural intention to accept e-learning[(10,11)]. Compared to the perceived usefulness, perceived ease of use dimension of extended TAM holds significant effect on users' attitude to the mobile based money technology. Perceived ease of use hold significant effect on system usability during COVID -19 in a Microsoft teams online platform[(12)]. Task technology fit plays a role for the active learning when students adopt social media for the purpose of learning[(13)].

3 Results and Discussion

3.1 Demographic Profile

The below Table 1 shows that the demographic profile of the respondents' participated in the study.

Maximum 55% of the respondents were female, Maximum 46% of the respondents were in the education category of Engineering, Maximum 48% of the respondents preferred both paid and unpaid MOOC course, Maximum 52% of the respondents were preferred synchronous mode of MOOC course. Kruskal wallis statistical technique were performed to identify the mean significant difference between demographic profile of the respondents on the Disruptive technology acceptance model dimensions. Through Kruskal wallis test it has identified that there is no significant difference find between the gender, education stream, MOOC preference, and MOOC course mode with the dimensions of disruptive technology acceptance model such as perceived ease of use, perceived usefulness, reliability, portability, attitude to use MOOC, MOOC usage behavior and MOOC learners satisfaction[(14)].

Table 1. Survey Result

Variable	Label	Frequency	Percentage
Gender	Male	172	45
	Female	212	55
Education Stream	Arts	104	28
	Science	80	20
	Engineering	178	46
	Others	22	6
MOOC Preference	Paid	73	19
	Unpaid	128	33
	Both	183	48
MOOC Course Mode	Synchronous	198	52
	Asynchronous	186	48

Source: Computed Primary data

Table 2. Survey Result

Constructs	Cronbach's Alpha	Composite reliability	Average Variance Extracted
Perceived usefulness	0.713	0.796	0.566
Perceived ease of use	0.728	0.790	0.559
Reliability	0.780	0.872	0.695
Portability	0.766	0.816	0.597
Economic value	0.721	0.842	0.641
Attitude to use MOOC	0.881	0.927	0.808
MOOC usage Behavior	0.717	0.842	0.641
MOOC learners' satisfaction	0.790	0.876	0.702

Source: Computed primary data

3.2 Construct reliability and Validity

According to Nunnally, (1978) reliability explains the internal consistency of the scales, Cronbach's value greater than 0.7 indicates desired reliability. Present study satisfied the reliability with greater than 0.70 Cronbach's values for all the constructs. AVE, composite reliability, discriminant validity, R square, and Collinearity statistics were checked in the measurement model before proceeding the PLS-SEM and bootstrapping to test the hypotheses. Table 3 presented the discriminant validity of the constructs used in the study[15].

3.3 Discriminant validity

Table 3. Survey Result

Constructs	ATM	ECV	MLS	MUB	PEU	PU	PTA	REL
ATM	**0.899**							
ECV	0.637	**0.801**						
MLS	0.503	0.430	**0.838**					
MUB	0.642	0.573	0.551	**0.800**				
PEU	0.563	0.517	0.313	0.461	**0.748**			
PU	0.355	0.359	0.473	0.394	0.506	**0.752**		
PTA	0.636	0.419	0.518	0.449	0.320	0.218	**0.773**	
REL	0.622	0.603	0.541	0.661	0.491	0.359	**0.**735	**0.833**

Source: Computed primary data

Note: ATM = Attitude toward MOOC, ECV= Economic Value, MLS = MOOC learners satisfaction, MUB= MOOC usage behaviour, PEU = Perceived ease of use, PU = Perceived usefulness, PTA = Portability, REL= Reliability. Bold highlighted diagonal values represented the discriminant validity.

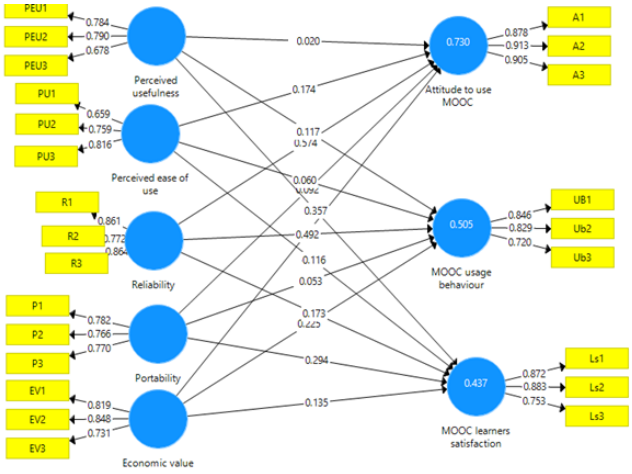

Fig 2. Measurement Model

Figure 2 represented the measurement model, factor outer loadings of the scales and R2 values of the dependent variables [16].

After completing the procedure of measurement model, Bootstrapping procedure has done with the assumed sub-samples of 2000 by using actual data 384 to test the hypotheses. The main objective of the study is to test the learners' acceptance on MOOC. The Table 4 presented the hypotheses framed in the study to fulfill the study objectives.

Table 4. Results of Hypotheses

Constructs	Effect Type	T- Statistics	Hypotheses Supported
There is a significant effect of Perceived useful on attitude to use MOOC	Direct	2.307	Yes
There is a significant effect of Perceived ease of use on attitude to use MOOC	Direct	7.314	Yes
There is a significant effect of Reliability on attitude to use MOOC	Direct	5.903	Yes
There is a significant effect of Portability on attitude to use MOOC	Direct	2.153	Yes
There is a significant effect of Economic value on attitude to use MOOC	Direct	2.656	Yes
There is a significant effect of Perceived useful on MOOC usage behaviour	Direct	2.158	Yes
There is a significant effect of Perceived ease of use on MOOC usage behaviour	Direct	7.655	Yes
There is a significant effect of Reliability on MOOC usage behaviour	Direct	5.903	Yes
There is a significant effect of Portability on MOOC usage behaviour	Direct	2.153	Yes
There is a significant effect of Economic value on MOOC usage behaviour	Direct	2.008	Yes
There is a significant effect of Perceived useful on MOOC learners' satisfaction	Direct	7.815	Yes
There is a significant effect of Perceived ease of use on MOOC learners' satisfaction	Direct	0.783	No
There is a significant effect of Reliability on MOOC learners' satisfaction	Direct	2.730	Yes
There is a significant effect of Portability on MOOC learners' satisfaction	Direct	2.471	Yes
There is a significant effect of Economic value on MOOC learners' satisfaction	Direct	2.506	Yes

Source: Computed primary data

It has understood from the Table 4 results of hypotheses and the figure bootstrapping results (Figure 3), there exists positive significant relationship between the dimensions of disruptive technology (perceived usefulness, perceived ease of use, reliability, portability, and economic value) on attitude of MOOC, MOOC usage behaviour and MOOC learners' satisfaction [17]. However there is no significant relationship find between the perceived ease of use dimension of disruptive technology on MOOC usage behaviour.

The study initiated to empirically test the direct effect of disruptive technology dimensions on learners attitude, and learners satisfaction in the context of MOOC. The result of the study supported that the technology acceptance model dimensions perceived usefulness, and perceived ease of use influenced the users' behaviour to use MOOCs, this relationship also found in the existing studies. The disruptive technology dimensions (reliability, portability, and economic value) introduced in the

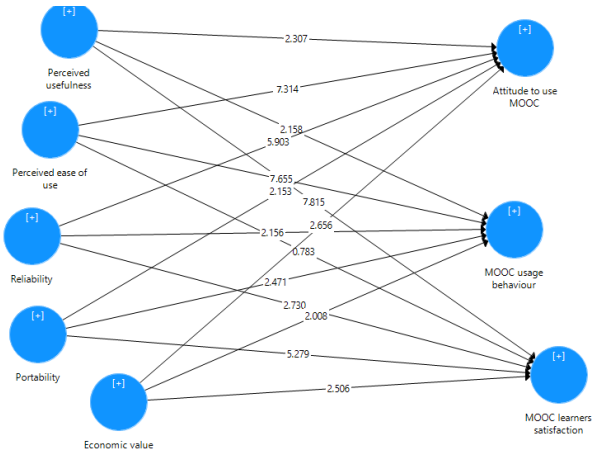

Fig 3. Boots trapping results

present study supported the positive relationship between the users' behaviour to use MOOCs. Worldwide various disruptive technologies such as online classes, social media based education, hybrid education and MOOCs amid COVID-19 to provide uninterrupted education. Among these MOOCs are popular because it covers different categories of learners. The empirical findings of the current study will help the MOOC service providers to understand the users' expectations of disruptive technology elements which helps the MOOCs service providers to achieve customers' satisfaction.

4 Conclusion

The present study will help the higher educational institutions, universities and Edtech companies to understand the learners' disruptive technologies acceptance model on MOOCs. Hence the MOOC service providers need to concentrate on disruptive technology dimensions along with perceived usefulness dimension in TAM, this prelude to achieve MOOCs learners' satisfaction. The current study considered that the MOOCs are disruptive technology because MOOCs disrupted the conventional learning methodology. It has found through PLS-SEM result, there exists positive significant relationship between the dimensions of disruptive technology (perceived usefulness, perceived ease of use, reliability, portability, and economic value) on attitude of MOOC, MOOC usage behaviour and MOOC learners' satisfaction. However there is no significant relationship (t- statistics with 0.783) find between the perceived ease of use dimension of disruptive technology on MOOC usage behaviour. There are few limitations the readers can find the present study it includes limited sample size, survey region, and common method variance hence the future researchers may concentrate on this to achieve generalisation. This is primarily due to the fact that earlier research did not examine or describe such characteristics. Age and gender were the only relations and moderators that the current study could only focus on because they had already been studied. Therefore, future research should concentrate on particular modifiers. Last but not least, the integrated model offered more empirical evidence in favour of the UTAUT, TTF, and TPB components being included. The assessment of the three models' strengths in the context of HE is another crucial area for future MASEM investigations.

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