Research Article

COVID-19 Scenario of Online Education: A Study Based on Acceptance Level of Online Learning among Students of Gujarat During Lock-down

Sarika Srivastava[1] & Anupama Chirag Dave[2]
[1]Assistant Professor, Graduate School of Management Studies, Gujarat Technological University, India, Email:ap2_cgbs@gtu.edu.in
[2]Assistant Professor, School of Business & Law, Navrachana University, Vadodara, Gujarat, India

Abstract

The pandemic COVID-19 forced all the educational institutions across India to remain shut from mid-March 2020. The sudden lockdown in between the ongoing academic sessions created the opportunity to switch over to online teaching through digital platforms. The e-learning market was estimated to grow even in normal circumstances, but this pandemic has given a great lift to this online learning. Various researches have been done on the usefulness of technology for online teaching but what is the level of acceptance among users i.e., students, should be understood. This study aims at understanding the acceptance level of students for online teaching. For this research data was gathered from 1,057 undergraduate and postgraduate students of Gujarat who had attended online lectures during the lockdown period of pandemic. Structural Equation Modeling (SEM) was used to test the research model and based on analysis strategic options which could be utilized post COVID-19 were suggested. The research identified that students had a favourable attitude towards using online mode of education. Attitude in this research was considered as a result of Perceived Usefulness (PU) and Perception about Complexity of using Internet (PCI). The results highlighted that students perceived online classes as useful to them in terms of improving knowledge, solving doubts related to the subject, saving time as well as scoring good marks. If the technical glitches can be resolved then it can increase the effectiveness. This paper helps in identifying the behavioural intentions of students for accepting online platforms and making strategic decisions for upcoming academic sessions.

Key Words: Online education, E- learning, Technology acceptance model, COVID-19 education, Attitude towards online teaching

Introduction

Online Education – Pre COVID-19 Scenario

The concept of learning online is not at all a new trend. The e-learning market has a history of 21 years by now. This market began in the 1960s when first computerized training courses were developed but owing to various barriers it did not take up then. Later in the 1980s and 1990s various developments in the form of growth of PCs, few companies and educational institutions offering

courses online led to the beginning of a new era of education. The year 2000s saw an explosion in usage of e-learning methods. The revenue from e-learning industry has grown more than 900percent since 2000. The global e-learning market in the year 2015 was worth $107 billion (Global Industry Analysts, Inc., USA). In the year 2019 the adoption of education technology with global edtech investments had reached US$18.66 billion (Metaari Whitepaper). This trend was expected to grow owing to various economic development drives. The statistical figures for online education were very attractive even before COVID-19 as it was projected to reach $350 Billion by 2025. But, COVID-19 has brought a change in the landscape of the education industry.

Education Industry during COVID-19

The educational institutions like schools, colleges, coaching centers and universities were shut down to curb the spread of COVID-19 infections. While these educational institutions at global level were closed during different points of time according to the spread of COVID-19 infections, if the statistical numbers are looked at, there were around 157 Crore students across 191 countries who were impacted (UNESCO report). In Indian context more than 32 Crore students considering all school, college and university level were affected with the restrictions imposed to curb COVID-19 infections. The major areas of concern for colleges and universities during this closure were completion of course, conducting examinations and placing final year students when most of the companies worldwide were cutting down from any form of expenditure. This pandemic forced educational institutions to adopt some safe means of reaching out to the students.

Online Education during COVID-19

The sudden closure of educational institutions was a huge challenge as it was affecting the life of many students and their parents. In response to this unavoidable circumstance, the majority of the educational institutions preferred adopting online mode of teaching. The objective of this unplanned shift was that online teaching could help educational institutions reach their students at their homes. However, in a country like India significant barriers were affecting this sudden shift in the teaching-learning process. The main barrier being the availability of necessary infrastructure to support the online teaching learning process as only 27 percent of households in India have some members with access to the internet (National Sample Survey as part of the Survey on Education (2014). Students who were not having reliable internet access or technology had to struggle to participate in the digital learning process. This barrier was faced across countries as there was a gap between students who actually had required infrastructure/ technology and the number of students who were actually enrolled in different courses (OECD data). Experts from the education industry believe that this unplanned, rapid shift from offline to online teaching with a very minimal time for both faculties and students to "Accept-Adopt-Implement" the change

is going to bring a new hybrid model of education.

Literature review

Online education, as mentioned, has a history of more than a decade owing to which a lot of empirical research both at global and Indian context has been done in the past in this area. This section of the paper highlights crucial findings from those researches.

Vijaya Lakshmi Y., Das Jaishree, Majid Ishfaq (2020) attempted to assess the eLearning readiness of the stakeholders through a questionnaire from a sample of 12 lab administrators, 83 teaching staffs and 153 students belonging to 35 colleges of Gujarat. Results showed that e-learning helps to a lesser extent in maintaining transparency, face-to-face contact and interactivity which hinder students and faculty members' readiness towards e-learning. Authors identified the need to plan for training programmes to increase their e-learning readiness.

Arora Amit Kumar, Srinivasan R. (2020) assessed the adoption rate for virtual classes from 341 teachers of higher education institutions (HEIs) of Ghaziabad region with two sets of respondents: who adopted and not adopted virtual classrooms, respectively. Network issues, lack of training, and lack of awareness were stated to be the major challenges faced by them. Lack of awareness was stated to be the most important reason by those who did not adopt virtual classrooms followed by lack of interest and doubts regarding the usefulness of virtual classes. Less attendance, lack of personal touch, and lack of interaction due to connectivity issues were found to be the significant drawbacks of virtual classes.

Phutela, N. and Dwivedi, S. (2020) employed interpretative phenomenological analysis (IPA) to scrutinize the respondents from Delhi-NCR of India through semi-structured interviews to understand the student's perspectives on the impact of Information and Communications Technology (ICT) in education industry. Drivers for e-learning adoption and inhibitors who restrict the adoption of e-learning were identified.

Aggarwal Ritika (2017) in her research discussed the role of e-learning in the higher educational environment in the digital age and compared the economic costs associated with traditional face-to-face and e-learning methods.

Perceived Usefulness (PU) and Enjoyment were significant factors which contributed towards learners' acceptance behaviour with Web-based Learning System (WLS) while included motivational perspective into the Technology Acceptance Model (Zhang Sheng, Zhao Jue, Tan Weiwei, 2008). In a survey of 400 post graduate students and their attitude towards e-learning was explained by perceived usefulness and intention to use. It was found that 76percent students were significantly positive towards e-learning, 82percent students found e-learning useful and 57percent intended to adopt e-learning (Mehra V. and Omidian F., 2011). E-learning experiences and perceptions of engineering students were investigated at two public Libyan universities and the study demonstrated

that there was a statistically significant correlation between students' attitude towards technology and their levels of access to various technologies. Students who had better access to technology showed that the internet generated stronger positive attitudes (Rhema, A. & Miliszewska, I., 2014). The attitude of teachers towards e-learning was analyzed through the research conducted on 85 teachers of Punjab University with factors related to feeling towards flexibility, performance of computer, self-efficacy, and anxiety towards computer /technology and significant impact of age was seen on teacher's attitude towards computer and e-learning (Suri Gunmala and Sneha Sharma, 2017). The quality, reliability and medium richness are key technological aspects to be considered (Sanders Lopez and Nagelhout, 1995). Convenient remote access, minimal required time for the network to exchange documents and the quality of interface also play an important role (Trevitt, 1995). McIntyre and Wolff (1998, P.257) noted that one of the powers of interactivity in a web environment is the capability to engage by providing rapid, compelling interaction and feedback to students. Engagement is also enhanced by problem-based presentation of educational material. An engaged student is a motivated student (Neorman and Spohrer, 1996).

Davis (1986) developed the Technology Acceptance Model (TAM) which is based on the Theory of Reasoned Action (TRA), to understand the causal relationships among users' internal beliefs, attitudes, and intentions as well as to predict and explain acceptance of computer technology (Davis et al., 1989). This model suggested that the user's actual usage behavior (actual use or AU) is directly affected by behavioral intention (intention to use or IU). In turn, behavioral intention is determined by both the user's attitude and its perception of usefulness. Two key parameters that were capable in influencing user's attitude were identified as perceived usefulness (PU) and perceived ease of use (PEOU), and that these beliefs acted as mediators between external variables (e.g., design features, prior usage and experience, computer self-efficacy, and confidence in technology) and intention to use. Furthermore, TAM explained that PEOU indirectly affects IU through PU (Davis et al., 1989; Venkatesh & Davis, 2000).

Research methodology

Research gap & research question

The statistical data about e-learning or online education industry points out that even before COVID-19, the growth prospects of this industry was high and now that COVID-19 has forced educational institutions across the globe to accept online mode of teaching this industry is expected to grow as it has become a significant aspect of delivering education now. Besides this, from the literature it is understood that a lot of work has been done in this area pertaining to awareness, factors that contribute to acceptance of online education. But now that students have actually used these online platforms during lockdown their perceptions might have changed and new issues/ problems would have come up. It is crucial for the educational system to

know their behavioural intentions of using these online platforms for getting education in future. Any issues that they would be facing with regard to usage of online modes of teaching should also be looked into. This research shall be useful for making strategic decisions for upcoming academic sessions which remains uncertain as of now. Based on this gap the following research question has been addressed in this paper – "What is the acceptance level of online learning among undergraduate and postgraduate students of Gujarat who have attended online lectures during the lockdown period of COVID-19?"

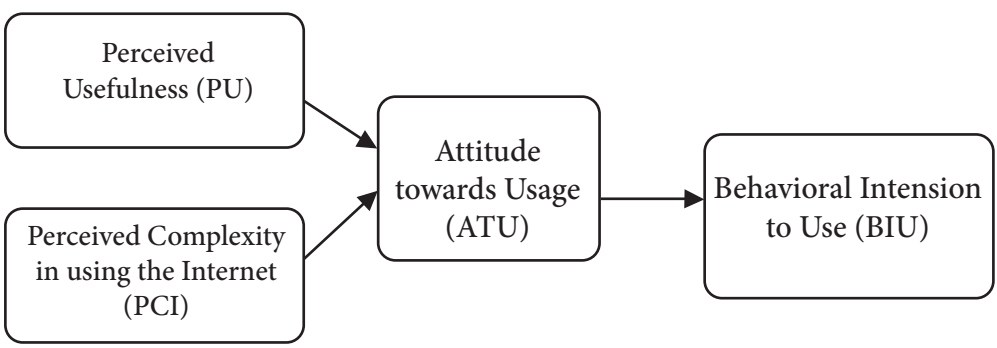
Objectives

1. To study the impact of Perceived Usefulness (PU) on Attitude towards Usage (ATU) of online learning.
2. To examine the impact of Perceived Complexity in using the Internet (PCI) on Attitude Towards Usage (ATU) of online teaching
3. To analyze the impact of Attitude towards Usage (ATU) on Behavioural Intention to Use (BIU) Online learning
4. To propose the education continuity plan for online learning based on the acceptance level among students of Gujarat

Research Model

The objective was to understand the acceptance level of online learning among students. The variables such as, Perceived Usefulness (PU) of online teaching, Perceived Complexity in using the Internet (PCI), students' Attitude towards Usage (ATU) of online teaching and their Behavioural Intention to Use (BIU) Online learning were identified (Fig.-1).

Figure-1: Research Model



Source: Compiled for research

Data Collection

This study employed the quantitative approach. The primary data for study were collected through a survey questionnaire. A 5-point Likert scale was used for the items in the questionnaire. Prior to the distribution of the questionnaire, a pilot study was conducted in order to test the reliability of the instrument. The data were collected from undergraduate

and postgraduate students of Gujarat. Total 1,575 responses were received and 1,057 questionnaires were considered final for this study after removing duplicate and vague entries. Responses of only those students have been included who are currently enrolled in Engineering, Management, Pharmacy, Computer Applications and other courses and have attended online lectures during lockdown period of COVID-19 pandemic. Period of data collection for this research was from 4-11 May, 2020.

Variable Measurement

The main objective of this study was to evaluate the acceptance level of online learning among students of Gujarat during the Lockdown period. The questionnaire comprised of two sections – section 'A' collected respondents' demographic information (Table-1) and section 'B' examined the identified variables - Perceived Usefulness (PU), Perceived Complexity in using the Internet (PCI), Attitude towards Usage (ATU) and Behavioural Intention to Use (BIU) Online learning (Table-2).

Table-1: Demographic Classification

Demography		Frequency
Gender	Male Female	748 309
Age Group	Less than 20 years 20 – 23 years 23- 26 years 26 - 29 More than 29 years	395 617 040 004 001
Educational Qualification	Undergraduate Post-Graduate	863 194
Discipline	Management Engineering Pharmacy Computer Application Any Other	240 777 007 009 024
Attended Online Lectures during Lockdown	Less than 10 10 – 20 20-30 More than 30	465 335 138 119

Source: Data Analysis

Hypothesis

1. H0: There is no significant impact of Perceived Usefulness (PU) of online teaching on Attitude towards Usage (ATU) of online teaching
2. H0: There is no significant impact of Perceived Complexity in using the Internet (PCI) on Attitude towards Usage (ATU) of online teaching
3. H0: There is no significant impact of Attitude towards Usage (ATU) of online teaching on Behavioural Intention to Use Online learning

Table-1: Demographic Classification

Demography	Measured Items
Perceived Usefulness (PU)	PU1: Attending online classes improved my knowledge.
	PU2: Online classes helped me in solving subject related doubts.
	PU3: I can score good marks by attending online lectures.
	PU4: Online classes save my time which can be utilized in other productive activities.
	PU5: Overall, online classes were very useful to me.
Perceived Complexity in using the Internet (PCI)	PCI1: High internet data consumption is a major area of concern.
	PCI2: Poor sound quality / low speed during online lectures always irritates me.
	PCI3: I face the issue of internet connectivity frequently.
	PCI4: Teaching through online platforms is not secured.
	PCI5: It is very expensive to get an internet package for viewing online lectures.
Attitude towards Usage (ATU)	ATU1: I generally have a favourable attitude towards online education.
	ATU2: I believe it is a good idea to use a digital platform for my coursework.
	ATU 3: I like the idea of attending online classes.
	ATU 4: Attending the online sessions provided me a lot of enjoyment.
	ATU 5: It is very boring / frustrating to attend the online classes.

Behavioural Intention to Use (BIU) Online learning	BIU1: I plan to attend online classes more frequently to continue my studies.
	BIU2: I propose replacing classroom teaching with online classes.
	BIU3: I will recommend the online classes to others.
	BIU4: I intend to attend the online lectures in the future.
	BIU5: Now I know the mechanism and usefulness of online lectures; I would prefer to attend the same in the next semester / year.

Data analysis

Data collected through the structured questionnaire was analyzed using software's like SPSS & AMOS 21 while for descriptive analysis Excel was used. SEM was performed on the collected data which included analysis of data at two levels i.e. the measurement model and the second being the structure model.

The Measurement Model

The model used for the study had four measured variables like: Perceived Complexity in using the Internet (PCI), Perceived Usefulness (PU), Attitude towards Usage (ATU) and Behavioural Intention to Use (BIU) Online learning. Each of these latent variables were measured using various indicators. The Measurement Model was used to understand the relationship between these latent variables and indicators. The psychometric properties of the model with regards to reliability & construct validly (which included both Convergent validity and Discriminant validity) were calculated. To test the reliability and validity of measured model calculations were done in Excel using the outputs derived from SPSS & AMOS 21.0 software. (Table- 3 Summary of Reliability & Validity for Measured Model)

- **Cronbach's alpha (Internal Consistency):**
  Using SPSS 21.00 Cronbach's alpha was calculated for the measured model; this value shows the consistency of items in a set in measuring the concept. This value usually ranges between 0 & 1, any value more than 0.70 is considered to be acceptable (Gliem, J. A., & Gliem, R. R., 2003). Cronbach's alpha for all the measured model used in this research were above 0.8 which indicates that items in the set were consistent in measuring the concept. (Table- 3 Summary of Reliability & Validity for Measured Model)
- **Composite Reliability (Internal Consistency Reliability):**
  Composite Reliability (CR), has a more retrospective approach of measuring overall reliability of consistency of framed constructs in terms of equivalence and stability. The acceptable value for composite reliability should be 0.70 or above

(Hair et.al.2010). Composite reliability for the measured model was greater than 0.70 and hence it can be concluded that the construct was having high internal consistency and reliability. (Table-3 Summary of Reliability & Validity for Measured Model)

Table-1: Demographic Classification

Construct	Items	Standardized Loadings	Cronbach's alpha	Composite Reliability CR	Average Variance Extracted AVE
Perceived Complexity in using the Internet	PCI5	0.624	0.822	0.7329	0.133225
	PCI3	0.805			
	PCI2	0.775			
	PCI1	0.73			
Perceived Usefulness (PU)	PU5	0.899	0.922	0.790561	0.1381122
	PU4	0.768			
	PU3	0.86			
	PU2	0.831			
	PU1	0.831			
Attitude towards Usage (ATU)	ATU4	0.826	0.896	0.720944	0.155236
	ATU3	0.891			
	ATU2	0.812			
	ATU1	0.788			
Behavioural Intention to Use (BIU) Online learning	BIU1	0.799	0.91	0.797225	0.139445
	BIU2	0.712			
	BIU3	0.882			
	BIU4	0.863			
	BIU5	0.835			

Source: AMOS 21.00, Excel calculations

Construct Validity: Construct validity was calculated using convergent and discriminant validity for which data from AMOS 21.00 was extracted and excel was used for calculation of average variance extracted (AVE) and correlations which are required for interpreting the validity of the instrument used to collect data.

- Convergent Validity: This subset of construct validity aims at measuring the construct validity of the instrument that has been used to collect the data. Two essential values that are used to check convergent validity are standardized factor loading and

average variance extracted (AVE). The factors loading value of latent to observed variable and AVE values should be above 0.05 to confirm convergent validity (Hair et.al.2010). It was identified that the values of both AVE and standardized factor loading for all latent and observed values were above the acceptable limit, thereby making our construct confirm convergent validity (Table-3 Summary of Reliability & Validity for Measured Model).

- Discriminant Validity: This happens to be the second subset of construct validity with an objective of measuring the distinctiveness of each construct. This can be done by comparing Square roots of AVE with the correlation squared. To obtain discriminant validity, the square root of Average Variances Extracted (AVE) of the individual factors must be higher than the variances of constructs. The same was achieved in this research after doing analysis. (diagonal element in the correlation matrix) (Table-4 Discriminant Validity).

Table-4: Discriminant Validity

	PU	PCI	ATU	BIU
Perceived Usefulness (PU)	0.372	0.017956	0.0719	0.0651
Perceived Complexity in using the Internet (PCI)		0.365	0.0225	0.025921
Attitude towards Usage (ATU)			0.394	0.08208
Behavioural Intention to Use Online learning (BIU)				0.394

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

Source: AMOS 21.00, Excel calculations

The Structure Model

The measured model above helped in understanding that the latent variables used for study had good reliability and validity. Now the structure model of SEM will help in measuring the relationships between the latent and observed variables and testing the hypothesis. Structured model is performed in two parts; in the first section calculations of vital indices are performed to confirm the research model after which the results of hypothesis testing are revealed.

Model Fit Analysis

The verification of the model has been done in this research by using 03 types of fit measures. (Table-5).

Table-5: Goodness-of-fit indices for

structural model

Fit Indices	Recommended Level of Fit	Model Value
Absolute Fit Measures		
x2 (chi-square)		358.67
df (degrees of freedom)		130
Chi-square/df (x2/df)	< 3	2.759
GFI (Goodness of Fit Index)	>0.9	0.926
RMSEA (Root Mean Square Error of Approximation)	<0.08	0.066
Incremental Fit Measures		
AGFI (Adjusted Goodness of Fit Index)	>0.80	0.823
NFI (Normed Fit Index)	>0.90	0.919
CFI (Comparative Fit Index)	>0.90	0.927
IFI (Incremental Fit Index)	>0.90	0.928
RFI (Relative Fit Index)	>0.90	0.905
Parsimony Fit Measures		
PCFI (Parsimony Comparative of Fit Index)	>0.50	0.788
PNFI (Parsimony Normed Fit Index	>0.50	0.781

Source: AMOS 21.0

GFI (Goodness of Fit Index) and RMSEA (Root Mean Square Error of Approximation) values were obtained as 0.926 and 0.066, respectively which were also in the recommended level of GFI >0.9 and RMSEA <0.08.

Among the incremental fit measures, the values of model for each fit were AGFI 0.823> (0.80 recommended level), NFI = 0.919 > (0.90 recommended level), CFI = 0.927 > (0.90 recommended level), IFI = 0.928 > (0.90 recommended level) and RFI = 0.905 > (0.90 recommended level).

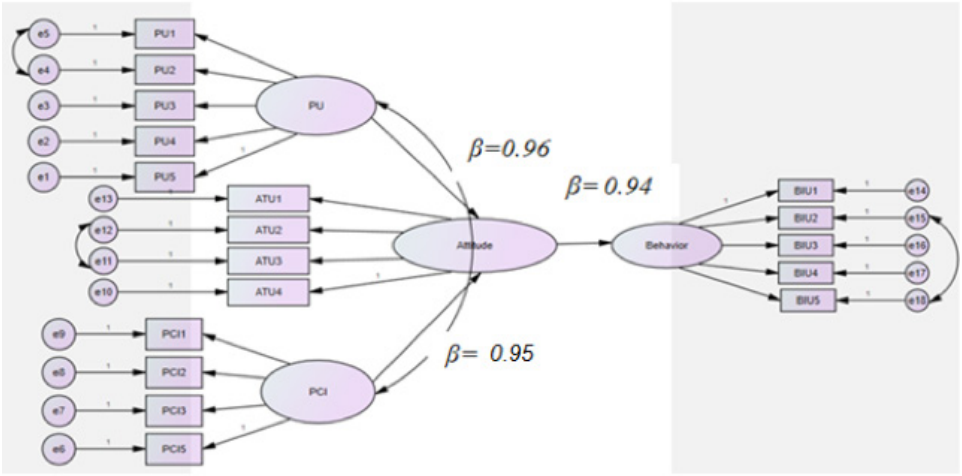
The value of PCFI (Parsimony Comparative of Fit Index) was 0.788 and acceptance level is more than 0.50. Similarly, the value of PNFI (Parsimony Normed Fit Index) was 0.781 against the recommended limit of higher than 0.50. So, both these values are in acceptable range. Thus, the comparison of the fit indices for the model with the recommended fit values suggests the

fact that the hypothesized structural model fits the data well (Table-5 Goodness-of-fit indices for structural model).

Hypothesis Testing

The analysis revealed that there exists relation among all the variables used in the model (Refer Table 6. Hypothesis testing result summary) Perceived Usefulness (PU) & Perceived Complexity in using the Internet (PCI) had an impact on Attitude towards usage of online teaching. Similarly, attitude had an influence on Behavioural Intention to Use Online learning, based on these suggestive measures for education continuity plans were suggested.

Table-5: Goodness-of-fit indices for structural model



Source: AMOS 21.0 Output

Table-6: Hypothesis testing result summary

Path			β	S.E.	C.R.	p	Results
Perceived Usefulness (PU)	→	Attitude	.960	.030	32.515	***	Supported
Perceived Complexity in using the Internet (PCI)	→	Attitude	.950	.0305	31.886	***	Supported
Attitude towards Usage	→	Behavioural Intentions to Use Online learning (BIU)	.948	.031	30.126	***	Supported

β = standardized beta coefficient, S.E. = Standard Error, C.R. = Critical ratio
Source: Data Analysis AMOS 21.0

Suggestive measures for education continuity plan post COVID-19

The research aimed at understanding the acceptance of online teaching among students of Gujarat who had a recent experience of online sessions during lock-down of COVID-19. The rationale of understanding acceptance was to know how far students intend to use online mode of teaching in the near future. Educational institutions now have understood that a hybrid model or an alternative mode of teaching is a necessity. This research can help in identifying stakeholder's perspective. From the research analysis it was observed that there existed a good relation between all the variables that were used for the proposed study. Based on the analysis the following strategic perspectives have been identified (Figure-3 for Research Model).

Students had a favorable attitude towards using online mode of education and they could enjoy this new change that was implemented for their safety. Attitude in this research was considered as a result of Perceived usefulness (PU) and Perception about Complexity of using Internet (PCI). The results highlighted that students perceived online classes as useful to them in terms of improving knowledge, solving doubts related to the subject, saving time as well as scoring good marks.

The variable "Perception about Complexity of Using Internet" was included in the research as in Indian context it is an important factor affecting effectiveness of online teaching as reported by several renowned research agencies. Perceived Complexity in using Internet (PCI) was considered in the research as Indian students lack the basic infrastructure required for smooth transition from offline mode of teaching to online mode. From these variables few problems that were faced by students could be identified and the following strategic alternatives could be suggested:

Table-7: Proposed Strategic Options

Path		Strategic Option
Connectivity Issues, Poor Sound Quality & low speed High Data Consumption	Platform for Online Teaching	• Development of indigenous platforms by Universities
		• Identification of common platform that can be used across university/institution/ subjects
		• Identification of platform that are user-friendly with less data consumption
	Delivering Contents online	• Pre-Planning about contents to be delivered through live online sessions
		• Pre planning about certain contents that can be shared through mails
		• Pre-recorded Videos/presentations/voice overs of faculties
		• Advance preparation for online classes & sharing contents with students
		• Recording online sessions and giving access to students for future reference
	Orienting Students	• Providing training/orientation to students about modes to be used
		• Creating manuals for usage of online tools and sharing with students
	Specifications	• Specification of VAS (data) plans can be shared with students in advance before start of online sessions
		• Specification about basic infrastructure required by the student for adopting online mode

The research identified that students had positive intentions of using online mode of teaching and they were even ready to recommend online mode of teaching to others. While if online mode of teaching can replace actual classroom teaching or not? – Still remains an unanswered question. However, it seems that acceptance for this mode has improved due to this forced shift. If the technical glitches can be resolved from online mode of teaching then it can increase the effectiveness.

Conclusion

This study makes a contribution in explaining the post-COVID19 scenario with the help of suitable statistical tests where the researchers have proposed strategic options for policy makers to prepare the roadmap of Indian education industry. The present study may be helpful for the higher education institutes in India in preparing themselves as a techno savvy institute, providing education in online mode to enhance learning experience

of students at convenient time, recording of online sessions for further use along with enhancing reachability, understanding the mind-set of students towards acceptance of online learning and coming up with the solutions to combat any such crisis in near future with an approach to become self-reliant country.

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