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Research Article

Effectiveness of Virtual Education on Academic Performance in Management Institutions of Delhi NCR: Lessons from COVID-19

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Abstract: The COVID-19 pandemic constituted a sizable mission to higher education and compelled educational institutions around the globe to suddenly shift to virtual learning approach. Higher education institutions are consistently challenged by the problem of generating satisfaction in virtual learning experiences which adhere to the new norms. The goal of the study is to assess the effectiveness of virtual learning across students pursuing management studies for scoring academic performance. Effectiveness is assessed by identifying various factors that influence quality in virtual education and then building a framework for analyzing the interaction amongst factors using Interpretive Structural Modeling approach. The factors were given categories according to their driving and dependence power. Self-efficacy and resistance to change are the factors which are at the base of the framework, suggesting higher driving power. Stress management and student motivation are the factors which are at the top of the hierarchy, suggesting higher dependence power. The method put forward gives the academic institutions a better comprehension of the measures which have maximum affect on academic performance in effective virtual education in management institutions across Delhi NCR.

Keywords: COVID-19, academic institutions, Interpretive Structural Modeling, Self-Efficacy, Student Motivation, virtual education.

INTRODUCTION

It is known that reform in the education system that took place more than a decade ago had focus on learning with the help of support provided by Information Technology (Zolochevskaya et al., 2021). The usage of novel technologies has been providing new ways of carrying out work thereby promoting creativity in learning (Sarikhani et al., 2016). It has been advocated that the use of technology is required for educational change that develops innovation and creative environment (Zolochevskaya et al., 2021). The transformation in the education towards e learning has been going on in the academic institutions to create the future workforce which has the necessary skill sets so that they can work anywhere in the world. This transformation has been pushed by COVID-19 to increase its pace. As the pandemic brought closure of the higher education academic institutions which led to significant burden on the academic institutions to administer the changes from traditional to virtual learning. The disruption in the education system brought by COVID-19 has been never seen before. Although the progress of moving towards digital learning in higher education systems has been going on for years, the pandemic accelerated the process and within a matter of weeks, fundamental changes got incorporated in the approach of teaching and learning. But moving towards virtual learning led the academic institutions to face many hurdles in adapting to the novel way of learning. Adopting virtual approach in such a short span of time lead to anxiety amongst academic staff in many higher education institutions (Sarikhani et al., 2016). This was due to the fact that they were not prepared and committed in adapting to the new way of teaching and learning drastically.

What is required is the discharge of educational approach which encourages creative thinking in individuals for the education system of the present age. Higher learning, as a social institution, should work in accordance with the requirements of the community. For achieving this goal, the conventional approaches (lectures, etc.) have to be blended with application of virtual learning in teaching-learning process so that institutions are able to realize the goal of creating the future workforce that is in harmony with the changing world needs (Zare et al., 2014). Moreover, COVID- 19 pandemic has garnered the revenue of virtual educational industry. The size of the global e- learning market exceeded USD 315 billion in 2021, and from 2022 to 2028, it is expected to grow at a 20% CAGR (Global market insights, 2022). There is a requirement for conducting research to understand the factors that can push the boost of the virtual educational industry and the challenges this industry possesses. Regardless of the increasing popularity of the education and learning imparted via digital tools there is a dearth of studies where current studies can be extended towards developing a unified framework that can identify the most imperative factors for making the virtual education system more successful. The unifying framework connects previous empirical research, ranging from e-learning initiative adoption to crucial success criteria of e- learning system

satisfaction (Eom, 2012). Present research shall advance the study conducted by Ho and Song (2019) who examined learners' need for learning outcomes. However, the study has been advanced by including the role of self-efficacy on learning outcomes.

Students pursuing management education in India are taken into consideration as more than 4 lakh students are studying in management higher education institutions in India (Ghara., 2020). There is still a lot of scope of research taking into account students of post graduate diploma in management as previous research has focused more on medical professionals (Haffar et al., 2023). The education industry has become more competitive as a result of the rising demand for online education, with suppliers fighting for the attention of a wide range of potential students (McKinsey & Company, 2022). Such competition can be tackled by understanding the factors that motivate the students towards learning virtually. Thus, the present research targets to fulfill the following objectives.

Research Objectives

- To recognize the factors which affect the effectiveness of virtual education on academic performance in management institutions across Delhi NCR.
- To develop a framework through ISM Methodology which will indicate the relationships amongst the factors recognized by the review of literature.
- To categorize these factors on the basis of their driving and dependence power with the help of indirect relationship MICMAC analysis.

Virtual learning is one of the most significant learning approaches in the information age. Thus, effort put in the direction of enhancing this type of approach is given a lot of importance globally. We proceed with the rest of manuscript as follows: The next section consists of the systematic literature review of the factors which affect the academic performance of the students in their transformation towards e learning. It is followed by the section which explains the Interpretive Structural Modelling approach used to identify the relationships amongst the factors. The results obtained by MICMAC analysis are presented in the next section. The results are examined with managerial/ practical implications in the following section. Finally, the last section consists of the outcomes which have been drawn with the limitations of the present research.

REVIEW OF LITERATURE

The efforts of Bandura (1997), which led him to develop the theoretical framework of triadic reciprocity or reciprocal relationships amongst the three factors of influence; behavioral, individual and environmental has provided the conceptual base for the research. Social cognitive theory differentiates amongst acquiring knowledge and performance based on the acquired knowledge as people do not always apply what they learn. Bandura's theory relies on the fact that people struggle to find a person who can take the initiative or they look for a belief that significant impact over important events in their lives can happen (Haffar et al.,2023). This assumption is set as the central point in self-development of the humans, ease with which they can adapt and they can change (Rababah., 2020). Individuals get influenced by utilizing their cognitive skills and self-acting potential by recognizing their objectives and putting in strategies to achieve them. Succeeding this, they evaluate how well they are doing in terms of attaining their goals, and making changes in their techniques when required (Haffar et al.,2023). The conceptual model prepared in this study is adopted to describe the effect of various measures on attaining effectiveness in academics during virtual learning. These relationships and this theory have not been tested before in the context of management students studying in academic institutions of India and e learning literature post COVID-19.

E learning consists of usage of a broad array of resources and approaches containing e-mails, web pages, journals, social and business networking provided electronically. Institutions of higher learning provide education services that use the internet or the network for enhancing the academic success of the students. Virtual education is significant approach used to guide and educate with the help of internet (Sarikhani et al., 2016).

Evolution of novel concepts in education has shifted the approach followed from having orientation towards student instead of having orientation towards teacher. Moreover, emergence of novel information devices has empowered individuals to apply modern approaches of education without any time and space barriers (Hosseini et al., 2015). Outbreak of Covid-19 pushed the educational institutions to switch to virtual learning mode (Khurana et al., 2021). Thus, it is imperative for academic institutions to identify the factors that influence the effectiveness of the online teaching process with respect to student's academic performance and their satisfaction. Institutions must be properly prepared for any uncertainties that may arise in the future (Maheshwari, 2020). Consequently, the strength of online learning and the outcomes of students' online learning become a source of concern for institutions in particular and in a generic sense. In fact, research on factors influencing students' online learning results has increased significantly worldwide (Pham, 2021).

Therefore, the present research is an attempt to find the effectiveness of virtual education on academic performance of management students studying in higher academic institutions of India. For this, a systematic literature review was carried out to identify the factors which would influence in increasing the strength of virtual learning on academic performance of the students. Systematic literature review helps to get an outline of the current work carried out by the researchers in the field of e learning. An opinion of the experts has also been taken. Accordingly, nine factors have been determined affecting the academic performance of the students. These factors are given below:

2.1 Self-Efficacy

Self-efficacy is an essential predictor of human performance across a wide range of tasks and circumstances, according to a huge body of study literature (Salkind, 2008). Self-efficacy is described as the belief that one has in one's ability to complete a specific activity or objective. Self-efficacy may be defined as a sense of confidence in one's ability to perform successfully in the broadest and probably most generic sense. According to Bandura (1997), "self-efficacy relates to beliefs in one's capacities to plan and execute the courses of action necessary to generate specific attainments. "According to Walsh and Salkind (2008), students' self-efficacy may be increased in four ways: (1) by personally experiencing mastery of classroom activities; (2) by witnessing mastery demonstrations of others while engaged in academic work; and (3) by hearing supportive comments from teachers and partners encourage individuals to persevere in the face of academic problems; and (4) students' efficacy views may be influenced by their physiological condition (their sensations of physiological agitation, heart rate, breathing rate, etc. There is a positive relation between technology self-efficacy of learners and outcomes of e- learning (Simmering et al., 2009). According to Johnson et al. (2008), e-learners' self-efficacy and perceived utility of the system were connected to perceived content value, course satisfaction, and course performance. Self-Efficacy has been proven to be closely connected to students' academic achievement in universities and to be a predictor of several metrics of university success (Gore, 2006).

2.2 Teacher Support

In the online learning process, the strategy is more learner-centered rather than teacher- centred, as compared to traditional education system (Debattista, 2018).Teacher support is an important factor that contributes towards students' academic performance as it enables students to get comfortable with their faculty and raise their doubts whenever they want to (Galyon et al., 2012).Students benefit from pedagogical approaches and professional competence of the teachers including their capacity to construct and integrate diverse concepts, and practices in designing online course materials in higher education (Alrefaie, 2020). Faculties should be readily available with the measures that ensure qualitative e- learning to facilitate the students with a sustainable studying environment (Abbasi et al., 2020).

2.3 Student Motivation

When students increase their participation in and class and are motivated to contribute, there are greater chances that it will improve their performance in the class (Maheshwari, 2020). Students' participation is essential with their lecturers and co-learners for improving the quality of online learning. The participation will not only increase their interaction but will also help in achieving the effectiveness of online classes (Jung et al., 2002). According to Afzal, Ali, Aslam Khan, and Hamid (2010), the component that guides students' state of mind toward the learning phase is motivation. Many studies have been conducted to assess the role of student motivation on academic achievement, and various definitions of student motivation have been used by various researchers. Furthermore, because the laws and criteria of online learning are more comfortable, proactiveness, self-study capacity, and a sense of compliance are crucial prerequisites for attaining higher learning results (Pham, 2021).

2.4 Technology Support

Information technology and its support plays a crucial role in online teaching as it not only encourages new learning platforms but also transforms the whole system of teaching, if IT operations are smooth from both instructors and learner's side (Eksail&Afari, 2020). Technology has been deeply rooted in education for more than two decades, however, technological revolution through portable gadgets such as mobile phones has brought changes radically (Valk, Rashid, & Elder, 2010). The ease of use, user experience convenience, and competency in information technologies all have a direct impact on users' perspective and motivation to study (Chaka & Govender, 2017). Technological systems and support constitute a very critical factor that affects the usage and effectiveness of e-learning systems among students in colleges and universities (Almaiah et al., 2020). In order to accomplish the learning outcome, technological platforms employed in the e-learning environment should be user pleasant (Goh et al., 2017).

2.5 Course Content Design

Course content that is engaging generally attracts participation & proactiveness from students that influences the learning outcomes for students in educational institutes (Ashwin &McVitty, 2015). The organization and content of chapters of learning materials are included in the E-learning content. Furthermore, the E-learning curriculum provides supplementary elements to assist students comprehend the subject more clearly and thoroughly (Khamparia & Pandey, 2017). This element promotes the development of students' analytical, critical thinking, and problem-solving abilities (Akyuz & Samsa, 2009). Structure, course design interface, testing and assessment methodologies, and exchange forums between lecturers and learners are all components of e-learning course design. An excellent course design will entice and promote students' participation in online classes (Oh, Chang & Park, 2020). The design and delivery of online courses have a significant influence on students' happiness, learning, and retention in online courses (Irani, 2005).

2.6 Administrative Support

Administrative support is very critical in deploying a cutting-edge e-learning system in higher education (Meyer & Barefield, 2010). Administrators will oversee the policies of schools, including higher education institutions, as well as the motivation of instructors, smooth functioning of curriculum and the learning environment of students (Strike, 2018b). Administrators have a significant impact on the overall functioning and growth of institutions (Yang, 2010). Administrators can actively participate in the planning and management of the online programme to assure the quality of e-learning (Strike, 2018a). Because

technology adoption in higher education is unavoidable in online courses, colleges and schools require a unified supporting framework with a collaborative atmosphere (Barefield & Meyer, 2013; Bolden et al., 2015).

2.7 Assessment of Progress

CGPA, which is associated with class and subject-related accomplishment, is commonly used to assess student performance (Robbins et al., 2004). There are two categories of elements or variables that impact a student's academic performance known as intrinsic and extrinsic factors. For example, learning facilities, gender and age differences, and so on can all have an impact on a student's academic performance (Hansen, 2000). Several studies have identified the determinants of academic performance such as high school grade, class attendance & socio-economic status (Alam & Islam, 2021; Sothan, 2018).

Student's Learning Satisfaction "Student satisfaction" can be defined in a variety of ways. Kayastha (2011) and Browne, Kaldenberg, Browne, and Brown (1998) investigated and discovered that student happiness was decided by evaluating the quality of coursework and other instructional module practices, as well as many features or components associated with the college and university. The majority of research have indicated that E-learning improves student achievement and happiness (Means et al., 2013).\

2.8 Resistance to change

The resistance to change has garnered a lot of attention in recent years. Because of the COVID-19 pandemic and its after effects, many higher education institutions globally have been forced to start various online learning platforms (Haffar et al., 2023). It is recognized by Sarikhani et al., (2016) that student's resistance to change and the anxiety level present the critical factors that prevent the smooth transition towards virtual learning. Aristovnik et al. (2020) also found increased anxiety, frustration, and boredom concerns which prevent the successful implementation of online learning thereby affecting the academic performance.

2.9 Stress Management

Al Ateeq et al. (2020) and Wang & Zhao (2020) explored the perceived stress level among students. They concluded that the stress and anxiety levels elevated due to insufficient provision of the proper infrastructure. The impact of COVID-19 on teaching and learning processes was disruptive as within a short span of time, all the educational institutions were forced to switch from offline to online learning without they being ready for the same. This led to stress and anxiety among the students and the teachers due to poor preparedness and incompetence (Lytras et al., 2022). This transformation was fast to ensure continuity of the educational process which led to stress among the students. Therefore, stress management becomes an essential issue to support performance in online education. Moreover, Aristovnik et al., (2020) gave a suggestion that integrating stress management programs to mitigate the higher stress during distance learning will help in successful penetration of e learning.

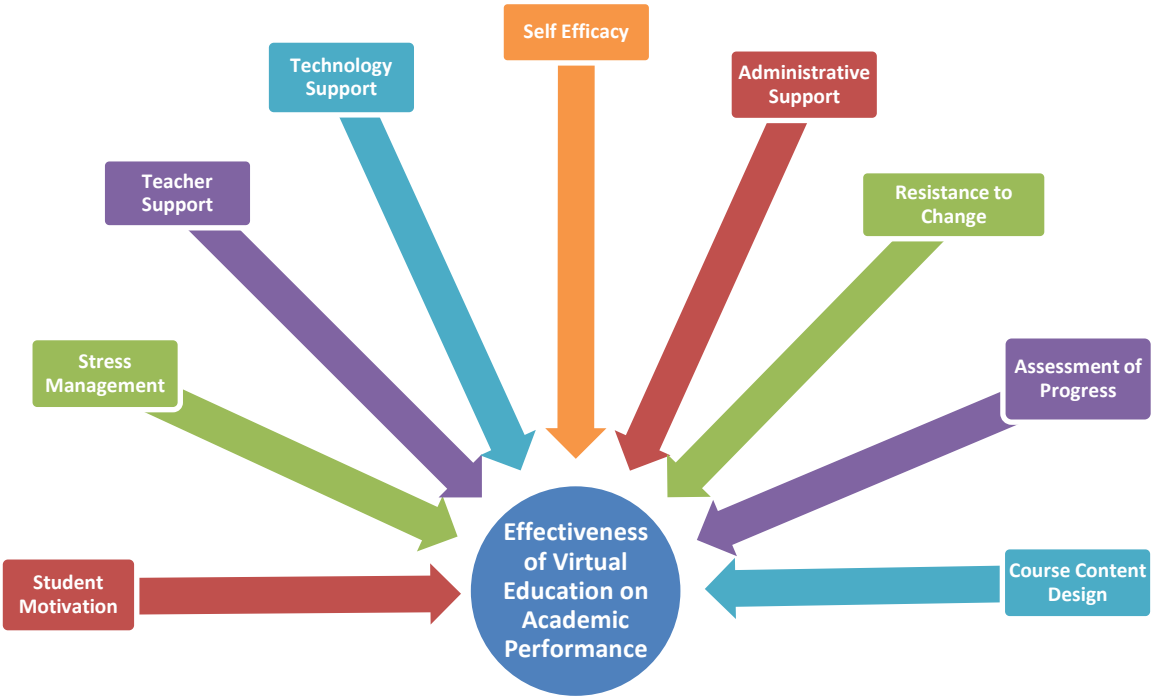

Figure 1: Factors affecting Effectiveness of Virtual Education on Academic Performance of Students

The factors are summarized graphically in Figure 1. According to the state of the art, the present research is intended to identify the factors which will help in increasing the efficiency of the educational process in higher learning with respect to online learning. The novelty of the research relates the translation of knowledge into a model of sustainable innovation capability for

future educational initiatives and policies for higher education institutions.

3. The Research Methodology

The approach followed in the present research consists of assessing the effectiveness of online learning on academic performance in management higher education institutions of India taking lessons from COVID-19 so that it will help develop resilience in the teaching learning approaches for any such pandemic in the future. The present research takes perceptions of the experts in the higher education environment. Their perceptions are then analyzed by using the qualitative technique. The present study employs the Interpretive Structural Modeling technique to analyze the relationships between the two factors thereby helps in identifying the factor which needs more attention for achieving better penetration of e learning amongst the students. MICMAC analysis is employed to classify the factors according to their driving and dependence power so that better conclusions can be drawn from it.

3.1 Interpretive Structural Modeling

Interpretive Structural Modeling is a technique used in systems engineering and management to understand the relationships among different elements of a complex system. The ISM technique involves creating a hierarchy of the elements of the system being analyzed, identifying the relationships between these elements, and then constructing a matrix to represent these relationships. The matrix is then used to generate a digraph (directed graph) that shows the relationships among the elements. The digraph can be used to identify the most important elements of the system, as well as the relationships that are most critical to the system's overall behavior. ISM can be used in a variety of contexts, including organizational analysis, supply chain management, and risk management.

The main aim of this research is to identify and rank the factors using ISM approach to find out the effectiveness of virtual education on academic performance in management institutions in Delhi - NCR. The ISM approach suggests the use of expert opinions to develop the contextual relationships among the variables. The experts who have given contributions in this study were from academia and industry. In this study, for identifying the contextual relationships among the variables, five experts, two from the industry and three from the academia were consulted. The experts were selected because they are conversant with the field of the study.

To collect the data about the relationships among the variables, a questionnaire was administered to each expert. The profile of the experts is shown in Table 1. The researcher presented the research objective and clarified the meaning of each variable. This step provides necessary support for making the respondent understand the relationships among the variables. This was followed by analyzing the relationships identified. The results were then discussed with the experts and a final matrix was achieved reflecting the experts' consensus on their judgements.

Table 1: Profile of the experts

Expert	Research Area	Designation	Affiliation	Years of Experience
Academic 1	Member of research team on NEP 2020	Professor	Jamia Millia Islamia, Delhi	More than 30 years of experience
Academic 2	Research on sustainable supply chain	Professor	IMT Ghaziabad	More than 25 years of experience
Academic 3	Sustainable Oriented Innovation, Industry 4.0, Circular economy	Associate Professor	IIM Rohtak	More than 20 years of experience
Academic 4	Member of research team on NEP 2020	Professor	AICTE	More than 20 years of experience
Academic 5	Artificial Intelligence, Sustainable Supply Chain	Professor	IIM Lucknow	More than 18 years of experience
Academic 6	Innovation Management, Technology Management	Associate Professor	Sharda University	More than 10 years of experience
Company 1	Strategy Management	Manager	Microsoft	More than 8 years of experience
Company 2	Artificial Intelligence, Machine Learning	Manager	Deloitte	More than 7 years of experience

Company 3	Marketing	Team Manager	KPMG	More than 5 years of experience

3.2 The Structural Self Interaction Matrix

To analyze the relationships among the variables identified by the review of literature, a contextual relationship of "A leads to B" was selected as the focus. This means that experts were asked to identify the extent to which one variable leads to another. Keeping in mind the contextual relationship for each source, the existence of a relationship between any two sources (i and j) and the associated direction of the relation are questioned. Based on the contextual relationships the SSIM (Table2) is developed for the given variables identified for the effectiveness of virtual education on academic performance in Management Institutions in Delhi- NCR.

Table 2: Structural Self Interaction Matrix

	9	8	7	6	5	4	3	2	1
1. STUDENT MOTIVATION	A	A	A	A	A	A	A	A	
2. STRESS MANAGEMENT	A	A	A	A	A	A	A		
3. TEACHER SUPPORT	A	A	A	A	A	X			
4. ASSESSMENT OF PROGRESS	A	A	A	A	A				
5. TECHNOLOGY SUPPORT	A	A	A	A					
6. COURSE CONTENT DESIGN	A	A	X						
7. ADMINISTRATIVE SUPPORT	A	A							
8. RESISTANCE TO CHANGE	A								
9. SELF-EFFICACY									

V – measure i will help achieve measure j; A – measure j will be achieved by measure i; X – measure i and j will help achieve each other; O – measure i and j are unrelated

3.3 Reachability Matrix

The SSIM is transformed into a binary matrix, called the initial reachability matrix by substituting 1 or 0 for the original symbols, V, A, X and O. The rules for the substitution are the following:
(1) If the (i, j) entry in the SSIM is V, then the (i, j) entry in the reachability matrix becomes 1 and the (j, i) entry becomes 0.
(2) If the (i, j) entry in the SSIM is A, then the (i, j) entry in the reachability matrix becomes 0 and the (j, i) entry becomes 1.
(3) If the (i, j) entry in the SSIM is X, then the (i, j) entry in the reachability matrix becomes 1 and the (j, i) entry becomes 1.
(4) If the (i, j) entry in the SSIM is O, then the (i, j) entry in the reachability matrix becomes 0 and the (j, i) entry also becomes 0.

Following these rules, the initial reachability matrix for the variables is obtained. The final reachability matrix is obtained by incorporating the transitivities as enumerated in step 4 of the ISM approach. This is shown in Table 3. In this table, the driving power and dependence of each variable is also shown. The driving power of a particular variable is the total number of variables (including itself) which it may help achieve. The dependence is the total number of variables which may help achieve it. The driving power and dependence power will be used in the MICMAC (impact matrix cross-reference multiplication applied to a classification) analysis (Section 5), where the performance measures will be classified into four groups, as autonomous, dependent, linkage and independent.
Table 3: Final Reachability Matrix

VARIABLES	1	2	3	4	5	6	7	8	9	DRIVING POWER
1. STUDENT MOTIVATION	1	0	0	0	0	0	0	0	0	1
2. STRESS MANAGEMENT	1	1	0	0	0	0	0	0	0	2
3. TEACHER SUPPORT	1	1	1	1	0	0	0	0	0	4
4. ASSESSMENT OF PROGRESS	1	1	1	1	0	0	0	0	0	4
5. TECHNOLOGY SUPPORT	1	1	1	1	1	0	0	0	0	5
6. COURSE CONTENT DESIGN	1	1	1	1	1	1	1	0	0	7
7. ADMINISTRATIVE SUPPORT	1	1	1	1	1	1	1	0	0	7
8. RESISTANCE TO CHANGE	1	1	1	1	1	1	1	1	0	8
9. SELF-EFFICACY	1	1	1	1	1	1	1	1	1	9
DEPENDENCE POWER	9	8	7	7	5	4	4	2	1	

3.4 Level Partitions

The reachability and antecedent set for each variable is found from the final reachability matrix (Warfield, 1974). The "reachability set" for a particular variable consists of the variable itself and the other variables which it may help achieve. The "antecedent set" consists of the variable itself and the other variables which may help in achieving it. Subsequently, the intersection of these sets is derived for all variables. The variable for which the reachability and the intersection sets are the same is given the top-level position in the ISM hierarchy, as they will not help achieve any other variable above their own level. After the identification of the top-level element, it is discarded from the other remaining variables. This iteration is repeated till the levels of each source are found out (Tables 4 and 5). The identified levels aid in building the digraph and the final model of ISM.

Table 4: Partition of reachability matrix: interaction 1

Variables	Reachability Set	Antecedent Set	Intersection Set	Level
1	1	1,2,3,4,5,6,7,8,9	1	I
2	1,2	2,3,4,5,6,7,8,9	2	
3	1,2,3,4	3,4,5,6,7,8,9	3,4	
4	1,2,3,4	3,4,5,6,7,8,9	3,4	
5	1,2,3,4,5	5,6,7,8,9	5	
6	1,2,3,4,5,6,7	6,7,8,9	6,7	
7	1,2,3,4,5,6,7	6,7,8,9	6,7	
8	1,2,3,4,5,6,7,8	8,9	8	
9	1,2,3,4,5,6,7,8,9	9	9	

Table 5: Partition of reachability matrix

Elements	Reachability Set	Antecedent Set	Intersection Set	Level
1	1	1,2,3,4,5,6,7,8,9	1	I
2	2	2,3,4,5,6,7,8,9	2	II
3	3,4	3,4,5,6,7,8,9	3,4	III
4	3,4	3,4,5,6,7,8,9	3,4	III
5	5	5,6,78,9	5	IV
6	6,7	6,7,8,9	6,7	V
7	6,7	6,7,8,9	6,7	V
8	8	8,9	8	VI
9	9	9	9	VII

3.5 Formation of ISM Model

From the final reachability matrix, the structural model is generated. If a relationship exists between the variables j and i, an arrow pointing from i to j shows this. The resulting diagram is called a digraph. Removing the transitivities as described in the ISM approach, the digraph is finally converted into the ISM model as shown in Figure 2. It can be seen from the diagram that self-efficacy is a very significant factor to assess the effectiveness of virtual education on the academic performance of

management institutions. Student motivation appears at the top of the hierarchy, implying that it depicts the success obtained in making the study online.

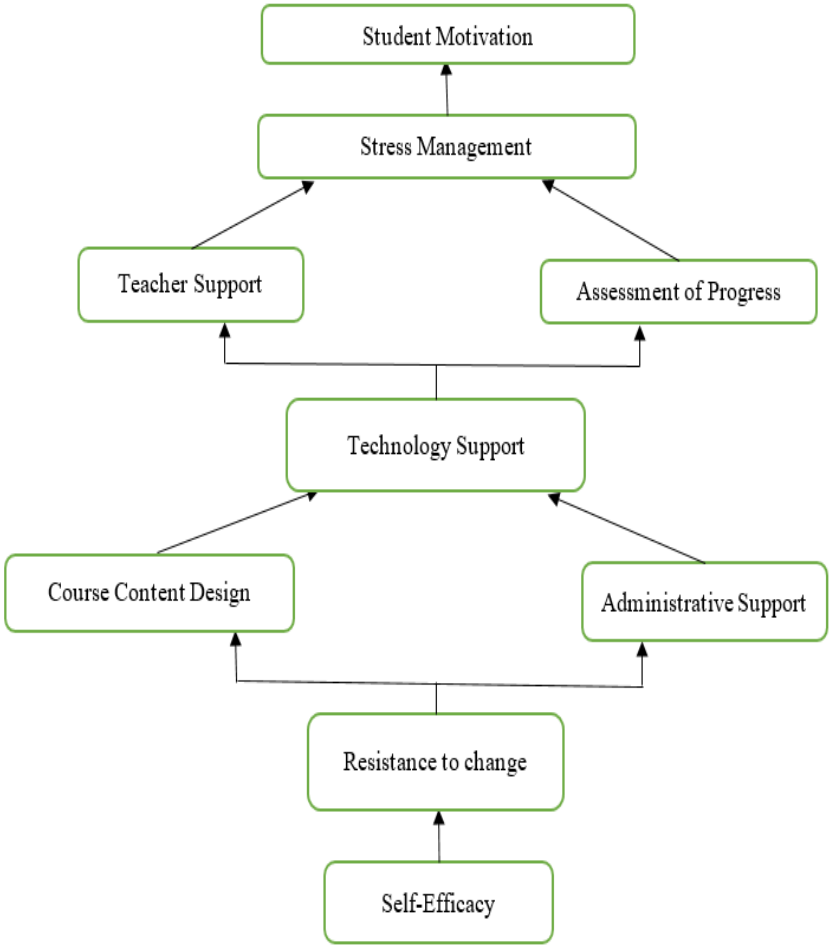

Figure 2: Final Diagram of the relationships amongst the factors

3.6 MICMAC Analysis: Classification of factors

All performance measures have been classified into four categories, based on their driving power and dependence (Table 3). The four categories are:

- Autonomous measures;
- Dependent measures;
- Linkage measures;
- Independent measures.

This classification of factors is similar to that used by Mandal and Deshmukh (1994). The driving power and dependence diagram for the suggested factors is shown in Figure 3. The first cluster in Figure 3 represents the category of autonomous variables. These variables have little driving and little dependence power. The present study involves no autonomous variables. The second cluster consists of dependent variables that have a little driving power but strong dependence. In the present study, factor 1(Student Motivation), factor 2 (Stress Management), factor 3 (Teacher Support) and factor 4 (Assessment of Progress) are in this category. The third cluster consists of linkage variables. These are those variables which have high driving and high dependence power. Any action on these factors will have an effect on the other factors and also a feedback effect on themselves. Factor 5(Technology Support) is the linkage variable in the present study. The fourth cluster includes independent variables that have strong driving power but low dependence power. In the present case, factor 6(Course Content Design), factor 7(Administrative Support), factor 8(Resistance to Change) and factor 9(Self Efficacy) serve as the independent variables.

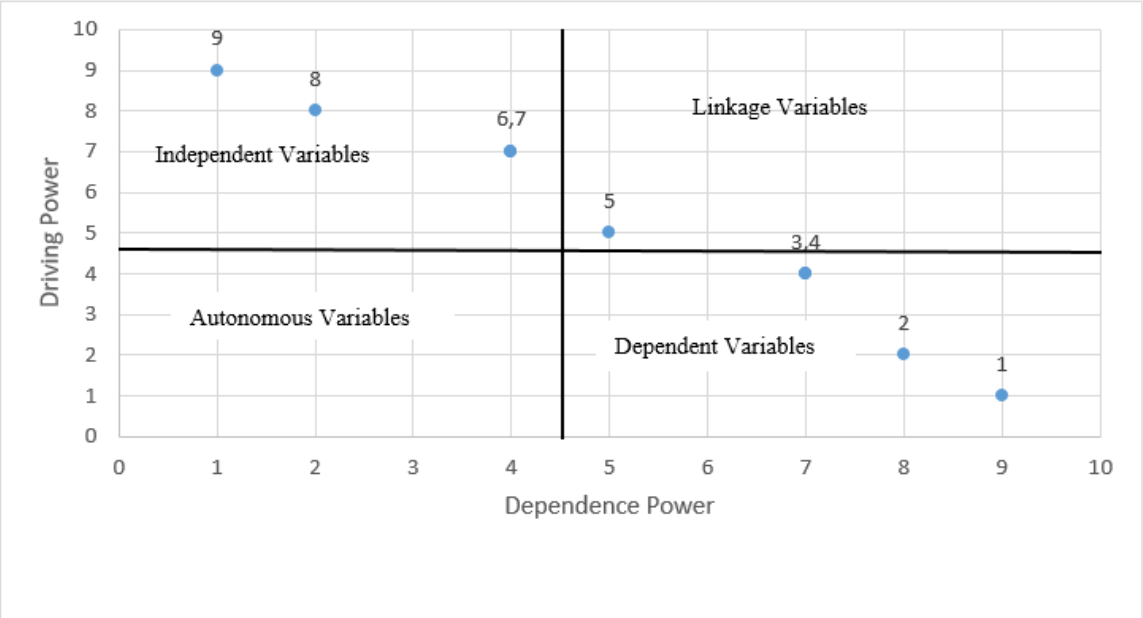

Figure 3: Suggested Clusters of factors

The results from ISM methodology indicate that the factor "Self Efficacy" forms the base of the ISM Model. Thus high priority should be placed to this source as this would drive other factors. Moreover, the ISM model provides an understanding of the relationships amongst the various factors which influence the effectiveness of the virtual education on academic performance of the students. The MICMAC analysis helps to classify the factors under autonomous, linkage, dependent and independent categories. The factor "Self Efficacy (factor 9)" which forms the base of the ISM model is categorized as independent variable from Figure 2. The factors which are at the top of the ISM model i.e. "Student Motivation (factor 1)" and "Stress Management (factor 2)" are categorized as dependent variable in MICMAC analysis.

DISCUSSION ON THE FINDINGS

The COVID-19 pandemic has posed a significant challenge to higher education and forced academic institutions worldwide to abruptly shift to remote teaching. Due to the emerging transition, higher education institutions have continuously faced difficulties creating satisfactory online learning experiences for the students. The present study lays emphasis on the effectiveness of virtual education on academic performance in higher education institutions. The authors in the present study attempt to present a framework to analyze the effective factors which influence the academic performance of the students in higher education institutions. Extensive literature review and valuable experts' inputs during brainstorming sessions enabled to carry out this study. Nine important variables were finalized during the brainstorming session. However, most of the researches in the field of online learning has been carried out assessing the academic performance of medical students. It has been identified from the review of literature that inadequate research has been conducted considering the academic performance of the students of higher education institutions in the field of management taking into account Indian perspective. Moreover, research involving modeling of the factors providing probable solutions for making online learning more effective has been done inadequately in the Indian context. The present study proposes a framework in which self-efficacy forms the base of the model. The resistance to change, and readiness for change in academics in e learning in HEIs have garnered increasing attention in recent years (Haffar et al., (2023)). The readiness for change reflects major psychological issues faced by the students when undergoing transition to virtual learning. The findings of the present study support the results of Haffar et al., (2023) where readiness to change is inferred as the main construct. A few researchers such as Paliwal and Singh (2021), Salvato and Rerup (2011) have given their conclusions that self-efficacy is the main parameter which drives commitment to change towards online learning. The outcome of the framework is the student's motivation. The motivation of students will get impacted if the factors at the middle level are managed properly. Further, the results of the MICMAC analysis have been summarized as follows: The cluster 1 has no variables depicting that there are no autonomous variables in the present study. Cluster 2 in the MICMAC analysis shows the dependent variable region. In the present study, factor 1(Student Motivation), factor 2 (Stress Management), factor 3 (Teacher Support) and factor 4 (Assessment of Progress) are in this category. The variables in this category represent the outcomes. Cluster III denotes the third quadrant of MICMAC analysis and represents the linkage variables region. These are those variables which have high driving and high dependence power. Any action on these factors will have an effect on the other factors and also a feedback effect on themselves. Factor 5(Technology Support) is the linkage variable in the present study. For the academic institutions, support provided by the management in terms of finance is the main

actor that governs the stability of the factor "Technology Support" and thereby maintaining link between driving and driven factors. The fourth cluster includes independent variables that have strong driving power but low dependence power. Thorough observation implies that factor 6(Course Content Design), factor 7(Administrative Support), factor 8(Resistance to Change) and factor 9(Self Efficacy) serve as the independent variables. These factors are the main drivers which will influence the academic performance of the students when teaching virtually. These findings also expand the research of Al-Kahtani, N. (2022) by offering evidence about the relationship between the factors affecting e learning in educational settings.

4.1 Theoretical Implications

The current research addresses the call of previous research studies (Haffar et al., 2013; Holt et al., 2007; Jones et al., 2005; Olafsen et al., 2021) to investigate about the various factors that influence the academic performance of the students studying in higher education institutions in Indian context. Drawing from the Social Cognitive Theory, a framework is developed that depicts relationships amongst various factors affecting the academic performance of the students studying in higher education institutions. The present research will help to theorize the mechanisms of the connection between self-efficacy and student motivation. Our findings show that different factors are influenced by self-efficacy which drives the other factors. This helps in identifying the most vital factor which the institutions should pay attention to enhance the level of effectiveness in academics among the students of higher education institutions to make them ready for e learning for the challenges in the future.

A significant theoretical contribution of this study is the role of social cognitive theory behavioral, environmental, and personal components in generating and driving change in HEIs. Based on the findings of this study, HEIs must consider the association between technology support and teacher support to e-learning changes to successfully implement online learning during and after the COVID-19 pandemic. When individuals contribute to substantive changes in the online learning environment at various times of their careers, they indirectly influence notable events in their lives. This conviction underscores the very essence of the theory and is verified by our findings.

4.2 Practical Implications

The concept of online learning seems to be here to stay. A paradigm shift was established in the teaching practices of the HEIs within months of the start of the coronavirus pandemic as academics acquired online experience. HEIs must be encouraged to think about online learning and train their academic staff to become proficient with the relevant technologies and software related to learning and teaching. One of the significant implications of the present research is that the educational institutions should pay attention to enhancing the required infrastructure by providing the administrative support following the challenges faced during COVID-19. This would benefit the students in building their capacity so that transition towards virtual education can be obtained smoothly in the future. The enhanced infrastructure would provide the needed technology support to support the teachers to learn new e learning tools. Higher educational institutions would also be better aligned with global practices for any future unexpected disruption.

The study has demonstrated that to raise the effectiveness of virtual education in academics, student efficacy should be built by using e learning tools. This will motivate the future workforce and will foster effective commitment to e learning.

CONCLUSION & FUTURE WORK

Based on the literature review and expert opinions, a number of factors based on student perception which can influence virtual education in management institutions in Delhi NCR have been identified. The nine factors identified in this research have significant overlaps and relationships that are sometimes difficult to see. A more complete understanding of these factors and their relationships, through logical structure, will help academic institutions to make better decisions to make virtual learning more impactful. It will also force the administration of academic institutions to be very specific about their performance priorities for effective penetration of the virtual education among the students. The measures proposed in the manuscript have been taken from the opinion of the experts and the review of literature and it presents the measures in the hierarchical manner and clusters them into driver and dependence categories. Accordingly, the ISM model proposed in the present study can provide the decision maker with a more realistic representation of the problem. However, the research findings are tempered by some shortcomings. ISM can only act as a tool for imposing order and directions on the complexity of relationships among the variables. It does not suggest any relative weights associated with the variables (Kannan et al., 2008). Even so, this model can be applied with other approaches such as the Analytical Network Process (ANP) (Saaty, 2001), which requires a decision structure to help determine the weights of each risk source. Simulation and systems dynamics modeling may also be used to help identify how various factors will influence it and its performance results. In the future work we can quantify the opinion of the experts. This depends upon the degree of inheritance of various variables and the amount of interaction that is possible by using Delphi, AHP, ANP, SEM or fuzzy logic. While using graph theory and matrix methods the interaction among the variables can be easily analyzed and transformed into mathematical equations. SEM requires larger sample to carry out further research. Thus due to complementary nature of ISM and SEM, it could well be a fruitful approach if future research were directed first at developing an initial model using ISM and then testing it statistically using SEM.

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