Factors Influencing the Adoption of e-Learning Technologies: An Indian Perspective

Prakash Khundrakpam, Khundrakpam Devananda Singh, and Elangbam Nixon Singh

Abstract—The importance of e-learning has become very significant across the globe in recent decades. India, with a burgeoning learning environment and huge prospect of human capital is at the forefront of such changes. As a result, stakeholders are increasingly opting for extensive use of available technologies in this context. The objective of this study is to draw the factors influencing the adoption of e-learning technologies by school teachers. Data collected from 85 teacher respondents through Google Forms questionnaire were analysed. Principal Component Analysis with Varimax rotation was then applied for the study. As a result of analysis, five factors were drawn and renamed as Prospects: perceived and real; Facilities: availability and accessibility; Material challenges; Assured outcomes and Skill-based challenges. The overall findings of the study conclude that these five factors influence the adoption of e-learning technologies.

Index Terms—Atmanirbhar Bharat, blended learning, e-learning technology, focus group discussion.

I. INTRODUCTION

Education research has constantly focused on online learning as a keyword or concept for more than two decades [1]. The term 'online learning' comprises many diverse and overlapping terms such as e-learning, blended learning, online education, online courses, etc. In this paper, we use the term 'e-learning' to refer to such synonymous practices. The "e-learning" is synonymous with 'online learning' and 'web-based education' and is defined as the use of the internet in some way to improve the communication between teacher and student in the classrooms and also in distance modes [2]. E-learning is the practice of connecting and overcoming the educational gap between the teacher and the student by the use of web-based technologies [3]-[5]. It has also been found that the increasing choices and complexities in the nature and quantity of technologies lead to stress amongst the teachers and students in the e-learning process [6]. In this context, it has also been argued that there is pressure on the teachers who want to adopt e-learning [7], [8].

E-learning has thus become a major component of education globally, including India. Attitude of the user [9], [10], available facilities [9], [11], challenges and opportunities [12], [13] have been quoted to be the important determinants of e-learning activities. The present paper is an investigation on the adoption of e-learning technologies among the school teachers in India.

II. LITERATURE REVIEW

There are widespread evidences of the importance of "attitude" as a factor that influences learning [14], [15]. The learning attitude may differ in accordance with profession, gender, and age. However, in some studies, there is no significant indication of variations in the teacher's attitude and self-efficacy towards e-learning based on their gender and age [16], [17]. The success of the adoption of e-learning technologies rest on the user's attitude towards the concerned technology to be used. In this regard, it is opined that attitude towards technology is one of the major predictors for the use of technology by teachers [18]-[20]. The attitude towards the use of computers in e-learning is influenced by diverse factors including computer confidence and computer liking [21], achievement of the users [22], achievement and value creation [23], self-efficacy [24], gender and age [25], [26], subject domain [20], and the technology level [27]. It has also been argued that there are various advantages of using e-learning platform in computer-based tests of students and is acceptable to both teachers and students [28]. In a scholarly article, Lakshmi, Das, and Majid also found a positive perception towards the concept of e-learning among the teacher respondents [29]. E-learning is the most preferred learning method among students [30].

Previous research findings have also proved that institutions, policymakers, and implementing bodies need to take more initiatives for increasing e-learning facilities in educational institutions [31], [32]. The facilities available to the person who is the end-user are the most important factors that influence the adoption of e-learning practices [33]-[35]. Poor connectivity and non-availability of e-learning devices are the most common experiences among the people in North-East India [36]. In addition, unreliable technology and lack of self-confidence to engage in e-learning activities among teachers are the challenges in adopting e-learning practices [33], [35], [37]. In this context, the precondition for the improvement of e-learning adoption is to have knowledge on different barriers to the effective use of technology in teaching-learning process [38]. Lack of technological knowledge is one of the main burdens to the adoption of e-learning [39]-[42].

On the other hand, there are various prospects of e-learning that have been identified by previous studies. The benefits gained due to the adoption of e-learning are saving

time and space [43], ease of access, locational advantage, lower cost [44], performance improvement, skill development [45], and building confidence [46], [47]. In a scholarly article, it was also found that the performance of the students and the efficiency of teaching practices increased in a direct proportion with the greater the use of e-learning resources and tools within an educational context [48].

From the review of literature, it is acclimatized that Attitude of the User (AU), Available Facilities (AF), Various Challenges (VC) and Numerous Opportunities (NO) are some of the factors influencing the adoption of e-learning technology.

III. OBJECTIVES

The objective of this study is to draw the factors influencing the adoption of e-learning technologies amongst the school teachers.

IV. METHODOLOGY

A. Participants

Data were collected from 94 participants through online mode by sharing a Google Forms questionnaire link from 24th August to 9th September, 2020. 85 voluntary responses were found valid and considered for further analysis. They consisted of 33 males and 52 females who were working in 15 different schools in the study area. The respondents were in the age group of 20-30 years (36.5%), 31-40 years (35.3%), 41-50 years (16.4%) and 50-60 years (11.8%) respectively. There were 41 Post Graduates and 44 Graduates. 36 teachers possessed Bachelors of Education (B. Ed.) qualification. Out of the total participants, 5.9% were principals and 24.7%, 28.2%, 21.2% & 20% were PG Teachers, Graduate Teachers, Middle School Teachers and Primary Teachers respectively. 54.1% of them have a teaching experience of more than five years and the remaining 45.9% had experience of more than two years but less than five years. Out of 85 respondents, 80 have responded on their monthly income and among them 22.7% have monthly income of more than 55,000 Indian Rupees (INR) and 64% are in the monthly income range of 15,000 INR to 25,000 INR.

B. Sample and Questionnaire

The study was conducted in West Garo Hills District of Meghalaya, North-Eastern Region (NER) of India. The authors have physically verified the schools, in the study area, have minimum basic e-learning facilities. Initially, a Focus Group Discussion (FGD) was held with 8 senior teachers to discuss the general scenario of e-learning in the district. The authors used ethnographic analysis of the discussion and subsequent commentaries to draw various themes related to the topic. It is already stated that AU, AF, VC and NO are the common factors influencing the adoption of e-learning technology. Based on the initial review of the literature and also from the vigorous ethnographic analysis, four determinants (AU, AF, VC and NO) of adoption of e-learning were drawn. This was followed by a further literature review to check and review the validity of the determinants drawn previously. Having done so successfully, the questionnaire for this paper was conceived by also aligning with the findings of [47], having 25 items was constructed by the authors. A series of FGDs was then again held with the aforementioned 8 senior teachers to discuss the relevancy of the questionnaire items in the study area. After thorough discussions, 23 items were finalized for the study and the same were administered in the questionnaire. It is worth mentioning here that the two items were avoided as it was not suitable for the area of study concerned and the deletion of the two items were affirmed by the result of numerous FGDs. On the other hand, the other 23 items were found suitable for the study in terms of study area perspectives and as an outcome of various FGDs. Each item was scored on a four-point scale.

C. Statistical Analysis

Principal Component Analysis (PCA) with Varimax rotation, Bartlett's Test of Sphericity and Kaiser-Meyer-Olkin (KMO) were applied for the study. The reason for adopting PCA with Varimax rotation in this study is to simplify the complexity in the collected high-dimensional data while retaining its trends and patterns. It transforms the data into fewer dimensions or components, with the objective of finding the finest summary of the data.

Statistical Package for the Social Sciences, Version 20 (SPSS-20) [49] is a statistical software developed by International Business Machines (IBM) Corporation, New York, United States of America for data analyses and management. It is a widely used data analyses software in social science research. This software was used to analyse data in this study.

V. FINDINGS

Altogether, 23 items AU (5), AF (7), VC (6) and NO (5) [see Table I] were subjected to PCA with Varimax rotation. Bartlett's Test of Sphericity was significant at p < .001 and KMO was measured at .74 which was acceptable.

The total variance explained of the analysis identified a 6-component structure with initial Eigenvalues more than 1.0 and cumulative total variance explained at 68.5%. The identified component structure was also supported by Scree plot. The component-wise factor loadings of each item are shown in Table I.

Based on the factors loaded in the components, the influencing factors in each component are renamed as in Table II.

TABLE I: COMPONENT-WISE FACTOR LOADINGS OF ITEMS

Items	Components					
	1	2	3	4	5	6
(A1) E-learning in school education is important.	**0.777**	-0.181	-0.116	0.176	0.069	0.273
(A2) E-learning can counter the shortcoming in traditional learning.	**0.792**	0.076	-0.051	-0.043	-0.143	0.281
(A3) E-learning has an impact on your daily life.	**0.659**	0.189	-0.030	0.085	0.041	-0.175

(A4) E-learning technology has enhanced communication between teachers and students.	**0.528**	0.333	-0.250	0.011	-0.096	-0.363
(A5) Use of e-learning technologies can raise the educational standards.	**0.627**	-0.037	-0.271	0.337	0.084	0.184
(F1) I have a laptop computer that can be used for e-learning.	0.370	0.126	-0.106	-0.081	**0.680**	0.360
(F2) I have a smartphone that can be used for e-learning.	0.270	0.448	0.306	-0.120	0.417	0.277
(F3) There are internet facilities at home.	0.118	0.294	-0.078	0.041	0.045	**0.766**
(F4) Enough computer sets are available at my school.	0.013	**0.802**	-0.040	0.235	-0.164	0.099
(F5) There are internet facilities at school.	-0.031	**0.727**	-0.177	0.144	-0.293	-0.012
(F6) Projectors & Projector screens are available in the school.	0.061	**0.775**	0.056	-0.117	0.008	0.111
(F7) Pen drives are available for teaching and learning process.	0.149	**0.674**	-0.273	0.091	0.233	0.030
(C1) Teachers do not have equal access to e-learning facilities and tools.	-0.110	-0.157	0.322	0.020	**0.720**	-0.082
(C2) Teachers are afraid of operating computers and other e-learning tools.	0.005	-0.214	0.312	0.381	**0.658**	0.005
(C3) Internet connection is not always available due to one or the other reason.	-0.051	-0.014	**0.571**	0.184	0.242	0.448
(C4) The erratic power supply is a major challenge to e- learning.	0.080	-0.345	**0.756**	0.046	0.053	0.038
(C5) High cost of software is also a major challenge to e- learning.	0.015	0.013	**0.801**	-0.014	0.259	-0.199
(C6) E-learning motivates me to acquire new knowledge.	**0.783**	0.059	0.303	0.171	0.087	0.064
(P1) E-learning has helped me to overcome the problem of shortage of learning resources.	**0.742**	-0.005	0.259	0.312	0.113	-0.055
(P2) E-learning will promote distance learning if adequately utilised.	**0.581**	0.219	0.261	0.397	0.086	-0.281
(P3) E-learning will extend the frontiers of knowledge in the nearest future.	0.545	0.078	0.098	**0.634**	0.038	-0.151
(P4) E-learning will eradicate e-illiteracy in our society.	0.248	0.186	0.108	**0.710**	-0.027	0.121
(P5) E-learning will make school education generally more effective.	0.542	0.017	-0.198	**0.623**	0.214	0.073

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

Note: Lettered numbers in parentheses indicate item number in the questionnaire.

Source: PCA output from SPSS

TABLE II: NAMING OF FACTORS INFLUENCING TO THE ADOPTION OF e-LEARNING TECHNOLOGIES

Components	Loaded Factors	New Factor Name
1	A1, A2, A3, A4, A5, C6, P1, P2	Prospects: perceived and real
2	F4, F5, F6, F7	Facilities: availability and accessibility
3	C3, C4, C5	Material challenges
4	P3, P4, P5	Assured outcome
5	F1, C1, C2	Skill-based challenges

Source: Researchers' factor naming

Note: Component 6 was not considered as it has single item indicator.

VI. DISCUSSION

This study investigated various factors which may influence the adoption of e-learning technologies in the study area. The questionnaire items were developed through rounds of FGDs with select respondents. From the result of PCA, the study identified a 6-component structure. Items with factor loadings of more than 0.5 were considered. In this regard, component 1 consists of 8 items, component 2 with 4 items, components 3, 4 and 5 with 3 items each and component 6 with 1 item. There are evidences that the use of single-item indicator is biased and necessitates the use of multiple indicators [50]-[52]. Therefore, Component 6 with a single item was not considered. The remaining five components were named as:

1) Prospects: perceived and real
2) Facilities: availability and accessibility
3) Material challenges
4) Assured outcomes and
5) Skill-based challenges.

As evident from the review of literature, several prospects of e-learning have already been identified by previous studies. Such studies have also noted that facilities and their availability impact and influence the adoption of e-learning. The need to tide across material and skill-based challenges to realize the assured outcomes is also evident. In the first component, we accounted for the perceived and real prospects of e-learning such as the enhancement of connectivity between teachers and students, overcoming the shortcomings of traditional learning systems, increasing educational standards and facilitating quality distance education. The second component accounted for the availability and accessibility to facilities that influence e-learning such as access or lack of access to laptops, smartphones, a proper internet connection and equipment such as pen drives. The third component looked at challenges such as erratic power, disruptive internet and high cost of software that impacts e-learning. Similarly, the fourth component addressed assured outcomes and the fifth, skill-based challenges such as the unease or in worse cases, the inability of teachers to operate computers and e-learning platforms.

Additionally, the items under Component 4 show similarities with items under Component 1. It might seem tempting to argue that there is no basis for the differentiation of Components 1 and 4. Such an argument is misleading because, on close observation of the items (P3, P4 and P5), they exhibit certain characteristics that deviate them from the items in Component 1. First, they relate to only future prospects of e-learning that the respondents have not felt yet. (Note that Component 1 = Prospects: real and perceived and includes the impact of e-learning that the respondents have experienced already). In addition, the use of the imperative in the items (P3, P4 and P5) signifies that the respondents have

a deeper sense of conviction about the occurrences of items under Component 4 compared to the items under Component 1, which are merely general probabilistic statements.

In the Indian context, the Government of India is taking various initiatives for the promotion and enhancement of e-learning in the country. Study Webs of Active Learning for Young Aspiring Minds (SWAYAM), Diksha, E-Pathshala, National Repository of Open Educational Resources (NROER), e-yantra, Open Source Software for Education (FOSSEE) etc. can be mentioned as e-learning platforms. Such policy interventions are welcome and will go a long way in improving access and penetration of e-learning in the country.

VII. CONCLUSION

From the study, five factors were drawn and renamed as Prospects: perceived and real; Facilities: availability and accessibility; Material Challenges; assured outcomes and Skill-based challenges. The influencing factors drawn as a result of analyses in this paper, in each component, are aligned with the findings of R. K. Soni [53]. The overall findings of the study conclude that the above-mentioned five factors influence the adoption of e-learning technologies, in the Indian context. There is an urgent need to scale up the outreach and adoption of various policy initiatives taken up by the government to increase the penetration and consequent adoption of such e-learning technologies in the country. Such a need is also aggravated by the COVID-19 pandemic and the consequent lockdown resulting in online classes all over the country. Such initiatives will go a long way in further developing the techno-educational landscape in India and usher in the transformation of the educational sector.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHOR CONTRIBUTIONS

Prakash Khundrakpam prepared the questionnaire, developed methodology, performed analysis and wrote draft manuscript. Khundrakpam Devananda Singh conceived and designed the study, collected data, developed methodology, performed analysis, wrote draft manuscript, reviewed and edited the manuscript. Elangbam Nixon Singh developed methodology, reviewed and edited the manuscript. All authors have read and approved the final version of the manuscript.

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