Assessment of Innovative Technologies in India's Education Sector: Scope and Challenges

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Abstract
Traditionally, education has been imparted through classroom teaching methods. This classical approach is slowly changing with the application of Information Technology in education, making it accessible and cost effective. India has steadily adopted the concept of e-Learning, which means using innovative technologies to bring education in the online domain. e-Learning provides a solution, which offers flexibility in learning and diversity in pedagogy for students and teachers. This paper brings out the role of e-Learning in changing the landscape of education system in India. The main aim of this paper is to present a qualitative study of the current innovative technologies being used in education sector in India along with an assessment of the polices related to it. While there is little doubt that the use of digital technologies has improved access to education, enhanced educational attainment levels and enriched the teaching and knowledge gaining experience. However, there exists a research gap regarding the magnitude of these improvements and the current bottlenecks in this area. This paper attempts to bridge this gap by making an assessment of the Government initiatives and their impact using data from both official reports and non-government studies. Some suggestions have also been proposed to address the challenges being faced at ground level. e-Learning has tremendous potential to make education accessible in India, however, it needs more financial resources and better coordination between bureaucratic agencies in order to become successful.

Keywords: E-Learning, Information & Communication Technology (ICT), Digital India, Higher Education

1. Introduction

e-Learning has become increasingly popular in Higher Education sector over the last few decades. The rapid increase in internet-connectivity has propelled the growth of web-based learning platforms (Department of Telecommunications, 2018, p. 10). The concept of e-Learning is an amalgamation of various features such as online learning, virtual learning, distributed learning and open-source learning. In India, e-Learning is accelerating its growth into modern educational systems. Communication satellites, computer networks and emails are supplementing face-to-face learning. During the last century, the Indian education system was heavily characterized by conventional methods of teaching, where students relied on knowledge only from books. Penetration of technology in education has brought a knowledge revolution by creating additional platforms, which add to the resource availability for students and teachers (Bajpai, Biberman, & Sharma, 2019). This has not only made education more accessible but has also resulted in overall improvement of results. Further, the introduction of Information & Communication Technology (ICT) in Higher Education has created opportunities for many educational start-ups to adopt effective teaching and learning pedagogies to cope up with the changing trends in education sector.

In recent years, higher education system has dramatically improved in India and one of the factors is the launch of Digital India campaign in 2015. Launched by the Government of India as a national programme to promote electronic service delivery platforms, it aims to transform the country into a digitally empowered society. e-Learning is one of the aspects of the Digital India initiative and many programmes are currently being implemented to promote online education (MEIT, 2019).

2. Research Objectives

i. To examine various developments in Higher Education after the launch of Digital India campaign.
ii. To examine the impact of e-Learning on Higher Education in India.

3. Adoption of e-Learning in the Conventional Mode of Learning

"Rote learning, reliance on printed material or book-based learning are the characteristic of the conventional teaching practice." (Fry, Ketteridge, & Stephanie, 2009). Even though it cannot be claimed that conventional mode of learning will be completely replaced by online learning, however, the progress suggests that the traditional characteristics are gradually changing now. Online education provides a more holistic method of teaching with emphasis on interactive engagement, participation and discovery rather than only passive absorption of facts. Now many higher educational institutions provide personalized and multi-disciplinary courses, access-cum-computing devices to students and teachers and web content to all learners across the country.

e-Learning has been adopted as an essential strategy by institutions to deliver information. Many business models have been established to expand the scope of online education in India. Initially effort has been made to develop a platform that connects prospective students and content providers. Such platforms have played an important role in connecting content providers and curators. In India business models

like consumer-to-customer (C2C), Business-to-Business (B2B) and Business-to-Customer (B2C) have been launched to meet the present-day requirements of customers. The C2C model provides a platform that "connects prospective teachers with students whereas B2B business model is prevalent in higher education, where institutes offer degree or diploma courses to students either through their own platform or third-party aggregators." (KPMG, 2017). According to an analysis "the online education system in India currently stands at US $247 million with an average of 1.6 million users; it is expected to grow to US $1.96 billion with around 9.6 million users by 2021." (Palvia, et al., 2018). This complements the rapid growth and penetration of internet in the deepest corners of India. At the end of March 2020, India witnessed a quarterly growth of 3.4% in the number of internet subscribers as per Telecom Regulatory Authority of India (TRAI) (IBEF, 2020), which roughly translates to an internet penetration of 31%.

4. Digital India and e-Learning platforms to promote Higher Education in India

There are three segments of higher education in the country – undergraduate level, graduate level and doctoral level. University Grants Commission (UGC) is the central regulatory authority which gives affiliation to the universities. There are also individual agencies such as All India Council for Technical Education (AICTE), Medical Council of India (MCI), etc. responsible for the regulation, coordination and development of higher education in India. These bodies along with UGC have stared emphasizing on promotion of online learning in higher education (Shah, 2015). Their efforts are supported by Government of India through its Ministry of Human Resource Development (MHRD).

Several schemes have been introduced under the ambit of Digital India campaign in this regard. Some of the important programmes to promote online education include Massive open online courses MOOCs, The 'Study Webs of Active Learning for Young Aspiring Minds' (*SWAYAM*), The National Mission on Education through Information Communication Technology (NMEICT), National Digital Library NDL, The Free and Open-Source Software for Education (FOOSE) and ARPIT. These are briefly explained as under:

4.1 Massive Open Online Courses (MOOCs): It is a prominent digital tool used for open and distance learning in higher education. It provides open access to self-learning environments that helps students to connect to the global learning platforms. Courses offered under MOOCs are made available using *Swayam* platform. The knowledge resources are mostly available in the form of recorded lectures delivered to the large-scale participants. At present nearly 84.3% post-secondary degrees and nearly 40% graduate degrees are offered under MOOC's platform (Kumar & Garg, 2020). It was developed by National Knowledge Commission in 2009 with the aim to make knowledge available, connecting different research and educational institutions by the means internet. MOOCs is not only designed to meet the needs of learners but will also serve the purpose of professional training for almost 500 million people by 2022 (Devgun, 2013).

4.2 National Mission on Education through Information Technology (NMEIT): It is a Centrally Sponsored Ccheme that provides high quality interactive course modules using Information Technology. The mission was commissioned in 2009 by MHRD for the purpose of enhancing Gross Enrolment Ratio (GER) in higher educational institutions of India. The three core components of this mission are – content generation, low-cost access to research and development, and providing e-learning facilities in higher education institutes. The e-content is based on the curriculum and includes all the disciplines of humanities, social science, fine arts and natural science. The mission works with the help of one stop education portal-*Sakshat* portal. The helpline provides access to e-learning and ICT based education to all learners. The other digital learning platforms like Learning Management System (LMS) for e-PG *Pathshala* provides an open access and hosted on INFLIBNET server and is also accessible through *Sakshat* Portal (UGC, 2017-18). The programme reaches out to every corner of the country by providing single window access to technology.

4.3 ***SWAYAM*** stands for 'Study Webs of Active-Learning for Young Aspiring Minds programme. It is a digital platform introduced by Government of India to promote lifelong learning and skills. Swayam platform is designed to achieve three principles of education policy- access, quality and equity (Ambedkar, 2020). The courses offered under this platform include school level, undergraduate, post graduate and other professional courses. These courses are free of cost and the candidates who opt for these are awarded with certification and credits on the completion of the course. The important objective is to provide quality in education to achieve digital literacy in a knowledge-based economy (Majumder, 2019). Swayam provides smart delivery of e-content through complete assessment system using audio and video lecture, reading material, online discussions and self-assessment tests. Currently there are thirty-four lakh students enrolled in almost 800 plus courses (MHRD, 2018). Swayam program of Ministry of Human Resource and Development (MHRD) is a robust e-learning platform that aims to bridge digital divide by providing best teaching and learning resources to all students, especially the most disadvantaged. Another most cost-effective means to promote e- learning is through *Swayam-prabha*. These are a set of 32 educational channels that operate through DTH services (Direct-to-Home) throughout the country. These channels are devoted towards telecasting educational programmes by means of GSAT-15 satellite. The motive is to make available high-quality e-content for the students using Swayam-Prabha channels (MHRD, 2020).

4.4 National Digital Library (NDL): It is a virtual repository of e-resources is designed to hold multi-lingual content that serves the students at all academic levels and disciplines. The framework of the project is being developed by IIT Kharagpur**.** The objective is of this project is to provide a single access window to the users, linking national and international digital libraries across globe. The content available to users is in the form of e-books, audiobooks, lecture materials, thesis, reports, articles, journals, question papers and their solutions, simulation tools and video lectures in different streams. NDL India is committed to achieve the long-standby goal of "Education for All" (Rani & Aswath, 2019). It makes knowledge resources available to all the learners at cost-effective and convenient manner. NDL supports the use of technology in key areas like User Interface Federated Search, Interface for Differently-abled Users, Multi-lingual Support, Metadata Extraction, Disaster

Recovery and Analytics. In the present time of Covid-19 pandemic, NDL has bought a paradigm shift by ensuring that every citizen gets technologically empowered through the availability of knowledge resources (Tyagi & Singh, 2014).

4.5 Free and Open-source Software for Education (FOSSE): Free and open access to educational resources has been launched by National Mission on Education through ICT to revolutionize the information shared and disseminated. The idea behind launching of open and free source of education is "freedom to share knowledge", since it emerges out of two terms – Free Software Foundation (FSF) and Open-Source Initiative (OSI). FSF takes a value stand on software development and distribution, while OSI promotes the economic and practical side of Open-Source Software (Moore & Thankachan, 2017). FOSSE is a tool designed to reduce the dependency on proprietary software in educational institutions. The medium of instruction through which knowledge is imparted are as spoken tutorials, documentation, and awareness programmes, such as conferences, training workshops, and internships. It is considered to be highly reliable in terms of performance and security as it has an ability to localize content at low-cost application. The purpose is to ensure the development of digital content to increase productivity and quality of education system in India. This project is being implemented by IIT Bombay (MHRD, 2020).

4.6 Annual Refresher Programme in Teaching (ARPIT): is an online refresher training designed to enhance the professional development of university faculty. The training modules under ARPIT focus on new and emerging trends in education sector, latest pedagogical practices adopted by the academic institutions and trainings sessions on curriculum development. The training material is circulated using Swayam platform and there is an end term examination after the completion of ARPIT course. The course is conducted every year and the refreshers module is developed by National Resource Centre's (NRCs) to ensure career development of academic faculty of the universities.

5. Impact of e-Learning on Higher Education in India

The above discussion gives an indication about the growth of online education in India. Post Covid-19 pandemic, online education has received a huge impetus in all states. The closure of colleges and universities forced all institutions to revamp their infrastructure and provide online education facility to students. The consequence of Covid-19 pandemic on education can be gauged by the fact that MHRD's e-learning platforms saw a nearly five times increase in access by stakeholders (Ministry of Education, 2020). For instance, The National Online Education Platform *SWAYAM* was already having 26 lakh subscribers in 574 courses and post the lockdown in the country, it was access 2.5 lakh time till April 2020 as compared to 50,000 times in March 2020. Similarly, the National Digital Library used to see an average strike rate of 22,000 time daily. However, post Covid-19 pandemic, the average daily strike rate went up to 1,50,000 time and more. These figures show that innovative technologies proved to be a game-changer in delivery of education at the higher education level.

Considering the positive feedback from the stakeholders, Government of India has increased its spending on e-education projects annually. Table 1 below shows the spending pattern of the government from FY 2015-16 to FY 2018-19:

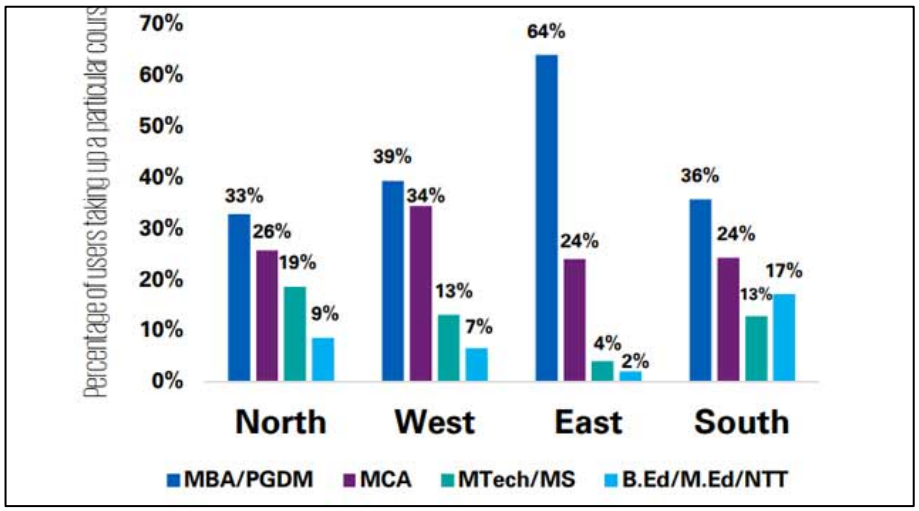
Table 1: Amount spent by Government of India on e-Education projects (Rs. crore)

S. No	Name of scheme	2015-16	2016-17	2017-2018	2018-19
1	SWAYAM project	52.00	61.00	63.07	44.97
2	e-pathshala, NROER, MOOCs (SWAYAM)	1.9	2.17	3.01	1.39
3	e-learning by NIOS	0.77	0.69	0.81	0.50

Source: Ministry of Education, (2018).

The increase in government's expenditure has given a fillip to the adoption of e-education. Further analysis of its impact brings out more trends. According to a report by KPMG and Google (2017), among under-graduate, diploma and post-graduate courses, online education has mostly been dominated by post-graduate courses as can be seen in Graph 1 below:

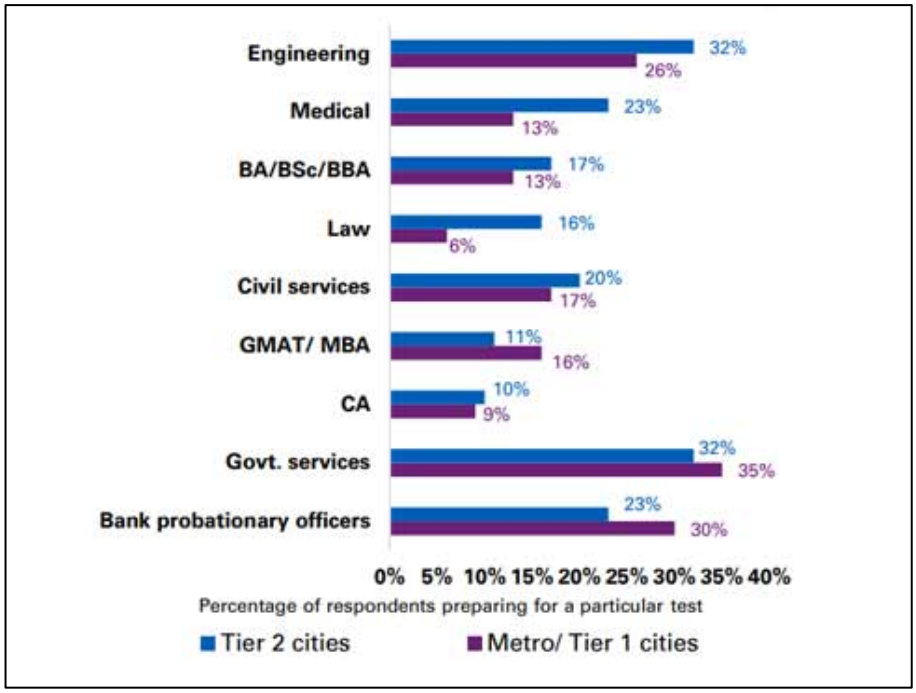
Graph 1: Course-wise preference of online higher education across geographies in India (2017)



Source: KPMG Report: Online Education in India: 2021

The above graph shows that online education for pursuing MBA/PGDM courses is highest among students when it comes to higher education courses. This indicates that students at the higher education level prefer to take online courses which will help them to get jobs easily in future. Further, the study also shows that when it comes to the comparison between Metro/Tier 1 cities and Tier 2 cities, the students in the former cities prefer job-focused online test preparation courses while the students in the latter cities prefer online course focused on undergraduate degrees. This is shown in graph 2 below from the same study:

Graph 2: Tier-wise adoption of test preparation courses (2017)



Source: KPMG Report: Online Education in India: 2021

The above analysis brings out the impact of innovative technologies in supplementing the conventional forms of education in India. Even though it cannot completely substitute the physical classrooms in higher education, it has the potential to be a strong viable option for knowledge delivery. There are many factors which limit the full success of online higher education in India. Firstly, the Gross Enrolment Ratio (GER) in higher education stood at 26.3% in 2019, which was lower than the global average of 36.7% (Ravi, Gupta, & Nagaraj, 2019). This is quite low when considered in terms of the number of youth population in India. A low GER at higher education level means that majority of the students do not pursue higher studies and remains unaffected by the developments in online education. This is compounded by other limitations such as poorly developed digital infrastructure particularly in rural areas/tier 3 cities, lack of uniformity in learning materials and course outcomes, poor teacher training and engagement, etc. These challenges must be overcome in order to reap the full benefits of innovative technologies in education.

6. Conclusions

This paper brings out an assessment of the developments in innovative technologies in higher education in India. It is seen that higher education has greatly benefited from the advancements in online education particularly after post Covid-19 pandemic. By making higher education affordable, easy to access and synchronized with conventional classrooms, e-learning platforms have proved their potential in the present times. The future of online education is bright since it is backed up by huge market size and positive interest of the stakeholders. Efforts need to be made to improve the quality, expand the system and remove the bottlenecks like poor infrastructure, etc. India's higher education will greatly benefit if the new polices such as the National Education Policy 2020 or the proposed National Higher Education Qualification Framework (NHEQF) addresses these challenges.

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