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## A STUDY OF EVOLUTION OF TECHNOLOGY IN HIGHER EDUCATION IN INDIA

Swati R. Gawali

CES's Dr. A. B. Telang Senior College, Nigdi, Pune, India.

### ABSTRACT

Due to New Education Policy 2020, the Indian higher education system is at the brink of transformation. The Global lockdown 2020 has taught the nation that intervention of Information and Communication Technology can minimize the disruptions in the contact-intensive education sector of India and thereby ensure the uninterrupted teaching-learning environment. From then the growing use of Computer, Handheld computing devices, Educational Mobile Applications, Smart boards, and Open Educational Resources (OER) is playing a crucial role in improving educational processes and its outcomes.

Educational or Instructional Technology (EdTech) such as Custom Learning Experiences, Cloud computing, 3D printing, Speech-to-text options, Virtual and augmented learning experiences etc. as well as the Emerging and Disruptive technologies such as Robotics, Artificial Intelligence and Machine Learning is redefining the educational operations and also mechanisms of the higher education institutions. In the present study recent trends and future perspectives for education sector in this technological era are identified and discussed. Certain recommendations are suggested on the basis of the critical observations from the review. These can be useful for the growth and development of Indian higher education sector.



**KEYWORDS:** Education Higher, NEP 2020, Education Technology, Digital India Technology.

### INTRODUCTION

India is a diverse country with 1.39 million populations, out of which two-third are youth. In the economic growth and development of any country, education is considered as a national investment for creating a knowledge society and thereby upgrading the standards of living. The advent of globalization, privatization and liberalization, has created dramatic changes in the implementation of educational theories in the classroom teaching-learning process in Indian education, thereby improving the access and retention in the school education substantially. Still the goal of imparting equitable, quality, lifelong learning and holistic education is not achieved, which is mandatory to satisfy 21<sup>st</sup> century skills and Sustainable Development Goals as well. When we dream India as a world leader “Vishwa Guru” then planning and implementation for education embedded with use of technology must be strengthened.

The horizons of the knowledge have widened due to information explosion. Therefore the use of educational technology and information communication technologies (ICTs) in education is the need of the time. There is variety of mass-media such as television, radio, newspapers and films etc. available for such communication processes. By stimulating the sensory organs of the students, these different ways of mass media help them to understand the learning concept easily. In Indian education, the ICT

enabled teaching has widely replaced the traditional way of teaching learning process during the COVID 19 pandemic.

Basically Education Technology is defined as an array of tools that helps in advancing student learning and is measured in how and why individuals behave. Educational technology is also the study and ethical practice of facilitating e-learning and improving performance by creating, using and managing appropriate technological processes and resources. [1] Educational Technology relies on a broad definition of the word "technology" which signifies the tools and the sources to enhanced, to develop the skill of the Education. Education policy and economic development are interlinked by three productivity factors namely:

**1) Capital deepening** – which expresses the ability of the workforce to use equipment that is more productive than earlier versions

**2) Higher quality labor** - which expresses a more knowledgeable work force that is able to add value to economic output

**3) Technological innovation** - which expresses the ability of the workforce to create, distribute, share and use of the new knowledge.

The education technology has the capability to reach out to every nook and corner of the country. It also bridges the digital divide by providing teaching, learning, assessment and continuous professional development solutions any time anywhere coupled with achieving scale and speed. It is with these perspectives that the National Education Policy 2020 lays great emphasis on the use of educational technology to enhance the access of educational opportunities, improve the quality of education, address concerns of inclusion and diversity and improve access, quality, equity, affordability and accountability of the educational system in the country. Thus, meticulous use of educational technology and information and communication technologies (ICTs) can liberate the system and help achieve quality education in school, higher educational institutes and teacher education in the country.

The emergence of New Education Policy (NEP) 2020 is further pacing up the use of technology both within and across higher education. The government of India has emphasized upon digitalization of education through introducing INSAT and motion pictures with the help of an active role of the press. As per the objectives of NEP initiatives are taken by Government to set up 'Virtual Universities'. 'Digital India' campaign of government of India, is strongly promoting the use of technology in every sector of economy including education. This progression towards adoption of new technology and innovations are imposing many challenges as well as opportunities for education sector players and policymakers. Considering this, the present study identifies and addresses few recent trends and future perspectives for education sector in this technological era. On the basis of the critical observations in the study few recommendations are suggested which may be useful for the growth and development of Indian higher education sector.

## OBJECTIVES AND METHODOLOGY

Related to digital technology and education in India many studies (2 - 6) were published which are focusing significance and use of technology in education sector. However, with respect to technological innovations and new initiatives of Indian Government such as Digital India and New Education Policy 2020, there is a need to identify, think and address the recent trends and advancements in the higher education sector and also to suggest innovative practices for the improvement.

The vision of this paper is to leverage technological innovations for the creation of skill oriented, learner centric and an all-inclusive education sector. The objective of this paper is to find out certain trends and future perspectives for the higher education sector in reference to digitization. The present study is conceptual and adopts descriptive approach. Data is collected from secondary sources such as annual reports and press releases of Ministry of Human Resource Development, Economic Surveys, Web resources, and Media Reports.

### Evolution of Indian Higher Education System

Different types of Institutions imparting Higher Education in India includes

- University Level Institutions such as Institutions of National Importance or Institutions that are established under State Legislature Act
- Central, State, Private, Deemed and Open Universities
- Colleges affiliated with Universities
- Stand-alone Institutions which are not affiliated with Universities (e.g. IIMs, Polytechnics, Diploma Level Teacher Training Institutes, Nursing Institutes etc.)
- Distribution of Degree-Level Institutions

Since independence the higher educational institutions in India has witnessed a multifold increase in their capacity (Table 1). During last 72 years i.e. from 1950 and 2022, the number of universities has increased from 25 to about 1375, colleges from 700 to 47844 and the teachers from 15,000 to nearly 15.10 lakhs. Consequently, the enrolment of students has also increased from a mere 1.00 lakh in 1950 to over 418.91 lakhs in 2022. This expansion in institutional capacity in terms of number of universities, colleges and teachers has provided a greater access to the students for pursuing higher education.

**Table 1: Capacity Expansion in Higher Education**

Capacity Indicator of Institutes	1950	2022-23
Number of University Level Institutions	25	1375
Number of Colleges	700	47,844
Number of Teachers	15,000	15.10 lacs
Number of Students Enrolled	1 lac	418.91 lacs

Source: Annual Report of UGC 2022-23 and Higher Education in India at a Glance, UGC (2012)

From Table 2 it is clearly seen that in Indian higher education system the share of private universities is 40% which highlights greater presence of Government funding institutions, colleges in providing subsidized education to the needy and poor people.

**Table 2: Distribution of Higher Education Institutes**

	Number of Institutes	Percentage
Central University	56	4.07
Institute of National Importance	167	12.15
State Public University	465	33.81
State Private University	433	<b>31.49</b>
Deemed University (Government)	127	9.24
Deemed University (Private)	127	<b>9.24</b>
Total	1375	100

Source: Report of AISHE 2022-23

Even though the efforts of Government there is a huge gap between graduate students (72.20) and post-graduate students (16.80). The number of students enrolled for research drastically drops

down to 0.81. Table 3 provides the distribution of enrolled students in percentage. To improve the standards of higher education, research must be encouraged. Proper funding and guidance should provide to the competent persons for research and publication of research work.

**Table 3: Student Enrollment in Higher Education Institutes 2022 - 23**

	Students	Percentage
Graduate	74.198 Lacs	72.20
Post – Graduate	17.268 Lacs	16.80
Research	38,081	0.81
Diploma/Certificate	8,88,611	1.01
Integrated Courses	66,124	0.64
PG Diploma	1,37,967	1.34
Total	102.77 Lacs	100

Source: Annual Report of UGC 2022-23

### **National Education Policy 2020: Journey towards digitization:**

The five fundamental guiding pillars of NEP 2020 are Access, Equity, Quality, Affordability and Accountability. The NEP 2020 is focusing on Skill Development through Teaching learning activities and Attitude and/or Aptitude Building through Co-Curricular activities. Digitization of education system can contribute significantly in developing value-based and skill-based education. In this way the intertwinement of technology in Indian education system may strengthen these pillars. As per the NEP 2020 the relationship between technology and education is bi-directional at all levels and the NEP 2020 proposes to create a conducive digital ecosystem for all the stakeholders of education sector (students, teachers, and evaluators). Different thrust areas of technological intertwinement pinpointed by NEP 2020 are:

- Facilitating Teaching-learning and evaluation processes
- Supporting teaching preparation and professional development
- Enhancing educational access
- Streamlining educational management and administration
- Removing language barriers
- Extending greater access to Divyang students

By 2030 in every district, the new policy aims to establish multidisciplinary universities preferably in public private partnership mode and blended mode of learning. Along with it, foreign universities will be soon arrived in the country due to the recent education policy provisions, which can produce new challenges to the higher education. It is expected that the whole educational components will be strengthened for facing the further competition. To enhance the importance of technology NEP 2020 creates a **National Educational Technology Forum (NETF)**. It aims to develop e-courses in regional languages and related virtual labs, to advice Central and State Government on use of technology in education, to build intellectual and institutional capacities in educational technology and to articulate new directions for research and innovation.

To develop teachers professionally and to act as a repository of teaching learning e-content various platforms like **DIKSHA, SWAYAM** has been proposed in NEP 2020. For expanding the horizons of the education sector, educational software in all major Indian languages are being created. Suitable equipments are also being integrated to create e-content into teaching learning practices. For divyang students education is made accessible with the help of educational softwares. As per the report of Gupta et. al. (5) in higher education there is a significant contribution of distance education with new

information and communication technology (ICT) thereby the open learning programs must be promoted extensively. The **National Research Foundation (NRF)** is established to expand research activities. The NRF is aimed to develop application-based research and to advance core Artificial Intelligence research. Hence the higher educational institutions have to offer research programs in disruptive technologies such as Machine learning, Robotics, Artificial Intelligence, etc. and have to develop and deploy varied technology centric instructional materials courses.

### **Digital Education and HEIs: The Future Forward:**

In the National Policy of Skill Development and Entrepreneurship (NPSDE) 2015 the goal stated is to of create a skilled workforce of 110 million people by 2022. Creative programs focused on re-skilling and up-skilling has to be initiated by higher education institutions. During the Global lockdown many key initiatives were taken by HEIs to face the challenges. Some of the key initiatives towards online and digital education are (<https://www.education.gov.in>)

Source: NEP 2020 (<https://www.education.gov.in>)

1. Blended learning approach with online and experiential learning
2. Creation of Virtual Labs and digital platforms
3. Preparation for effective online assessment
4. Pedagogical changes for online/digital education
5. Availability of multi-lingual educational programs 24/7
6. Faculty development initiatives and effective digital training to teachers

Use of technology has been already introduced in higher education. The digital initiatives taken by UGC & MHRD in higher education during COVID-19 are (Jena, 2020):

- 1) e-GyanKosh (<http://egyankosh.ac.in/>)
- 2) Gyandarshan (<http://www.ignouonline.ac.in/gyandarshan/>)
- 3) Gyandhara (<http://ignouonline.ac.in/Gyandhara/>)
- 4) National Digital Library of India (NDLI) (<https://ndli.iitkgp.ac.in/>)
- 5) e-Yantra (<https://www.e-yantra.org/>)
- 6) FOSSEE (<https://fossee.in/>)
- 7) Virtual Labs (<http://www.vlab.co.in/>)
- 8) e-ShodhSindhu (<https://ess.inflibnet.ac.in/>)
- 9) Shodhganga (<https://shodhganga.inflibnet.ac.in/>)
- 10) VIDWAN (<https://vidwan.inflibnet.ac.in/>)
- 11) National Educational Alliance for Technology (NEAT)(<https://neat.aicte-india.org/>)
- 12) SAKSHAT (<https://sakshat.ac.in/>)

The higher education in India faces many challenges ranging from geographical disparities in access to education, to shortages of trained and qualified faculty (Thakran & Sharma, 2016). Technological interventions are helping to overcome these challenges and to improve the quality of higher education available nationwide. However, HEIs are also facing many challenges related to use of technology in education. Some of them are unavailability of resource infrastructure, digital competencies of teachers to meet further need, bridging digital divide, becoming screen based education, online assessment on scale, limitation in delivering certain types of courses/subjects in online/digital space and so on [7].

India is among the top 50 (Rank 48) innovating countries for the first time in 2020 since the inception of the Global Innovation Index in 2007. India secured 45<sup>th</sup> rank on the parameter of University/Sector research collaboration, which is the strength of the country (Economic Survey 2021).

As per the Economic survey 2021, investment in Research & Development is a prime input for innovation. In India, the contribution of higher education in the Gross Domestic Expenditure on R&D (GERD) is approximately in the same proportion as that of top 10 economies. However, there are many challenges in the standards of R&D and innovation. To overcome these challenges, HEIs can initiate following steps:



- 1) Increase the coordination and collaboration between national and state level institutions
- 2) Continuous customization of digital education platforms at national level inclusion portals, apps, labs as per the arising education needs.
- 3) Promote research on disruptive technology, new pedagogical and curricular structure and effectiveness of training modules etc.
- 4) Design, development and roll out MOOCs for students and teachers with appropriate policy evaluation, certification and credit transfer
- 5) Curriculum designing with special focus on Technology and vocational education

### RECOMMENDATIONS:

Due to the varying geographical conditions and the high cost technology has not reached in every part of India. Hence in education sector it is used in low percentage. Also lack of necessary e-skills and unawareness of digital education benefits people do not prefer technology in education sector. These challenges can be minimized by following certain recommendation mentioned below:

- 1) **Investment in Digital Technology:** Education sector received 2.56% share of equity inflows into Services sector in 2019-20 and the FDI inflows are increasing substantially into this sector. By 2030 it is expected that the FDI inflows will rise from \$117 billion \$313 billion. This may create sufficient digital infrastructure and may bridge the digital divide, Government should provide various concessions, incentives and facilities to investors in education sector. Investment policy should be in coherence with other policies like Information technology policy, education policy, taxation policy, and foreign exchange policy. ICT infrastructure must be enhanced for speedy delivery of information as well as services to learners. ICT enabled technologies should be promoted among public through mobile applications and social networking.
- 2) **Laws and regulatory framework:** For a learner 'learning is now without any boundaries' due to technology. Technological innovations are taking place faster than the related laws, policies and regulations. The disintegrated laws and regulations in different countries is a challenging task in application of these innovations in the education sector.
- 3) **Adoption of technological innovations:** Introducing higher education reforms, Industry-academia collaborations, improved patenting and trademark regulations and more investment in scientific research Government can create an environment conducive for research and innovations in the country. Government policies must motivate innovative Educational startups by providing concessions and incentives to them. Effective cost of computing devices can minimize digital divide. Financial support must be provided by Government to register patents and copyrights.
- 4) **Faculty Development:** To impart the required e-skills and knowledge amongst faculty Government has already initiated Pandit Madan Mohan Malaviya National Mission on Teachers and Teaching (PMMMNMTT) and opened Teaching Learning Centers (TLC). These programs should be strengthened by making an integrated strategy of e-skills creation, ICT development and diffusion, local networking, and cooperation projects. Experiential learning and training programs should be developed for faculty re-skilling, up-skilling, and updating of know-how, possibly with technological aids.

### CONCLUDING REMARKS:

Over the next decade India will have the highest population of youth in the world. So, the ability to provide high-quality educational opportunities will determine the future of our country. After corona pandemic new global scenario imposes unprecedented challenges for the higher education system also. The revolutionary changes in the functioning of Indian higher education are possible only with the synergetic interaction between technology and higher education sector. Therefore, higher education ecosystem must be more technology driven, learner centric, accessible, competitive and vocational and skill based.

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