

Digital Transformation of Education: An Overview

Swati Bajpai¹ & Kiran Lata Dangwal²

¹Research Scholar, Department of Education,
University of Lucknow, Lucknow, Uttar Pradesh

²Assistant Professor, Department of Education,
University of Lucknow, Lucknow, Uttar Pradesh
Email: kldangwal@yahoo.co.in

Abstract

Digital transformation of education is the need of the hour especially during and after this unusual situation of pandemic Covid-19, where face to face education has become infeasible. The vacuum created due to the inaccessibility of our traditional system of education has compelled all of us to look for an alternative to the traditional system of education and the virtual world of education in one such kind alternative. Such virtualization of education is the result of the digital transformation of education that had been taking place for decades ago not only in our country but all over the world. Our educational world has a long history of using technology in almost all spheres of education. So, it becomes very important for all of us to explore our history to know how such a digital transformation of education was started and what was the role of government in this paradigm shift? What interventions, policies and programs of government have been proved as a turning point? All such questions can be answered only through a thorough study of our history. A historical overview of the education system will help us to understand the role of government policies in the implementation of ICT in the education system to identify the trends and development in the digitalization of education. In this paper, the focus of the researcher is to highlight all those technologies and initiatives that have been taken for the digitalization of education from time to time by different countries. Keeping in mind such objectives of the study, the researcher has selected 7 countries: Italy, Korea, Finland, Morocco, Portuguese, New Zealand, and India and threw light on educational initiatives taken by these countries for the digital transformation of education.

Keywords: Digital transformation, ICT initiatives, technology, virtualization, paradigm shift, etc.

Introduction

Education being a fundamental right and fundamental need of survival is a matter of both national and international importance, as well as success of any country, is also directly related to their skilled and competent society. So, it becomes very important for a country to create such a strong system of education that can build a strong foundation for its citizens. For which, it is mandatory to upgrade our

system of education with the time to meet ever-changing demands of society. Digital transformation of education is one of such changes that had been taking place for decades, though it has not reached its full-fledged stage, still playing a very important role in meeting the challenges of increasing population, globalization of education, to address the individualized needs of learners and recently fulfilling the universal obligation of social distancing.

Digital Transformation of Education

Digital transformation of education means the use of technology in the field of education. The introduction of technology has facilitated a very smooth and gradual transition of the traditional system of education into a digital one. Earlier, it started as a supplement to an education, now technology has become an integral part of it. Although, it was not an easy journey from the traditional to a digital system of education. It had taken decades to establish a proper system, to train personnel and motivate users to accept the change. For which various agencies including government, semi-government & private agencies had taken multiple initiatives to provide connectivity (at personal, national and international level), to generate digital educational content, to arrange training and orientation programs for users, to develop low-cost equipment required for digital education and organized various other promotional activities to encourage digital education.

Here, we will discuss the education system of different countries in terms of their digitalization. When these countries have started adopting ICT in their education system and what type of measures and policies, they have taken to ensure the gradual digitalization of their system of education.

Why there is a need for Digital Transformation of Education

“Necessity is the mother of invention” is a famous proverb. When there is a need or problem, there is a solution to that problem. Likewise, digital transformation of education also addresses multiple problems and needs of the education system such as:

- To address the issue of increasing population
- To provide equal access to quality education to all

- To open the door of education for all anytime, anywhere
- To optimize the use of available resources both physical and human resources
- Preservation, conservation, and transfer of educational resources
- To preserve the educational assets in digital form
- To globalize, individualize, and universalize the system of education
- To create a virtual system of education
- To provide a platform to intellectuals for virtual interaction

An Overview to Digital Transformation of Education

In this paper, the researcher had discussed the education systems of only seven countries: Italy, Korea, Finland, Morocco, Portuguese, New Zealand, and India and highlighted the major initiatives taken by these countries towards the digital transformation of education.

The major reasons why the researcher had chosen these countries are:

- To cover the different digital educational initiatives taken by different countries across the world as much as possible
- To cover countries from different regions of the world
- Availability of data
- Limitation of time and resources

Italian System of Education

The first national ICT initiative of Italy in the field of education was the “National Plan for Informatics” launched in 1985 for the professional development of

science and mathematics teachers of upper secondary schools. But the “Programme for the Development of Educational Technologies” initiative taken in the early 1990’s had been proved as a milestone in the field of the Italian education system as it provided autonomy and funds to the schools to establish technological labs and also facilitated professional development of their teachers. A large-scale National Programme for Teacher’s Professional Development was launched in 2000 to develop ICT awareness and knowledge among the teachers and also to encourage them for its educational use. In 2007, a new large scale initiative for ICT introduction in schools “National Plan for Digital Schools” was launched to introduce ICT directly into the classroom activities at all levels of education including all subject streams. Four initiatives that have been taken under the “National Plan for Digital Schools” are:

1. **Piano LIM-** To provide funds for interactive whiteboards in the schools
2. **Cl@sse 2.0-** To create ICT based learning environment in the schools
3. **Scuol@ 2.0-** To promote innovations to the traditional method of education
4. **Editoria digitale scolastica-** To provide digital books to the students

Other than these initiatives, there are some more initiatives that have been taken for the digitalization of education and these are:

- **Database SD2** - Managed by the Institute for Educational Technologies of the National Research Council in Genoa and it offers online service of documentation, training, and updating to the teachers.

- **The Internet site ‘INDIRE’-** Managed by the Library of Pedagogical Documentation situated in Florence and provides information and resources to the teachers and students.
- **OTE: Technological Observatory-** Managed directly by the Ministry of Education and it provides technical assistance to schools in Italy.

Korean System of Education

In Korea, computers have been included in their school curriculum since the 1970’s, although the formal plan to introduce ICT in education took place in 1987 with the launch of the “Computer Education Strengthening Plan”.

In 1996, The Ministry of Information and Communication appointed an Informatization Promoting Committee which proposed a Master Plan for Informatization Promoting popularly known as Master Plan I (1996). The major focus of this plan was to set up ICT infrastructure and to achieve this objective, initiatives like EDUNET (1996), RISS (1998) and KERIS (1999) were taken. EDUNET was the first comprehensive educational information service of Korea, while RISS was the first Research Information Service System of Korea. KERIS came into existence with the merger of the Korean Multimedia Education Center (KMEC) and the Korean Research Information Center (KRIC) as per the KERIS Act. KERIS framed the guidelines for elementary and secondary schools for the use of ICT in education.

To strengthen the use of ICT in education, Master Plan II came into existence in 2001. Under Master Plan II, initiatives like Educational Content Sharing System (2001), National Education Information System (NEIS), Cyber Home Learning System (2004), and e-learning Global Cooperative Centre (2006) were taken to invigorate the use of ICT in education.

In 2006, Master Plan III was launched for the further advancement of ICT in education and for these initiatives like Digital Textbook Development Plan (2007), U- Classroom (2007), Operation of Digital Textbook Model Schools (2008), Cyber Security Centre (2008), and KOCW (2010) were taken under Master Plan III.

Further, Master Plan IV (2010) and Master Plan V (2014) also came into existence for smart education and student-centred learning respectively.

Finnish System of Education

Finland's system of education is considered as one of the successful systems of education across the world and this is because of their efficient teachers, availability of the best quality infrastructure and resources and their traditional curriculum & pedagogy. Integration of ICT in the Finnish system of education is attributed to the policies that had been launched from time to time for digitalization of education such as Education Training and Research for the Information Society (1995), National Strategy (2000-2005), Information Society Program for Education Training and Research (2004-2006) and The National Knowledge Society Program (2007-2015).

These policies have played a very important role in establishing their ICT infrastructure, developing ICT literacy among the users, addressing issues related to its implementation and ICT integration with the community & their daily life.

Ubiquitous Information Society Strategy (2008), a joint initiative of the Ministry of Education and the National Board of Education, led by the Ministry of Transport and Communications and run by an inter-Ministry advisory board was taken to encourage ICT in teaching-learning and to identify best practice innovations in schools.

All these Finnish policies played a very important role in the development of ICT infrastructure, professional development of teachers, development of digital content and technology-based digital tools of teaching-learning.

Moroccan System of Education

In Morocco, integration of ICT in the education system started with the launch of the 'National Charter of Education and Training' in 1999, wherein Article 10 assimilation of ICT and computer facilities in education had been emphasized along with the promotion of distance learning. Further, a 'National Action Plan' was prepared in 1999 under the supervision of King Mohammed VI who declared the period of 1999-2009 as the "education decade". Thereafter, the Government of Morocco identified five themes: education, governance, private sector development, e-commerce, and access and included them in their 'e-Maroc plan' to facilitate the use of ICT in almost all the sectors of society including education and to reduce the cost of using computer and internet facilities. Apart from these, there are some more initiatives, such as CATT (1999), Marwan project (2002), CVM (2002), GENIE (2005), CIVICS, BRIDGE, ALEF, and MAF that have been taken to promote the digitalization of education in Morocco.

Portuguese system of education

In Portugal, the system of education is mostly centralized and managed by the Ministry of education along with the Ministry of Science, Technology and Higher Education. As far as integration of ICT in the Portuguese system of education is concerned, Lisbon Strategy (a European Union [EU] plan) and Portugal's Strategic National Plan were prepared for the upgradation of education as well as for ICT integration in education. These two plans led to the development of Portugal's Technological

Plan for Education' which was although prepared by the concerned Ministry but also approved by a resolution of the Council of Ministers in 2007 which means Portugal's Technological Plan for Education was approved by the entire Government. It was a comprehensive plan with four major dimensions of a) Technology Goals, b) Content Goals, c) Training Goals and d) Investment & Financial Goals. To accelerate the pace of ICT integration in education, to develop ICT infrastructure and to provide ICT access to students, many other programs were started such as Technological Kit (to lower down a student to computer ratio), Voice Over Internet Protocol: VOIP (to provide VOIP & video conferencing solutions to the schools), Internet in the Classroom: Local Area Networks (to provide wireless access in Local Area Network), High-Speed Broadband Internet (to provide access to high-speed internet), Portugal's laptop distribution programs (to distribute laptops to the students and teachers) and ICT Competencies program (to trained teachers with ICT skills and ICT implementation in the classroom).

New Zealand System of Education

In New Zealand, the first Digital Strategy to implement ICT in different sectors of society including health, governance, commerce and education was released in 2005. In 2008, Digital Strategy 2.0 was released with a major focus on investment in fibre-based broadband and adopting different strategies for rural and urban areas. The first national plan for ICT integration in education 'ICT Strategic Framework for Education' was released in 2006-2007. This framework for education covered primary, secondary as well as the tertiary levels of education with four major dimensions of a) Connection, b) Capability, c) Content, d) Confidence. 'ICT Strategic Framework for Education' was initially developed for

the period of 2008 -2012. Some other initiatives taken for ICT implementation in the field of education includes School Network Upgrade Program-Phase 1 (SNUP-1) and School Network Upgrade Program-Phase 2 (SNUP-2) (to provide connectivity to small schools), School Network Upgrade Program-Phase 3 (SNUP-3) (to prepare schools for fibre-based, 100 Mbps connectivity), TELA Laptop Scheme, 2003 (to provide subsidized laptops to teachers), The Computer Access New Zealand Trust (to provide recycled computers to schools), The National ICT Helpdesk (to provide software and hardware support to schools) and The Ministry of Education (to provide free of cost basic software to schools such as MS Office, antivirus etc.)

Indian System of Education

In India, the use of technology in education has a history of years since British rule. In 1930, the first educational and cultural program was aired by British Broadcasting Corporation (BBC) through broadcasting radio and in 1937, All India Radio (AIR) broadcasted educational programs for school students. Further, the invention of television and its acceptance as a medium of information exchange led to the introduction of educational television for secondary schools in Delhi in 1961. In 1975, Satellite Instructional Television Experiment (SITE) was launched to develop rural communities through education. The use of computers in education started with the launch of Computer Literacy and Studies in School (CLASS) in 1984.

Besides these initial initiatives, the Government of India had taken two major initiatives named INFLIBNET (1991) and NMEICT (2009). These are not single initiatives, but umbrella terms for multiple initiatives that have been taken under these two initiatives for different levels of education including primary, secondary, senior-secondary, higher and technical education. The list of initiatives

that have been taken under INFLIBNET are e-shodhsindhu (Consortium for Higher Education e-Resources), Shodh Shuddhi (to enhance research quality by providing plagiarism detection software to member educational institutions), N-list program (to provide an access to e-resources to colleges), INFOPORT (a gateway to all Indian scholarly e-content), IR@INFLIBNET (Institutional repository of INFLIBNET), OJAS (Open Journal Access System, but services has been terminated since 2016), Shodhganga (an open repository of Indian theses), Shodhgangotri (an open repository of Indian synopses submitted to Educational Institutions for Ph. D. program), IndCat (a union catalogue), SOUL (a library automation software), e-PG Pathshala (to provide e-content to postgraduate level students), Vidya-mitra (an integrated e-content platform to provide an access to all education e-content through a single-window interface), Vidwan (a premium database of experts), Research Project database (to provide information about ongoing and completed project of faculty members) and many others.

While initiatives that have been taken NMEICT are Virtual lab (to provide a remote access to labs to those who don't have an access to costly lab equipments), Sakshat (one stop educational portal, an integrated platform to provide an access to all educational e-content), e-yantra (an initiative taken for engineering students), A-view (to provide a platform for teaching-learning in real time through video conferencing), SWAYAM (an Indigenous MOOC), SWAYAM Prabha (34 DTH channels dedicated to educational programs), FOSSEE (to promote the use of FLOSS tools in academia and research), GIAN (to provide an opportunity to learn from international faculties), NPTEL (to provide e-content to science and engineering students), e-Acharya (an integrated platform to provide e-content), National Digital

Library (to provide an access to all type of educational e-content), SOS (to provide tools for analysis of system), Spoken tutorial (to provide an access to free and open software) and Baadal (a cloud orchestration and virtualization management software to maximize the utilization of ICT infrastructure), etc.

National Academic Depository (NAD) is an online depository of academic awards including certificates, diplomas, degrees, mark sheets, etc. It provides 24×7 hours accessibility to academic awards to its stakeholders. Its stakeholders are not only students but also educational institutions, verifying entities, the Ministry of Education, UGC and DigiLocker.

The Current Situation

Italy- Currently, the use of technology and ICT in Italy is not confined to the only secondary and vocational levels of education, but has also become an inseparable part of their education system at the primary level. ICT technologies, interactive whiteboard technologies, multimedia equipment, and internet facilities are now available to all levels of education including primary, lower secondary, upper secondary and vocational education. Teachers are being trained to use ICT to improve student's performance, and attainment, educational communication and cooperation as well as to achieve specific learning goals.

Korea- In Korea, the Government has started the use of ICT in education to strengthen its system of education. Now, their focus is on SMART education where S means self-directed, M stands for motivated, A is adaptive, R means resource-enriched and T stands for technology embedded. In schools, students are not only learning through traditional methods but also actively using ICT at all possible levels to become a new generation of learners. A digitized

curriculum is being used to reflect the modernization of education. Not only teachers and students, but also society is being encouraged to utilize the ICT facilities to become a digital society.

Finland- In Finland, the National Board of Education, responsible for education systems all over the country, has implemented national ICT policy all across primary and secondary educational institutions to ensure the development of ICT infrastructure and strategies required to meet the national framework. Teachers have been trained to achieve mastery over the ICT skills, using ICT tools for educational purposes, to develop digital content, create digital networks of institutional management, etc.

Morocco- In the Moroccan system of education, ICT is being used to achieve two major objectives of making students digitally literate and secondly in developing different digital pedagogical approaches to achieve the national goals of education, i.e. using innovative methods and approaches in educational institutions. GENIE programme of Morocco was awarded UNESCO King Hamad Bin Isa Al-Khalifa Prize in 2017 for its considerable efforts and impact on the use of technology in the field of education.

Portuguese- Portuguese system of education managed by the Centralized Ministry of Education has developed ICT infrastructure and resources to reform and modernize the education system at the school level through a national initiative 'Technical Plan through Education'. Now, their schools are interactive places of learning with ICT trained teachers and school staff to create an information society. Proper government guidelines have been issued for teachers to develop ICT competencies. Teachers are being provided with three levels of certificate for digital competencies.

New Zealand- The Government of New Zealand has launched the Ultrafast Broadband Project to provide fibre-based ultra-high-speed internet connectivity to all the schools by 2020. Schools have been developed and facilitated to use ICT infrastructure for the modernization of the education system. The government is also providing heavy funds for the professional development of teachers in terms of digital competencies.

India- Although the Government of India had already taken multiple initiatives for digitalization of education since 2016, it has accelerated its pace of taking and implementing new ICT initiatives for integration of technology in education, such as online educational portals, content in digital form for different levels of education, virtual classrooms, online admission and examinations as well as digitalization of administration and management activities. In 2016, it launched 28 new initiatives and programmes at different levels of education, but due to lack of awareness and encouragement, these initiatives were not reaching their end-users. But now because of this pandemic of Covid-19, both teachers and students are forced to learn and explore these new digital ways of learning and with the passing of time, they are becoming more sincere, confident and techno-savvy with the use of these ICT initiatives and programs.

Discussion

After studying the education system of the above countries, we concluded that the use of technology in the system of education was started decades ago but the major advancement in the terms of formal policies and concrete initiatives took place after 1980. Almost all the countries have spent lots of money, time and attention on establishing educational ICT infrastructure, providing training for use of ICT in education,

development of low-cost tools for digital education, creating digital content & making it freely accessible to all, organising orientation programs to bring awareness among users and motivating them.

Being completely aware of the importance of ICT in education, the government of above-described countries put lots of effort into the digitalization of education but still, it has not reached its optimum level and the major problem is concerned with proper implementation and execution of these policies along with other challenges

of insufficient funds, resources and trained manpower. For which a lot of research is required to identify the area of problems and to properly address them.

Though digitalization of education is mandatory in the current scenario, its opportunities should also be taken into consideration. Like programs and policies taken for the advancement of ICT in education, the Government should also make policies and take measures to address the challenges related to them.

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