Technology and its relevance for Online Education During Covid-19 Pandemic

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Abstract - **To establish the background of the study, this paper analyses swiftness in the emergence of communication technology and the official birth of new technology in 1983 called the internet, which has now taken the significant segment in the world of communication technology. The paper also provides a brief historical timeline of the development in the field of technological infrastructure in India, starting with the first electric telegraph in the year 1850 to the era of low-cost data packages and connectivity throughout the country. For the feasibility of an online education system in India, this paper highlights the micro-level survey among the teachers and students of higher education institutions in India. The article further discusses the economic aspects of covid-19 on educational systems regarding the struggle between meeting the basic needs vs. expense on education.**

Index Terms - **Netizen, Technology, Online Learning, e-Learning, Affordability, Inequality, Unemployment, Feasibility, Pandemic.**

INTRODUCTION

The beginning of the 19th century imprinted a new era where humans learned to communicate with the non-living substances, forged into machines by putting together the various combination and finding an amazing combination that brought a whole new level of machines. Among these machines, some can even learn and interact with human beings. These features are known as Artificial Intelligence, e.g., Siri, Alexa, self-driving Cars, Chatbots, etc. The necessity to ease the living and make life more comfortable humankind plunged themself to research and innovations. The result was in the seeming invention of gadgets that human beings have imagined. One of the greatest inventions of this century was a device that we call the computer. Like every other beginning, it does have a root to the abacus in 3000 BCE. The invention of the ingenious method of calculations opened the way for future possibilities. The invention of computers became a reality by Charles Babbage, who is regarded as the father of the computer. He built the first mechanical computer in 1822 named Difference Engine with basic computation, and then in 1837, the Logic became part of computer history. The swiftness towards its development came in the 19th century with the invention of electric components like transistors[1], resistors[2], and diodes[3]. This invention led to the development of electronic computers, and the rest is history.

Today technology has become an integral part of one's life, and there is hardly a space in our social interaction that technology has not entered. The size of the device is ever-shrinking, and the speed of computation is exponentially increasing. Once it was a luxury, today it has become a need, the affordability is in the reach of many. These devices have become an essential communication tool that has revolutionized how we connect and have made the world even smaller by forming another society called "Netizen," a term coined by Michael F. Hauben. Netizen refers to Social Identities forming a Society over Internet connections by indulging in social networking. This new society

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[1] A transistor is a semiconductor device used to amplify or switch electrical signals and power.

[2] A resistor is an electric component used to regulate flow of Current,signals,voltage etc.

[3] A diode is a electronic component that conducts current in one direction.

endeavors to provide open access to information for all without prejudice.

The supranational Institution like UNESCO has been playing an essential part in the aspects of education for all. It took a revolutionary step by adapting The Universal Declaration of Human Rights dedicates the right to education as the heart of UNESCO's mission (*Right to Education*, 2019). Article 26 of the Universal Declaration Of Human Rights promotes education without any discrimination. It talks about universal access to education, and the Education 2030 agenda reprises ascertaining the completion of quality education. It advises countries to establish equal access to quality education and learning. The question here is, have we reached that milestone? The answers seem No! Bishwakarma & Varekan (2021, P537) states that the ongoing pandemic exposed the weakness of infrastructural readiness/preparedness towards equal and quality education accessible to all. Did our shortsightedness towards a possible future event like Covid-19 affect our entire educational system?

METHODOLOGY

It is an exploratory empirical study, and the tool used were interviews and questionnaires to students and teachers of HEI (Higher Education Institutions In India). It was analyzed using statistical tools.

LIMITATION

The questionnaires were sent to students and teachers using Google Forms. The form was available to access and respond to for a month. Due to Covid-19 pandemic restrictions, physical reach was not possible.
1. There was a limitation of time.
2. The form filling required electronic devices such as smartphones, tablets, or computers. Some respondents may have found it tedious and difficult.
3. Some respondents might feel insecure about clicking on the link, even though it was mentioned it was safe and no personal details would be collected.
4. Due to the pandemic, respondents may be going through anxiety and did not want to participate in the survey.

5. There was no reward for participating in the survey. Hence, there is a possibility of not participating in the survey.

THE OBJECTIVE OF THE PAPER

1. To highlight the relevance of technology in education in the period of disaster.
2. To seek the relevance of technology in the narrative of technological affordability and accessibility in India.
3. To examine the feasibility of online education in the present Indian context.

BRIEF HISTORICAL OVERVIEW ON EMERGENCE OF COMMUNICATION TECHNOLOGY

There is no doubt that there is a rapid increase in technology development. In an article on gulf news, Al Suwaidi (2018) commented, "Many people, even the most astute observers and followers, often fail to keep abreast of the changes that are taking place." It is astounding to observe the swiftness and the rate at which the systems exponentially bloomed. It can be easily followed when we study the history of the evolution of communication. The first telegram was used in 1844, and within 30 years (1876), the telephone and the Phonograph became part of society one year later. It took around 30 years for radio and television to take center stage of the communication system. The next revolutionary phase started in 1989 when Tim Berners-Lee, a British computer scientist, pioneered the World Wide Web to ease the process of information sharing. The next big follow up of this revolution was the initiation of building search engine by Larry Page and Sergey Brin in 1995, and then in 1998, Google was officially born, since then there is no looking back. At present, internet technology has taken a significant share in the communication world. The recent paper published by Iqbal (2020) affirms that now social media platforms like Facebook have reached 2.45 billion monthly active users. It must not surprise that India is the single biggest Facebook market with 269 million users in Quarter 2 2019.
The scenario of India's technological infrastructure (1850-2020)
The development of communication technology in India started in 1850 when the first experimental

electric telegraph in West Bengal between Kolkatta (then Calcutta) and Diamond Harbor was established. Previously it was set up for the East India Company. In 1854 it was opened for public use. After 27 years of the introduction of the telegraph, in 1881, the Oriental telephone company limited of England established telephone exchanges in Calcutta (Kolkata), Bombay (Mumbai), Madras (Chennai), and Ahmedabad. The 28th January of 1882 dates in Indian history when the first formal telephone service was established with 93 users (TelecomTalk, 2011). The growth of communication technology moved rather slowly, but after 73 years, India made its first mobile call on July 31, 1995, West Bengal Chief Minister Jyoti Basu made the first call to Union Communications Minister Sukh Ram. It costs Rs 8 per min (Das, 2020), equivalent to Rs 43.8 in 2021 (Value of 1995 Indian Rupees Today - Inflation Calculator, n.d.). The call rates with technological advancement have reached 40 paise per min on average since the first public call. According to an article published by R. Sharma (2020) in the Times of India web portal, India has 1,183.4 Million telephone subscribers. The popularity and ease increased with the amalgamation of internet telephony in 2002 as mobile internet users doubled in the last five years.

The development of internet networks and services has come a long way in India. Internet First became accessible to educational institutions in 1986 and then to common people in August 1995 through Videsh Sanchar Nigam Limited (VSNL). The speed at which India browsed the internet was 9.6 kbit/s (Goyal, 2020) which in 2020 was 12.07 Mbps and is still 23.19Mbps slower than the world average (businesstoday.in, 2020). This new technological revolution in India began in 1954 with the arrival of the first computer under Prof. Prasanta Chandra Mahalanobis. Since then, India has made significant progress in this field. Starting with the Indian-built first digital computer at Bhabha Atomic Research Centre on January 21, 1969 (D. Murali, 2011). Homi J. Bhabha and Vikram Sarabhai laid down the ten years guideline to look into the need of the electronic industry with research in design, development, guidance, and direction, which resulted in the development of technological infrastructure in India (Press Trust of India, 1966; see also International Development Research Centre, Canada, 1981).

Since then, there has been a well-paced development in technological infrastructure with electronics gadgets like smartphones, tablets, Smart TV, and data transfer medium like the internet.

AREA OF CONCERN

Lack of Mobile Services:
It is observed that there has been growth in the use of these facilities in India due to the affordable data pack that was made available first by Reliance Jio telecom and then others. However, the reach services to all are still in their adolescent phase. Remote villages are yet to be reached, and this will take some time until fiber optics high-speed broadband becomes a household name in the rural sectors of India. According to the Indiatimes web portal, 43,088 villages were still without mobile services on July 27, 2018. According to Soumyarendra Barik in medianama.com quoting the Ministry of Electronics and Information technology (MeitY), Sanjay Dhotre claimed that there were still 27,721 villages yet to be covered as of 2019. Odisha seems to top the chart in lack of mobile connectivity, followed by Maharashtra (Barik, 2020). Assuming that the work is at a very high speed, but it is far from completion.

SLOW, UNSTABLE, AND EXPENSIVE INTERNET SERVICES

The fluctuation of Internet services is still high in cities like Pune, far from the claims made by the companies (M. Sharma, 2020). According to istheservicedown.in (2021), the reported problems are related to internet connectivity.

As per Holslin (2021), Zoom (a platform for videoconferencing) requires around 810 MB to 2.475 GB per hour. The data services by various telecom service providers are expensive. It is in the range of 300 to 600 rupees 1-2 Gb per day (Digit Recharge. n.d.). 1-2 Gb data is not sufficient experience quality data or attend more than one lecture a day.

The broadband facility is not available to all areas as homes need to be connected via fiber optics. The cost of broadband per connection ranges from Rs 700 to Rs 1000 (Pune City), which is out of reach for many due to geographic locations, and socio-economic status. As per the article published in the Indiatimes tabloid, only 38% of school kids have internet access, and a

large chunk (62%) is not connected to the internet due to affordability (Khanna, 2020). India ranks in internet speed 129th position out of 138 countries behind neighboring countries like Pakistan, Sri Lanka, and Myanmar; the average speed is around 6.9 to 9.5 Mbps. (Mondal, 2021).

ACCESSIBILITY OF TECHNOLOGICAL INFRASTRUCTURE IN ONLINE EDUCATION IN INDIA

The sudden transition to online teaching mode concerned all the stakeholders. Students were worried about losing a year, and teachers were stressed adapting to the new teaching methodology in a concise period (Bishwakarma and Varekan, 2021, 539). The economy was hard hit, and it disrupted the circulation of funds which led to the closure of many schools. It forced families to focus on meeting their daily needs rather than investing in education and related infrastructure.

The survey results published by NCERT states that 27 percent of students did not have smartphones or laptops. Another survey by Smile Foundation presents an alarming figure of 56.01 percent of students having no access to the smartphone, which is the most basic tool for online learning. One of the main reasons seems to be the price of gadgets and internet services, and the affordability became a concern for students. Modi and Postaria commented, "The rapid shift to e-learning prompted by the pandemic has resurfaced long-standing issues of inequality and a digital divide in India that must be addressed by future economic, education and digitalization policies."(Modi & Postaria, 2020). The concern is evident and correct to dot, highlighting the unpreparedness and great digital divide that has now surfaced.

The concern toward bridging the digital gap is observed in the discourse of teachers and NGOs, and policy makers worldwide. Now, this is not limited to countries like India, the Covid-19 pandemic exposed the Digital Divide even among the first world countries like the United Kingdom, Australia, America, so it is evident that the digital divide among second and third world countries is even more significant and more complex.

Temple (2020) raised a concern about the low socio-economic strata students being left behind due to digital exclusion. It highlighted that the students at risk

of being left behind are those with disability, additional learning needs, and the indigenous community.

The worst affected category is female students, as the responsibility of siblings and the elderly generally increases and falls on the shoulders of girls and young women (Plan International, n.d.). As per the ongoing patriarchal traditions, a female child can help the mother in the kitchen and other daily chores. Acosta and Evans (2020) affirm the vulnerability of female students being affected most, as the pandemic could result in triggering various conditions like learning deteriorate, work delegation at home, taking jobs to support family, non-access to health facilities, early pregnancy, early marriage, and these circumstances generates a favorable circumstance to result in dropouts. However, to avoid these technologies must be easy Access, Affordability, and Ability.

ECONOMIC NARRATIVE OF SHIFTING TO ONLINE EDUCATION IN INDIA

The sudden shift to the Online mode of education due to the pandemic has exposed the stark economic disparities and that the story of economic growth has been urban-oriented, leaving the rural areas still in the dark. The Indian economy, considered as the fastest growing economy, and was painted and seen as "Incredible India" "Shining India" fell apart when it was struck with "Lockdown" thunderbolt. It brought the economic activities to a grinding halt and the emergence of millions of labor migrating back to the rural economy in an uncertain future.

It was always thought that 273 million Indians were out of poverty in the last ten years (The Times of India, 2020), but we forgot about the other millions in abject poverty. When the pandemic struck, the reality behind the painting on the wall came to the fore, and unfortunately, India was found to be a giant sleeping Elephant and unprepared for the eventuality. In the glory and glamour of economic success, the basics were ignored.

Some economic indicators and variables will indicate that India is far behind in meeting the accessibility and affordability for a successful Online mode of education. The Per Capita Income (PCI) of India is found to have fallen from $2140/- in 2019 to $ 1947/- in 2020 (CEICdata.com, 2018). There are only 622 internet users in India as of 2020, out of which 67% of

the urban population has access to the internet while only 31% of the rural population has an internet connection (The Economic Times, 2021). To complicate and rub salt to the wound, India being seen and projected as an economic powerhouse did more damage than good to the image of India. The allocations made by the government towards meeting various areas impacted by the pandemic were inadequate. The income and wealth inequality gap widened as over 230 million is expected to fall back to poverty due to a significant rise in unemployment and falling income during the first wave of Covid 19, and the second wave was even worse. The unemployment rate increased to 20.8% in June 2020, adversely impacting the earnings, savings, and employment prospects. The recurring waves and fear of more waves are slowing down the return of labor to productive employment. (Dhingra & Ghatak, 2021) All these contractions of economic variables will further impact the accessibility and affordability of online education, adversely impacting the prospects of long-term production and productivity.

Institutions were not equipped and prepared and were caught in a "Catch-22" situation as they had to invest and survive, but at the same time, their source of revenue was drying up. The sudden shift to the Online mode of education in India struggled due to:

1. The institutions are not prepared and require huge investment. The institutions could not afford to invest due to a shortage of funds as finance was not flowing in as expected due to the adverse impact on employment, business, income, and future uncertainty.
2. The students (especially) in the rural areas have no access or proper power and internet connectivity, and thereby effective learning process was almost next to impossible.
3. The rising unemployment, falling income, uncertain future, etc., complicated the issue of investing in the required facilities for online learning. The dilemma was whether to invest in such facilities or to meet other necessities to survive. Affordability to provide for all became a huge challenge, thus missing out on learning knowledge and skills.
4. The failure to learn the required knowledge and skills jeopardizes the prospect of productive employment and income, which will impact future production and productivity.

The individual with a vested interest in the economy that takes undue advantage of a given situation by profiteering has not improved the situation. Due to the high demand for goods and supply shortage, the high cost of living brought down the purchasing power and affordability for the needed equipment and facilities. Thus, the students are caught in a sticky sinking ground between need and inability to afford and access.

FINDING

The sample for the survey consisted of 25 teachers and 24 students in HEI. They covered a broad spectrum of programs and disciplines of the study. From the sample, we can observe that the income of both the sample groups has pretty good income to be in a position to afford electronic devices necessary for Online Teaching and learning. The highest percentage among teachers (48%) and students (33%) is between 10,000-30,000. While 52% of teachers earn 30,000 and above. While the income of 50% of the student family is above 30,000/- per month.
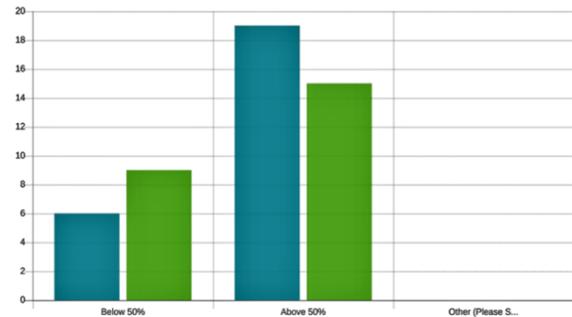

Figure 1. Percentage of family income is spent on basic necessities (Food, Clothing and Housing, etc.)
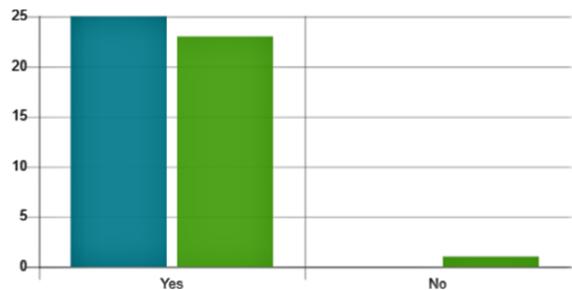

Figure 2. Access to Personal laptop/Mobile Phone/Tablet

The data indicates that most of the income is spent on basic necessities (food, clothing, housing, etc.) in normal time. We know that expenses on necessities are less elastic, but due to the pandemic, some adjustment is likely made in consuming these items to allocate extra budget for online classes as 100% of teachers and

96% of students own laptop smartphones. These adjustments are likely to be a one-time purchase and do not repeat frequently.
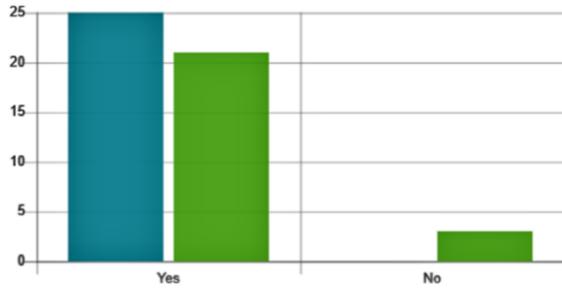

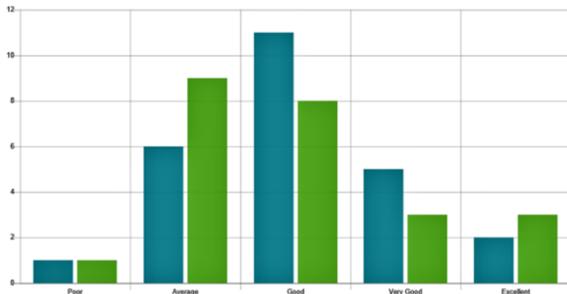Figure 3. Familiarity with the online educational platforms and quadrant.

Figure 4 Technological knowledge and skill of Online Education.

The teachers and students are well familiar with the online mode of education and the platform used by the university. Their technological knowledge and skill are also reasonably good. 84% of the teachers and 84% of students are aware of the online mode of education and can handle and execute it efficiently and effectively. The success is likely to depend mainly on the internet connection and familiarity of the particular platform used to disseminate the teaching.
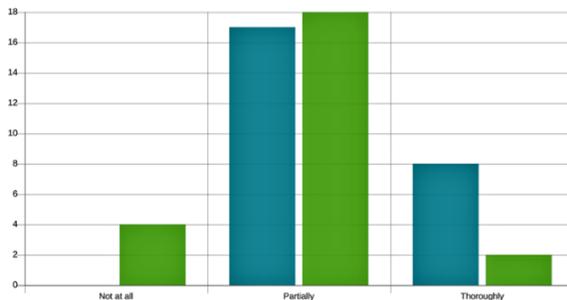

Figure 5 Awareness about the online platform adopted by the Institution.

Even though the teachers and students have the devices, knowledge, and skills, they may not have been oriented well about the platform adopted by the

University. The training and the familiarization have only been partial as 68% among teachers, and 75% among students are well versed with the platform. Undoubtedly if they are not trained well, it will adversely impact teaching and learning.
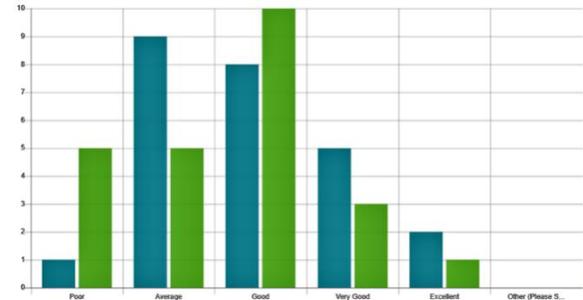

Figure 6. Internet Connectivity

The internet connectivity has been good but not great, which will negatively impact teaching and learning. Poor Connectivity will result in loss of time and teaching-learning opportunities. It will impact the performance of the students resulting in delays and increasing stress.
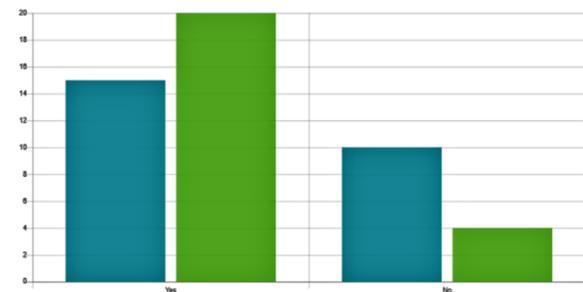

Figure 7. Readiness for Online Education.

When it comes to the feasibility of online education in India, most teachers (60%) and students (83%) agree that India is not ready for Online Education based on their experiences and observation. They agree that Pandemic has improved the preparedness but still fall far short. The reasons for this has been attributed to:
1. Poor technology in rural areas in comparison to urban areas.
2. Non-availability of high-speed broadband facilities in villages.
3. WiFi rates are high, which only the upper strata of society can afford.
4. Not able to afford devices for each school-going member of the family due to poverty.
5. Lack of training facilities for the stakeholders.
6. Most of the schools in India have very poor infrastructure and technology.

The significant deviation in the level of satisfaction of online teaching and learning is a matter of concern 60% of teachers are satisfied while 83% of students are not. There could be various inferences for that.

1. Barriers in communication between teachers and students.
2. Teachers are employed and can afford the infrastructure. Therefore they may be subjective about the situations.
3. There may be the sibling who may have to share the infrastructure, and due to their socioeconomic status and therefore subjective to view.

CONCLUSION

India and the world at large was found unprepared and unless a major punch is made towards technology availability and skill enhancement, Many Indians especially in the academic sector will miss the bus and found left behind. 3A's; Accessibility, Affordability, and Ability of the technology, which is the need of the hour, is a far cry for many Indian due to the socio-economic scenario. It will be imperative for all stakeholders to invest capital and time to ensure that teaching and learning continue online or offline for the effective application of knowledge and efficient management of the limited resources. Only this will ensure that the Pandemic Challenges are turned into opportunities for India to continue in the path of Economic growth and development.

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