DIGITAL TRANSFORMATION IN THE EDTECH INDUSTRY IN INDIA

by

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Dedication

I dedicate this dissertation to my loving parents who are my unwavering pillars of support. They have provided me with love, sacrifice, and advice throughout the course or writing this dissertation. Their belief in my abilities in my pursuit for knowledge has been the bedrock of my journey. The values that my parents instilled in me have also been essential in my academic expedition.

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ABSTRACT

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India's educational technology has been on the rise in the recent past. The main factors that can be linked to this increase include the availability of resources, demand for the technology, and the India's market size. The study investigates whether the educational technology transformation has taken place in India and the success of this transformation. Elements of EdTech are also investigated and the impact of the resources, technology, and accessibility are also evaluated. In this study, three focus group discussions have been convened consisting of between 7 and 9 participants per group. Surveys have also been delivered to 39 participants drawn from students, educators, EdTech companies, and policy-makers. After the collection of data, cleaning was done to ensure accuracy, completeness, and validity of the data. From the analysis of variance, the null-hypothesis in the study is rejected, indicating that the Educational Technology has occurred in India and has mostly been successful. The study has revealed that the main variables in EdTech include market size, teacher satisfaction, desire for digital learning, student retention, and need to have a competitive edge in the schools. The study also reveals that factors like resources, technology, and accessibility have a strong positive correlation with the efficacy of digital transformation in India. The future of EdTech in India is connected to the innovations like Artificial Intelligence and Machine Learning, Blended learning, online classes, and virtual learning among other innovations.

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CHAPTER 1: INTRODUCTION

1.1 Background

Education technology (EdTech) industry, in India is witnessing growth and its impact on the education system is being felt throughout the country. The combination of technology and the increasing demand for services is considered to be the driving force behind the remarkable expansion of this sector. These factors have created an environment that encourages innovation leading to changes in methods. Given these advancements it is crucial to understand the implications that arise from India's transformation in the field of education technology.

This transformation is prompted by factors like rising number of students actively participating in today's system and their growing preference for digital learning methods (Jaiswal and Arun 2021). The rapid growth of India's education sector and the subsequent rise of EdTech can be partly attributed to the country's student population, which represents a range of socioeconomic backgrounds and geographical locations. The EdTech sector in India is experiencing growth presenting opportunities and challenges due, to the transformative potential offered by digital learning solutions.

Despite this expansion it remains crucial to investigate how this digital transformation may impact outcomes and accessibility. Given the disruption of educational approaches it becomes crucial to thoroughly examine the effectiveness, impact and fairness aspects of the EdTech sector. Therefore, this study seeks to delve into the complexities surrounding

the growth and evolution of EdTech shedding light on its facets and potential consequences.

1.2 Objectives

This study's aim is to investigate digital transformation that has taken place in the EdTech industry in India has been successful. More specifically, the goals of the study are to:

- Investigate the elements impacting the adoption of EdTech solutions in Indian educational institutions. These factors include market size, EdTech, teacher satisfaction, desire for digital learning, student retention, and competitive edge.
- Analyze the impact of digital transformation in the EdTech industry on resources, technology, and accessibility.
- Investigate the scope of the EdTech industry in the future in India, considering the potential for market expansion, measures taken by the government, and technological advances.

1.3 Research Questions

The study is intended to answer the following questions:

1. What are the most important variables affecting the adoption of EdTech solutions in Indian educational institutions?
2. To what extent do factors like resources, technology, and accessibility impact the efficacy of digital transformation in the EdTech industry?
3. In light of the potential for market expansion and the government measures, what does future hold for EdTech industry in India?

1.4 Significance of the Study

This research employs comprehensive analysis of the multifaceted landscape of EdTech adoption in India. By synthesizing diverse literature, this study illuminates the challenges hindering widespread implementation, including digital divide, limited teacher training, and quality concerns. Moreover, it delineates the benefits of EdTech for educators and students, showcasing its potential to revolutionize learning methodologies. This research offers valuable insights into the complexities of digital transformation, exploring its effectiveness in fostering student-teacher engagement. By addressing the supply-demand imbalance and the impact of technological advancements on EdTech, this study aims to inform policymakers, educators, and stakeholders. Ultimately, it aspires to guide strategic decisions, policy formulations, and innovative approaches, becoming more inclusive, effective, and the sustainability of EdTech ecosystem in India.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

This chapter reviews all the relevant literature on Digital Transformation in the EdTech industry in India, introduces, analyses, compares, and integrates various published materials on the topic.

2.2 Digital Transformation and Rise of Edtech

The value of EdTech in India, as of 2020, was estimated to be $2.8 billion and is projected to increase to $10.4 billion by 2025 (Jaiswal and Arun 2021). Haleem et al. (2022) noted that the coronavirus exacerbated use of the online learning platforms leading to a surge in demand. EdTech sector in India has witnessed a 30% growth rate in 2020, and its Compound annual growth rate (CAGR) was estimated to change from 39% in 2020 to 2025(Jain and Lamba 2021).

Archambault et al. (2022) state that digital transformation has a critical influence in the growth of EdTech in India. It has transformed education delivery, making it more accessible, engaging, and effective (McGrath and Åkerfeldt 2019). Several levers are accelerating or decelerating the market growth of the EdTech industry in India as a result of digital transformation.

- Increased access to digital infrastructure: Digital transformation has led to implementation of digital infrastructure in India, like1 high-speed internet, mobile devices, and cloud computing. DWIVEDI and Joshi (2019) further noted that this has made it easier for EdTech companies to deliver their services and products to a larger

audience, including students in remote and rural areas. By 2025, the internet users in India is projected to rise to 974.81 million (Williamson 2022).

- Adoption of Artificial Intelligence (AI) and Machine Learning (ML): Aguilera-Hermida (2020) reported that AI and ML technologies have transformed the EdTech industry by providing personalized learning experiences to students. Chattopadhyay (2020) noted that these technologies enable EdTech companies to create adaptive learning algorithms that can personalize content and assessments based on a student's learning style, interests, and abilities. According to a report by RedSeer, AI and ML technologies are expected to grow at a CAGR of 52% between 2020 and 2025, providing significant growth opportunities for EdTech companies in India (Kravtsova et al. 2023).
- Gamification: Gamification is a technique that has been widely adopted by EdTech companies in the enhancement of both the student engagement in the industry and their motivation. Gamification applies the game design elements and features in the non-game environments like education.
- Video-based learning: This has become increasingly prominent in the EdTech industry, with EdTech companies leveraging platforms such as YouTube to deliver educational content to students (Zheltov 2022). Video-based learning is an effective way to deliver content in a visually appealing and engaging way (Chandrasekaran 2022). According to a report by RedSeer, the use of video-based learning is expected to grow at a CAGR of 43% between 2020 and 2025 (Bargavi 2022).
- Blended learning: Blended learning is a hybrid approach that combines online learning with traditional classroom teaching (Financialexpress, 2022). It provides students with

the flexibility to learn at their own pace, while also providing them with the opportunity to interact with teachers and peers in a traditional classroom setting. According to a report by Google and KPMG (20??), the adoption of blended learning is expected to grow at a CAGR of 44% between 2020 and 2025.

- Mobile learning: Mobile learning has become increasingly popular in India, with students using their mobile devices to access educational content and resources. Mobile learning provides students with the flexibility to learn anytime, anywhere, and on any device. According to a report by ResearchAndMarkets, the mobile learning market in India is expected to grow at a CAGR of 38.2% between 2020 and 2025 (Sharma 2022).
- Digital learning: Digital learning is the ability to use digital technologies to access, evaluate, and create information. Digital learning is a critical component of digital transformation in the EdTech industry. It enables students to use digital technologies effectively to learn and acquire new skills. According to a report by RedSeer, the adoption of digital learning programs in schools and colleges is expected to grow at a CAGR of 36% between 2020 and 2025 (Renz and Hilbig 2023).

While digital transformation has been a key driver of growth for the EdTech industry in India, there are also factors that may decelerate market growth. These include:

- Digital Divide: The digital divide refers to the gap between those who have access to digital technologies and those who do not. While digital infrastructure has improved significantly in India over the past few years, there are still many regions that lack access to high-speed internet and mobile devices. According to a report by the National Sample Survey Organization (NSSO), only 23% of households in

rural areas had access to the internet in 2017-18, compared to 42% of households in urban areas (Ameer and Vineeth 2021). This digital divide may limit the growth potential of EdTech companies, particularly in rural areas where access to technology is limited.

- Lack of digital learning: Digital learning is a critical component of digital transformation in the EdTech industry. However, there is a significant gap in digital learning levels among students in India. According to a report by the National Skills Development Corporation (NSDC), only 14% of Indian students have basic digital skills, while only 8% have intermediate or advanced digital skills. This lack of digital learning may limit the adoption of digital learning technologies, as students may struggle to use these technologies effectively.
- Resistance to change: Resistance to change is a common barrier to digital transformation in many industries, including the EdTech industry. Teachers and students may be resistant to the adoption of new digital technologies, particularly if they are accustomed to traditional teaching methods (Sikandar and Rahman 2021). According to a report by Google and KPMG, only 22% of Indian schools have fully adopted digital learning technologies, with many schools facing challenges in implementing these technologies due to resistance to change (Alam and Mohanty 2022).
- Limited teacher training: Effective implementation of digital learning technologies requires adequate teacher training. However, there is a significant gap in teacher training in India, particularly in rural areas. According to a report by the Indian Institute of Technology (IIT) Bombay, only 14% of teachers in rural areas have

received any form of ICT training. This lack of teacher training may limit the adoption and effective use of digital learning technologies in schools.

- Quality concerns: While digital learning technologies have the potential to enhance learning outcomes, there are concerns about the quality of digital learning content. According to a report by the National Council of Educational Research and Training (NCERT), much of the digital content available in India is of poor quality and may not be aligned with the curriculum (Pradhan et al. 2021).
- Regulatory challenges: The EdTech industry in India is subject to a complex regulatory framework, which may limit market growth. EdTech companies must comply with regulations governing data privacy, intellectual property, and online transactions, among others (Modgil et al. 2022). According to a report by Deloitte, regulatory challenges are one of the key barriers to the growth of the EdTech industry in India (Rani 2022).

- Competition: The EdTech industry in India is highly competitive, with a large number of players vying for market share. This may limit the growth potential of new entrants, particularly if they are unable to differentiate themselves from established players (Mathivanan et al. 2021). According to a report by RedSeer, there are over 4,000 EdTech companies in India, with the top 10 companies accounting for over 70% of the market share (Sahu and Samantaray 2022).

2.3 Benefits of Edtech for Teachers and Students

Educational opportunities are no longer influenced by conventional environments. The Indian EdTech business is thought to have garnered $16.1 billion in venture capital

financing, a 32X growth over the $500 million earned in 2010 (Financialexpress, 2022). Considering the rising prominence of Massive Open Online Courses (MOOCs), including distance learning, India's EdTech business is expected to achieve $30 billion over the following decade. Bligh *et al.* (2022) stated that the long-term influence of the outbreak on the education sector remains to be determined, and learning methods will undoubtedly become hybridised as cell phone and web adoption increases. Online learning is far less expensive than traditional schooling.

According to industry sources, schooling spanning first grade to level 12 in India will have expanded 6.3 times by 2022 compared to 2019 (The Times of India, 2022). Tümkaya *et al.* (2021) agreed that due to their cost, availability, and adaptability, these channels had enabled students from many economic levels but also social groups to get exposure to an excellent education. AI-powered internet sites in EdTech networks could simplify the process. Initially, pupils would most likely be required to complete a quiz. AI has been making significant advances in academia, transforming old ways of transferring knowledge into a holistic education model through simulations and virtual reality technologies.

Whereas the possibility of extending online learning seems enormous, Navaneeth and Siddiqui (2022) mentioned that a significant key hurdle within India for increasing the proactive usage of education technology consists of a lack of internet facilities. Nevertheless, Arthur-Nyarko *et al.* (2020) stated that the widespread usage of mobile phones improves student connectivity and learning skills. Competitive assessment applicants, particularly, commonly juggle jobs and school simultaneously. As stated by Jain *et al.* (2021), teachers could contact a large percentage of students with the help of EdTech. A geographical site where teachers and pupils may gather for class engagements

is no more required. Due to online programmes and training that were not accessible, individuals of various ages may study at their speed, without constraints, and even without compromising their daily duties. The NDEAR aims to establish a one-of-a-kind educational environment framework to advance the country's digital infrastructure while ensuring the independence of all key informants, notably provinces, including universities. As opined by Marín *et al.* (2020) EdTech improves instructors' present methods by transforming them into more effective or valuable for education. For instance, projector slides may improve classes using audio-visual components like illustrations, pictures, and recordings. Lee and Fanguy (2022) agreed that EdTech could increase instructors' ability to embrace and sustain innovative practices that might otherwise be difficult to implement. Materials are available for teachers to employ in the interest of improving their blended learning and instructional abilities. Using EdTech, they may exchange and debate materials with colleagues and instructors so they can help one another tackle certain problems.

Elumalai *et al.* (2021) opined that EdTech helps teachers to offer online classes to reduce the need for limited students to go to the campus for teaching or evaluation. Rees Lewis *et al.* (2019) agreed that these educational technologies (EdTech) tools support learning in innovative methods, collaboration, and attendance for pupils, both within and outside of the classroom. With the use of EdTech, instructors may facilitate hybrid teaching, which fosters an accessible learning environment where students can acquire the material regardless of their geographical or physical presence requirements. Havik and Westergrd (2020), on the other hand, claimed that since individuals can obtain everything via the Internet, people choose not to attend classes or quickly become side-tracked. Correia *et al.* (2021) argued that technological advances within education can be employed to gather data

in several digital formats, such as word or PDF documents, photos, and videos. All fresh batches of students could benefit from the saved files.

This limits how much equipment and time an instructor needs. This aids in lowering the teacher's expenditures. One might communicate with others online with the use of devices like computers and cell phones. This may encourage more pupils to sign up for eLearning courses. Even though the per-student cost is minimal, a course's enrollment will generate a lot of money for the teacher's work. Virtual teaching is not characterised by a one-size-fits-all approach - students can select courses that are most matched to their sensitivities and learning speed. Rodríguez-Martíne*et al.* (2022) opined this allows instructors to become more attentive to specific student inquiries and provide personalised answers to educational issues. Educators using the EdTech platform can engage with their students virtually and communicate with their students through a microphone at leisure. A digital whiteboard could be used by instructors to provide customised alternatives across topics.

Dash and Kuddus (2022) opined that managing as an educator in a country with 264 million school-aged students is not easy. One must continually switch between designing courses, devising teaching techniques, and producing exam papers while also attending regular lessons. Technologies, in contrast, have made the work of educators easier by streamlining these operations and bringing better methods to evaluate student growth and performance (Oishabytes, 2022). Educators usually not only possess an abundance of reference information from which to compose their lessons, but they may also experiment with emerging ideas to streamline a complicated topic. Betts *et al.* (2020) opined that whether for pupils or instructors, EdTech has simplified knowledge exchange and provided unprecedented worldwide exposure. Nowadays, an instructor may share their study

documents with educators all around the nation, facilitating the simple interchange of concepts, and thoughts, with expertise.

2.4 Key Challenges Behind Edtech Adoption in India

Indian schools and colleges mostly follow skill-based teaching curriculums (implying obtaining knowledge and skills through mastery and regular practice) rather than a knowledge-based approach (which refers to reading, watching, and listening to obtain necessary data before proceeding to the next learning step) (Subhashini *et al.* 2022). Hence, overwhelming information has replaced comprehension and evaluation. According to Selvaraj *et al.* (2021), most students gain academically from digital learning technology. Kozyreva*et al. (*2020) claimed that digital devices are notorious for distracting. So, adding such technology to the curriculum to transmit content while keeping the focus on the subject has become one of the most complex problems for institutions. Technology addiction is causing internet addiction, lack of exercise, in-person socialisation, and distractibility among students. Unfortunately, as per David *et al.* (2021), pricing remains an issue for specialised EdTech devices, particularly for poorer or lower-middle-income families, restricting their availability even while connectivity improves. Recognising the challenges, the government of India has sponsored numerous efforts during the past years to develop India's digital environment, serving as a stimulus for the EdTech industry.

Al-Samarraie *et al.* (2021) concurred that these signs were more noticeable once institutions reopened in early 2022 and kids returned to school after intensive technology usage. Instructors needed help to engage kids. According to UNICEF, the COVID-19 pandemic has affected 25–30 crore Indian children's education (India Today, 2022). Lee *et*

al. (2022) noted that a lack of socio-academic contacts hurts students' physical, mental, and behavioural health when schools close. Malik and Tyagi (2020) said that schools welcomed children back after the pandemic, although this was difficult. Online classes were handy, but understanding was poor. Pupils who could not use digital learning devices or engage with classmates struggled with regular lessons. Singh (2021) argued that several educators go too far with EdTech but entirely depend on educational technology. This could make the pupils feel alienated while learning, significantly affecting their performance.

Student engagement and mental ability plummeted with the switch to online instruction and a lack of regularity. Post-pandemic Indian teachers struggled with upskilling and reskilling, thus many had to take ICT training. They learned to use digital tools, create personalised lessons, and provide simultaneous and asynchronous courses. According to García-Morales *et al.* (2021), many instructors struggled to adopt digital technology owing to age or economic restrictions. Some teachers over 50 or 60 refused to learn or embrace technology. Several instructors could not afford equipment. Upskilling or reskilling will be the norm for future generations due to rapid technology advancement and new schooling.

2.5 Effectiveness of Edtech in Educator/Student Interactor (or Engagement)

EdTech only sometimes immediately answers students' inquiries, according to O'Brien and Pitera (2019). Dahlström (2022) stated that technology helped teachers avoid the administrative fallacy and develop stronger ties with students. Teachers can manage many courses with specific solutions. Auto-graded examinations and self-assessments minimise testing, giving teachers more time to help students and establish trust. Zeyab and Alayyar (2023) agreed that EdTech, or digital education technology, have made studying ubiquitous

by allowing students to access their programs from anywhere, improving student involvement. Technology may also be used to customise instruction to each student's needs, including accommodating kids with disabilities and illnesses. EdTech can solve educational issues. Personalised and adaptive teaching strategies can make self-led and other forms of education more accessible, practical, and engaging. Some pupils learn best by reading, but others by watching.

Dutta (2020) said speed, schedule-based instruction, and practice are benefits. EdTech can foster long-term engagement by analysing how students utilise developing technologies and getting input on how to employ them for learning. So, teachers may evaluate creative learning methodologies based on trust and respect among students. Photopoulos and Triantis (2022) concurred that technology's impact on education is unimaginable as it grows. These advances will further alter how standard and non-traditional courses are taught. So, firms must develop techniques to improve learning. EdTech has quickly become a primary teaching method for instructors. Technology has improved government-teacher support by enabling virtual coaching, peer help, and EdTech services for instructors. Yusof *et al.* (2019) also noted that today's students need more than an essential coursebook. Teachers may leverage EdTech and cutting-edge technology to produce immersive tutorials or presentations. Fun interactions help pupils learn (Mckinsey.com, 2022). EdTech provides unlimited resources, allows coursework submission, puts administrative activities online, and more, which improves teacher satisfaction by making their work more efficient and pleasant.

As technology has become prevalent in the educational sector, maintaining data is becoming incredibly useful and crucial. Laufer *et al.* (2021) opined that detailed analytics

of a learner's progress, including the number of exams taken, chapters finished, and more, are now available to teachers. This enables teachers to complete their tasks with more insights and less time effectively. The entire classroom may be given homework or tasks simultaneously, and instructors can check the outcomes online. Greenhow *et al.* (2021) agreed that this technology has helped professors concentrate mainly on their program units and provide in-depth instruction. Lesson preparation, marking, and other administrative activities may be automated using EdTech solutions, giving teachers additional time to concentrate on instructing and connecting with pupils. Students' enthusiasm and involvement in the classroom may be raised by using EdTech instruments for developing dynamic and exciting educational experiences.

Kabilan and Annamalai (2022) argued that teachers frequently discover that they like instructing immensely whenever their pupils are passionately involved in their studies and excited regarding it. Depending on each student's unique requirements and educational preferences, tailored learning environments may be developed using EdTech technologies. This could enhance student education results and make instructors feel highly productive. Zimmer and Matthews (2022) agreed that several EdTech products come with materials for career development for instructors that can assist educators in staying updated on the newest pedagogical approaches and technological advances. This may result in a feeling of contentment and professional advancement. Ultimately, EdTech could improve teacher satisfaction by assisting instructors in their jobs and streamlining administrative procedures.

Kim and Padilla (2020) opined that educators now have more accessibility to EdTech resources than ever because of the growing use of smartphones, high-speed broadband, and

other technical improvements. As a result, instructors now find it simpler to incorporate technology throughout their lessons and use EdTech tools more frequently. Chen *et al.* (2022) argued that the ease of access and functionality of EdTech products has simplified the process for instructors to implement technology within their courses. Nowadays, many EdTech solutions are considered by teachers and offer straightforward, user-friendly interfaces. Camilleri and Camilleri (2019) argued that the concentration on student-centred learning in the most recent technology advancements has resulted in the creation of EdTech solutions that encourage cooperation, and critical reasoning, including problem-solving. Starkey *et al.* (2021) agreed that these resources support educators in developing fun and dynamic learning opportunities for pupils. Recent technology advancements allow EdTech solutions to offer pupils more individualised learning opportunities.

This has enhanced educational objectives by making it more straightforward for instructors to meet their pupils' unique requirements and learning preferences. Nowadays, many EdTech products are made to work with current platforms smoothly. As a result, managing classrooms and monitoring student achievement with EdTech solutions has become simpler for instructors. 62% of educators believe that technology has helped them achieve work-life harmony, a tendency in metropolitan areas and non-metro areas (Bureau, 2022). 74% of instructors said EdTech businesses helped them to have greater discretion with their work schedule (Bureau, 2022). EdTech platforms may be employed to supplement, but not replace, the work of an educator.

Heinrich *et al.* (2019) argued that EdTech platforms are ideally suited for increasing quality training, providing tailored instruction, widening the practice of such guidance, and increasing learner involvement. These portals helped instructors in building skills or tactics

that enhance the distance learning opportunity. Depending on the pupils ' comprehension abilities, instructors can use different virtual assignment modes. As mentioned by Nachtigall*et al.* (2022) instructors may offer pupils vivid, exciting representations of the content they are attempting to teach by using movies, educational activities, and photos. Topics traditionally dry or challenging to comprehend could be made bright and entertaining. This could simplify the task for instructors to maintain their pupils' enthusiasm for the presented content and their interest.

2.6 Effectiveness of Digital Transformation in Edtech

The demand side of the EdTech industry in India i.e., market size, child demographic, teacher satisfaction rate, preference for digital learning environments over traditional classrooms, student retention and competitive edge act as independent variables which influence the adoption of EdTech in Indian institutions. Dhananjaya (2022) opined that the size of the Indian EdTech marketplace may significantly impact the implementation of EdTech within Indian institutions. Since there is a significantly growing market, there is a substantial demand for EdTech products, which may encourage businesses to adopt EdTech solutions to meet the needs of their instructors and students. In 2020, there were 622 million digital subscribers throughout India. Due to the increasing penetration levels across rural India, this figure is projected to expand by approximately 45% to 900 million by 2025 (Ibef.org, 2021). In rural India, the internet penetration rate remains below 40% whereas 66-69% of the urban population use the internet (Economic Times, 2022).

Children in India, particularly in the K–12 education sector, use EdTech at a high rate. Statista forecasts that the Indian EdTech marketplace is valued at US$2.8 billion and will

grow towards US$10.4 billion by 2025 (India Briefing News, 2022). The K–12 sector represents India's leading and potentially lucrative online educational company market, with more than 250 million enrolled students (India Briefing News, 2022). Kumar *et al.* (2021) mentioned that the educator satisfaction level may predict the profitability of the Indian EdTech market. The integrity of the material, usability, portability, and assistance given via EdTech firms might affect educators' satisfaction regarding EdTech solutions within India. Teachers are most inclined to embrace and employ EdTech products that are simple to employ, offer high-quality material, and are available on various gadgets.

Ameer and Vineeth (2021) argued that the popularity of EdTech platforms over traditional classrooms may be a key sign of how well the Indian EdTech market is doing. This could increase the accessibility and effectiveness of EdTech services, especially in places with restricted access to traditional schooling. EdTech can be preferred over traditional schooling for various things, including the capacity to offer tailored education, more exciting information, or more freedom for learners to advance at their preferred speed. Ifenthaler and Yau (2020) agreed that such educational technology tools successfully boost students' educational experiences and raise student retention rates. Reasonable retention rates among pupils indicate that EdTech systems deliver motivating and efficient learning opportunities, improving educational objectives and general academic achievement.

Thomas and Allen (2021) also mentioned that improving student involvement and a good learning setting may help enhance students' interest and drive in studying. India's EdTech market is highly competitive, with numerous businesses offering an extensive range of goods and solutions. Bhutoria (2022) argued that EdTech platforms set themselves apart by providing distinctive features like customised learning, interactivity, and adaptive

learning techniques. EdTech networks are creating strategic alliances with other businesses and organisations to increase their outreach and enhance their capabilities.

On the other hand, the supply side of the industry i.e., (available resources, technology that is used, and accessibility) act as the independent variable which influences the effectiveness of digital transformation of the EdTech industry within the country. Jafari-Sadeghi *et al.* (2021) mentioned that the accessibility of resources like capital and technological infrastructure might offer crucial information on the success of digital transformation within the Indian EdTech sector. These tools are essential for the creation and execution of EdTech alternatives, and their accessibility may significantly influence that industry's capacity to provide students and educators with valuable and meaningful remedies. Williamson *et al.* (2020) agreed that as financing availability reflects the quantity of capital generated within the EdTech sector, it could be a crucial indicator of how well the industry is undergoing digital transformation. The efficient provision of EdTech solutions to pupils and teachers within India may be made possible by the availability of technological infrastructure like high-speed broadband, portable devices, plus educational software. Technology might be a crucial indicator of how successfully the Indian EdTech sector has undergone digital transformation.

Alam (2022) argued that technological improvements have substantially increased the potential for electronic instruction and learning, over which EdTech products are based. Innovative and increasingly advanced technology may support more successful and efficient instruction, more individualised and exciting learning experiences, and better information and analytics for teachers and management. As more EdTech products are created, it is crucial that they can function in unison to deliver a smooth and all-

encompassing educational approach. In contrast, Dhawan (2020) stated that another crucial indicator of the success of digital transformation there in the Indian EdTech sector includes the accessibility of EdTech products. Irrespective of their geography or socioeconomic background, all pupils and teachers must have access to EdTech alternatives.

Pratsri and Nilsook (2020) agreed that this calls for creating EdTech systems that can suit various learning needs and the accessibility of technological infrastructure including web access and electronic gadgets. Significant aspects of the success of the digital transformation within the Indian EdTech business include the level of technological excellence and complexity, compatibility of EdTech services, and the accessibility of EdTech alternatives. Advanced technologies and the creation of creative EdTech alternatives with an emphasis on accessibility or compatibility can significantly increase the efficacy of online learning within India. Future growth in the Indian EdTech sector will heavily depend on closing the demand and supply imbalance.

The demand side elements define the industry's capacity to satisfy the desire and provide efficient solutions, whilst the supply side aspects show the potential for developing and accepting EdTech solutions. This is due to the demand demonstrating the market potential, including revenue and profitability, for the Indian EdTech business. Nevertheless, the EdTech business experienced difficulties because of a supply shortage, namely money and technological infrastructure like high-speed internet in some regions of India (Kumar *et al.* 2022). For the Indian EdTech sector to continue to expand and thrive, the supply-demand imbalance for EdTech products must be closed. To do this, the industry must concentrate on creating and providing cutting-edge products that are usable, practical, and inexpensive while catering to pupils and educators' needs and needs from various geographical and

economic statuses. This should necessitate expenditures in digital gadgets and infrastructure and the creation of increasingly complex and interconnected EdTech platforms that can deliver individualised and exciting learning experiences.

2.7 Future Scope in India

The future scope of the EdTech industry in India looks promising, with significant growth potential in the coming years. The future of EdTech in India will be influenced by the access to the technologies and the demands in the market owing to the growth opportunities. The report further highlights that the number of paid users in India's online education industry is expected to reach 9.6 million by 2021 and 37.6 million by 2025, indicating a significant shift towards online learning solutions.

2.8 Literature Gap

The scope of future research is the role of government policies and regulations in shaping the EdTech industry. Whereas the literature review touched upon some of the policy initiatives that have been undertaken by the Indian government, there is still a need to explore the impact of these policies on the growth and development of the industry (Mathivanan *et al.* 2022).

Another important area where further research is needed is the role of EdTech in addressing the digital divide in India. While the literature review discussed the potential of EdTech to democratize access to education, there is still a need to examine how effective EdTech has been in reaching underserved populations (Al-Karaki*et al.* 2021). For example, what are

the barriers that prevent students from low-income backgrounds from accessing EdTech tools? How can EdTech companies design products that are more accessible and affordable for these students?

A third area where further research is needed is the impact of EdTech on learning outcomes. While the literature review discussed the potential of EdTech to enhance learning outcomes, there is still a need to examine the effectiveness of specific EdTech tools and platforms. For example, what is the impact of personalized learning platforms on student achievement? How do gamified learning platforms affect student motivation and engagement? Are there any negative consequences of excessive screen time on student learning?

Finally, there is a need to examine the sustainability of the EdTech industry in India. While the literature review touched upon the growth potential of the industry, there is still a need to examine the financial viability of EdTech startups (Li 2022). For example, what is the average lifespan of an Indian EdTech startup? How do EdTech companies generate revenue, and what are the challenges they face in doing so? What is the overall contribution of the EdTech industry to India's GDP, and how does this compare to other sectors?

In terms of measuring the growth of the EdTech industry in India as a sector contributing to the country's GDP, there are several research questions that could be explored (Mathivanan *et al.* 2022). One approach could be to examine the financial performance of publicly traded EdTech companies in India (Bargavi 2022). For example, what is the revenue growth rate of companies such as Byju's and Unacademy? How does this compare to other sectors in the Indian economy? Another approach could be to examine the funding landscape for Indian EdTech startups. For example, how much venture capital funding has

been raised by Indian EdTech startups in the last five years? How does this compare to other emerging markets such as China and Brazil?

CHAPTER 3: METHODOLOGY

3.1. Introduction

Education technology (EdTech), an array of factors and variables significantly influence the adoption, efficacy, and future prospects of digital solutions in educational institutions. The adoption of EdTech in Indian educational institutions presents a multifaceted challenge and opportunity, given the complex and diverse landscape of the Indian education system. This study aims to investigate these challenges and opportunities by addressing three main research questions and related sub-questions.

The primary research questions and sub-questions are as follows:

1. **What are the most important variables affecting the adoption of EdTech solutions in Indian educational institutions?**
    - What are the key drivers that promote the adoption of EdTech?
    - What barriers hinder the effective implementation of EdTech in educational settings?
2. **To what extent do factors like resources, technology, and accessibility impact the efficacy of digital transformation in the EdTech industry?**
    - How does the availability of resources, including financial and human resources, affect the implementation of EdTech?
    - What role does the quality of technology and accessibility to digital tools play in the overall effectiveness of digital transformation within the EdTech sector?

3. **In light of the potential for market expansion and the measures taken by the government, what does the future hold for the EdTech industry in India?**
    - What is the current status of the EdTech market in India, and how is it poised for expansion?
    - What government initiatives and policies are influencing the EdTech industry's growth and direction?

This research endeavors to address these fundamental questions to shed light on the current state of EdTech adoption in Indian educational institutions, its effectiveness, and the potential for growth. By examining these questions, the study aims not only to identify challenges and opportunities but also to contribute to a more robust understanding of the complex EdTech landscape in India.

3.2. Research Design

The research uses a mixed methods approach, which is motivated by the diverse and multifaceted nature of the research questions, and which demands a well-rounded investigation of various variables.

Reason for Choosing a Mixed Methods Approach

The research design adopted for this study is a mixed methods approach, a deliberate choice driven by the intricate and multifaceted nature of the research inquiries. Aiming for a thorough investigation of the variables influencing EdTech adoption, effectiveness, and future potential, this approach provides a well-rounded exploration.

The decision to employ a mixed methods approach stems from several key reasons. Firstly, the complexity of the research questions demands a comprehensive understanding, and this

approach facilitates a holistic exploration. By integrating both qualitative and quantitative data, it enables a more robust analysis, fostering data triangulation and thereby bolstering the credibility and reliability of the research outcomes.

Moreover, the utilization of qualitative methods within this approach serves the purpose of delving deeply into context-specific factors, particularly relevant when examining the intricacies embedded within the Indian education system. This depth of exploration helps in unraveling nuanced insights, shedding light on specific contextual elements crucial to understanding the dynamics of EdTech adoption.

MEASURES

Variables Under Study:

Independent Variables:

The research encompasses a comprehensive analysis of various factors influencing the landscape of EdTech adoption and effectiveness in India. To capture the intricate dynamics at play, a mixed methods approach will be employed, amalgamating quantitative and qualitative methodologies.

Quantitative data collection will involve assessing several independent variables. Investment funding in EdTech companies will be measured by aggregating total venture capital and private equity investments, funding round counts, and average investment sizes over a specified timeframe. The digital infrastructure's quality and availability will be quantitatively gauged using metrics such as internet speed, broadband penetration, and digital device accessibility across different regions. Demographic trends, including age distribution and educational needs, will be gathered from surveys, government reports, and

census data. User experience and learner engagement metrics will be assessed through surveys, usability tests, user feedback, and learning analytics, focusing on user satisfaction, task completion rates, time spent on platforms, and engagement assessments.

The quantitative aspect will entail conducting a survey with a structured questionnaire to gather data on investment funding, digital infrastructure metrics, demographic trends, user experience, and learner engagement. The sampling frame will encompass diverse stakeholders in the Indian educational landscape, including EdTech company representatives, educators, students, and policymakers. The sample size will be determined to ensure a representative and statistically significant dataset.

For the qualitative dimension, semi-structured interviews will be conducted with key informants. These informants will include EdTech industry experts, educators, policymakers, and students. The number of interviews will be determined based on achieving data saturation, ensuring a comprehensive understanding of nuanced perspectives and insights into EdTech adoption, efficacy, and future prospects within the Indian context. This mixed methods approach aims to provide a robust and multifaceted exploration of the factors shaping the EdTech landscape in India.

Dependent Variables:

The research aims to investigate two dependent variables: the effectiveness of EdTech adoption and the future prospects for the EdTech industry in India. To achieve this, a mixed methods approach will be utilized, incorporating both quantitative and qualitative methodologies.

For the measurement of the effectiveness of EdTech adoption, quantitative data will be gathered through standardized test scores, learning analytics, and qualitative inputs

obtained from surveys and interviews. These methodologies will help in gauging the impact and level of effectiveness associated with the integration of EdTech in educational settings. The operationalization process will involve categorizing the effectiveness of EdTech adoption into various levels (e.g., low, moderate, high) and establishing correlations between learner engagement, user experience, digital infrastructure, and their influence on educational outcomes.

Concurrently, to ascertain the future prospects of the EdTech industry, a multifaceted approach will be employed. Data collection will include collation from existing reports, conducting interviews with industry experts, policymakers, educators, and stakeholders, and an analysis of government initiatives related to the EdTech sector. This comprehensive methodology aims to identify and comprehend key trends, market dynamics, and influential factors shaping the future trajectory of the EdTech industry in India.

Regarding quantitative data collection, a survey will be conducted among a diverse sample of students and educators within the Indian education system. The sampling frame will encompass various educational institutions, considering both rural and urban settings, ensuring a representative and comprehensive dataset. The sample size will be determined based on statistical considerations to ensure adequate representation and validity of findings.

In tandem with quantitative data, qualitative insights will be obtained through semi-structured interviews with key informants. These interviews will involve educators, EdTech experts, policymakers, and other stakeholders intimately involved in the Indian education landscape. The number of interviews will be determined based on saturation, aiming for a comprehensive understanding of qualitative aspects related to EdTech

adoption and future industry prospects. The selection of key informants will ensure diverse perspectives and experiences to enrich the qualitative dataset.

Measurement and Operationalization:

The quantitative variables will be operationalized through categorization, scoring, and statistical analysis. Qualitative data will be thematically analysed. Variables' interplay will be examined using regression analysis to understand their impact on the dependent variables.

This mixed methods approach and the careful measurement and operationalization of variables will enable a comprehensive analysis of the EdTech landscape in India. By considering the interplay of quantitative and qualitative data, the research aims to provide valuable insights into the multifaceted factors influencing EdTech adoption, effectiveness, and future prospects in Indian educational institutions

3.3. Population and Sample

Target Population:

The target population for this research encompasses diverse stakeholders deeply entrenched in the Indian EdTech ecosystem. These stakeholders play pivotal roles in shaping, experiencing, and evaluating the impact of EdTech solutions. The target population includes the following key groups:

1. **Students**: This group represents the primary beneficiaries and users of EdTech tools. The population of students spans various education levels, from primary to higher education, across different regions of India.

2. **Educators**: Teachers and educational professionals who engage with EdTech tools in their teaching methodologies. They contribute insights into the integration and effectiveness of technology in education.
3. **EdTech Companies**: EdTech companies, both established and emerging, that develop and provide educational technology solutions in the Indian market. This group offers perspectives on innovation, market dynamics, and challenges.
4. **Government Representatives**: Policymakers, officials, and individuals associated with the government who influence EdTech policies and regulations. Their perspectives are critical for understanding the regulatory environment and its impact.
5. **Experts and Analysts**: Subject matter experts and industry analysts with in-depth knowledge of the EdTech sector. Their expertise lends valuable insights into trends, challenges, and opportunities.
6. **Demographic Data Sources**: Existing demographic data sources, including government reports, surveys, and census data, which provide information on age distribution and educational needs within the Indian population.

Sample:

The sample for this research will be thoughtfully stratified across the diverse stakeholder groups to ensure well-rounded representation. The sample size will be determined through a combination of probability and non-probability sampling techniques:

1. **Students**: A substantial sample of students will be selected from a range of educational levels (e.g., primary, secondary, higher education) and diverse regions (urban, rural), ensuring a comprehensive cross-section of the student population.

2. **Educators**: A sample of educators will be chosen from various types of educational institutions (schools, colleges, coaching centers) and various teaching levels (primary, secondary, higher education).
3. **EdTech Companies**: A purposive sampling approach will be utilized to select a sample of EdTech companies, encompassing a mix of start-ups and established entities.
4. **Government Representatives**: Key government representatives involved in EdTech policy-making and implementation will be interviewed, ensuring a holistic understanding of government initiatives.
5. **Experts and Analysts**: A purposive sampling method will be employed to select experts and industry analysts with diverse perspectives and expertise in the EdTech sector.
6. **Demographic Data Sources**: Existing demographic data sources will be accessed to collect demographic information, enabling a detailed analysis of age distribution and educational needs.

The sample size for each group will be determined based on the principle of saturation, ensuring that ample data is collected to address the research questions comprehensively.

A variety of sampling techniques, such as random sampling, purposive sampling, and the use of available data sources, will be applied to gather data from the selected groups.

The chosen sample size and sampling techniques are poised to facilitate a robust, representative, and insightful analysis of the multifaceted EdTech landscape in India. They will be instrumental in yielding valuable conclusions and insights drawn from the gathered

data. In the study, the sample size of 39 participants were selected for the study. Three Focus Group Discussions were formulated with an estimated 8 participants per group.

3.4. Data Collection and Instrumentation

In order to obtain in-depth insights from a broad spectrum of stakeholders in the Indian EdTech landscape, this research employs a variety of data acquisition techniques. By integrating these methodologies, which are meticulously customised to the particular cohort under investigation, a comprehensive comprehension of the intricate forces that impact the adoption, efficacy, and future potential of EdTech will be achieved.

Face-to-face one-to-one Semi-Structured Interviews:

To facilitate comprehensive qualitative investigation, individual, face-to-face semi-structured interviews will be employed. This approach will enhance the acquisition of comprehensive and intricate perspectives from key informants who hold crucial positions within the EdTech ecosystem—such as government officials, educators, representatives of EdTech companies, and industry experts. The precise quantity of interviews will be established in accordance with the principle of data saturation, thereby guaranteeing the inclusion of a wide spectrum of viewpoints. The interviews will adhere to a meticulously organised topic guide, which has been purposefully crafted to direct the dialogues towards the precise research inquiries. By using open-ended queries, key informants will be encouraged to freely share their perspectives and experiences. The qualitative data that is gathered will provide intricate viewpoints regarding matters including the obstacles encountered in the adoption of EdTech, the experiences of users, and the consequences of governmental policies.

Focus Group Discussions (FGDs):

In order to enhance the knowledge acquired from individual interviews, supplementary focus group discussions will be undertaken. For the purpose of facilitating group discussions, the FGDs will convene key informants with diverse backgrounds. The diversity of stakeholders within each group will dictate the quantity of key informants and FGDs included in each group. FGDs will facilitate the identification of emergent trends, shared themes, and divergent viewpoints within the stakeholder community. The discussions will be directed by a topic guide that will address particular research inquiries. Facilitating fruitful discussions among key informants, FGDs will promote a collective understanding of issues.

Surveys and Questionnaires:

In order to obtain a comprehensive understanding from a sizable sample, questionnaires and surveys will be utilised. The survey instrument shall comprise a blend of closed-ended and open-ended inquiries. The structured data obtained from the closed-ended queries will facilitate quantitative analysis and provide valuable insights into various aspects such as demographics, digital infrastructure assessment, and user satisfaction. By posing open-ended inquiries, key informants will be able to furnish comprehensive accounts concerning their experiences, obstacles, and anticipations with respect to the adoption of EdTech. Surveys shall be conducted through various mediums, including online platforms, pencil and paper, in order to accommodate the preferences of key informants. To assure representation, the sample size for surveys will be determined using appropriate statistical methods.

The research will attain a comprehensive comprehension of the multifaceted EdTech landscape in India through the implementation of this multifaceted approach to data acquisition. By employing a combination of qualitative and quantitative data sources—individual interviews, group discussions, and surveys—the research will be able to obtain its information. The collected data will play a crucial role in providing exhaustive answers to the research questions by shedding light on various aspects of EdTech solutions' adoption, effectiveness, and future prospects within the educational landscape of India.

3.5. Data Analysis

Before the analysis of data, the data cleaning process was conducted. The reason for the data cleaning process is to maintain the accuracy and precision in the findings. The main reason for the data cleaning is to de-duplicate the data, remove the irrelevant data and information, fixing the structural errors in the data, filtration of the outliers in the data, and dealing with the missing data. The first step was removing all the incomplete surveys in the data. Incomplete surveys were eliminated to ensure the completeness of the data and to come up with accurate data systems. Consistency and uniformity of data was also critical in ensuring proper cleaning of these data.

The information gathered from diverse sources (interviews, focus group discussions, surveys, and focus groups) will be subjected to a rigorous analysis procedure in order to extract significant insights and conclusions. The analysis procedure will incorporate a combination of qualitative and quantitative methodologies, with each approach being specifically designed to correspond with the characteristics of the gathered data.

Qualitative Data Analysis:

- **Content Analysis**: Consisting predominantly of interviews and focus group discussions, qualitative data will be subjected to content analysis. By systematically identifying, categorising, and analysing recurring themes, patterns, and concepts in the textual data, this method is implemented. Key themes and narratives will emerge as a result of content analysis, offering in-depth understandings of matters such as obstacles to the adoption of educational technology (EdTech), user experiences, and the effects of governmental policies.
- **Thematic Analysis**: Additionally, the qualitative data will be subjected to thematic analysis, wherein recurring themes and patterns are identified. By employing this methodology, one can effectively examine the intricate facets of stakeholders' viewpoints, discern prevalent patterns, discrepancies in approaches, and nascent developments within the EdTech ecosystem.

Quantitative Data Analysis:

- **Descriptive Statistics**: The analysis of quantitative data obtained via surveys will be conducted utilising descriptive statistics. In order to summarise and illustrate the data, these statistics will comprise measures such as the mean, median, standard deviation, and frequency distributions. Descriptive statistics will furnish a comprehensive synopsis of the demographic characteristics of key informants, evaluations of digital infrastructure, and rankings of user satisfaction.
- **Regression Analysis**: In order to investigate the associations between dependent and independent variables, regression analysis will be utilised. In particular, an examination of the impact of investment funding, digital infrastructure, and user experience on the efficacy of EdTech adoption could be conducted utilising

multiple regression. This statistical technique will aid in determining the magnitude and direction of the influence of these factors.

- **Data Visualization**: For a robust analysis within the study investigating the landscape of the EdTech industry in India, a sample size of 39 has been meticulously computed, ensuring a confidence level of 90% with a margin of error ±13%. This selection of sample size, derived from an unlimited population size, is strategically designed to offer statistically significant insights into the effectiveness of EdTech adoption and future prospects. In conjunction with quantitative measurements, qualitative dimensions shall be thoroughly explored through focused interviews and surveys. Key informants from various stakeholder groups encompassing educators, policymakers, and industry experts will offer invaluable insights. A targeted approach of conducting semi-structured interviews with 20 key informants selected purposively, ensuring diversity across regions and roles, will enable a deeper understanding of contextual factors impacting EdTech adoption and prospects in India. Additionally, focus group discussions involving 8 to 10 participants per group will supplement these interviews, fostering interactive exchanges and nuanced viewpoints. The meticulous approach to sample size determination and the integration of qualitative methodologies, particularly interviews and focus group discussions, are instrumental in enriching the research outcomes. Through these methods, the study aims to elucidate multifaceted aspects such as the effectiveness of EdTech solutions, future industry prospects, and critical influencers shaping the landscape. The inclusion of diverse perspectives from key informants representing various segments of the EdTech ecosystem ensures a

comprehensive understanding of challenges, opportunities, and emerging trends. This structured approach is poised to yield in-depth insights that contribute significantly to the discourse on EdTech within the Indian educational milieu.

Integration of Qualitative and Quantitative Data: By integrating data from both qualitative and quantitative sources, a comprehensive understanding of the research questions will be achieved. In order to supplement quantitative findings, qualitative insights will furnish explanations, context, and profundity for statistical results. The integration of data from multiple sources through triangulation will augment the study's overall credibility and dependability.

Presentation of Findings: The research results will be disseminated in a coherent and structured fashion, in accordance with the standards and conventions of scholarly inquiry. In order to present the findings of the content and thematic analyses, narrative descriptions and illustrative quotations will be utilised. Tables and infographics will be used to present quantitative findings, providing a visual representation of key patterns and connections.

This research endeavours to offer a comprehensive and nuanced comprehension of the EdTech landscape in India through the utilisation of a mixed methods approach to data analysis. By integrating qualitative and quantitative methodologies, it is possible to guarantee a thorough examination of the research inquiries and extract significant findings from the gathered information.

3.6. Research Limitations

The research methodology selected for exploring the implementation, effectiveness, and future potential of EdTech solutions in India aims for comprehensiveness. However, certain constraints should be considered to evaluate the scope and credibility of this study. Sampling methods, particularly stratified sampling, aim to encompass diverse stakeholder groups. Yet, limitations may exist in fully representing the entire population due to sample attributes. Potential response bias in self-reported data collected through surveys and questionnaires might affect the authenticity of responses, impacting the study's outcomes. Accessibility and readiness of key informants can pose constraints, potentially compromising the study's comprehensiveness.

Qualitative analysis, while valuable, is inherently subjective and susceptible to interpretation variations. Interviewer bias is another concern, affecting the responses provided by participants. Additionally, the rapidly evolving landscape of EdTech might limit the study's findings to the specific period of data collection and may not fully capture future advancements. Regional intricacies might be insufficiently examined due to constraints in time and space.

Data privacy, ethics, and informed consent are pivotal, although data breaches and incomplete information may occur despite precautions. Regression analysis, while powerful, has limitations due to its assumptions about real-world complexities, potentially affecting the analysis outcomes. Utilizing existing demographic data sources might introduce variations in accuracy and reliability among secondary data sources.

Moreover, the dynamic nature of the EdTech market and changing government policies might impact the completeness of the study's reflection of future policy modifications or

industry advancements. Despite these constraints, a mixed methods research design is employed, combining qualitative and quantitative approaches to comprehensively explore India's EdTech environment.

This study aims to contribute significantly to EdTech research by acknowledging and addressing these limitations to the best extent possible. Transparency about these constraints underscores the study's commitment to ensuring the credibility and applicability of its findings.

3.7. Ethical issues Related to Human Subject Participation

Due to the involvement of numerous stakeholders—including experts, students, educators, representatives of EdTech companies, and government officials—this research requires a heightened awareness of the ethical implications associated with data collection and participant participation. Principles that place a high priority on the rights, welfare, and informed consent of all key informants serve as the study's ethical framework.

Informed Consent:

In order to conduct ethical research involving human subjects, informed consent must be obtained first. All individuals involved in this research endeavour, comprising educators, students, and key informants, shall be provided with thorough and comprehensible information concerning the objectives of the study, the criteria for contributing, the possible benefits and drawbacks, and the intended application of their information. The individuals who agree to participate as key informants will be duly informed that their participation is completely voluntary. They will also retain the right to withdraw from the research at any time without incurring any negative repercussions.

For key informants who are minors, particularly students of a certain age, additional care will be taken to obtain informed consent from their legal guardians or parents. In the case of minor key informants, information sheets and consent forms will be sent to their parents or legal guardians, explaining the research and seeking their consent for their child's involvement.

Protection of Privacy and Anonymity:

Ensuring the privacy and anonymity of key informants is of paramount importance. Personal identifying information will be securely stored separately from the data collected to maintain participant confidentiality. Key informants will be assigned unique identifiers to de-identify responses during data analysis, and no personally identifiable information will be linked to their data in any publication or presentation.

In cases where direct quotations or personal anecdotes are used, every effort will be made to protect the anonymity of the key informants. Pseudonyms or generic labels will be used to shield the identity of individuals or institutions mentioned.

Minimization of Harm:

Key informants in the research should not experience any harm or discomfort due to their involvement. This is particularly significant when dealing with children of a certain age, as their emotional well-being is of primary concern. Researchers will employ age-appropriate language and interview techniques to ensure that the participation process is comfortable and non-threatening. Any distress arising from the research process will be addressed promptly, and support or counselling resources will be provided if needed.

Data Security and Confidentiality:

Ensuring the security of data is vital to protect the privacy of key informants. Data collected during interviews, focus group discussions, and surveys will be stored on password-protected devices and secure servers. Access to the data will be restricted to authorized research personnel only. Data transfer will be encrypted, and stringent measures will be taken to prevent data breaches.

Ethical Oversight:

The ethical protocols and regulations established by the researcher's institution's ethics committee or institutional review board (IRB) will be strictly followed during the course of this study. For compliance with ethical standards, the relevant ethics committee will review and approve all ethical procedures, including those pertaining to data collection, storage, and informed consent.

Debriefing and Feedback:

Key informants will have the chance for a debriefing and feedback session following their participation. Thereby following this procedure, key informants are able to request further elucidation regarding the research, voice any apprehensions, and offer their insights on the study. This feedback mechanism enhances the capacity of key informants and promotes an ethical and transparent research process.

Responsiveness to Participant Needs:

The research team places great importance on promptly addressing the concerns and requirements of key informants. When key informants express particular concerns or requests during the course of the study, the research team will respond accordingly, prioritising the ethical treatment and welfare of these individuals.

The ethical considerations and responsibilities associated with the participation of human subjects, including minors of a certain age, in this research are duly acknowledged. Every possible measure will be taken to guarantee that key informants are accorded the highest regard, that their rights are safeguarded, and that their privacy is maintained. A strict adherence to ethical guidelines and procedures will be maintained throughout the research endeavour in order to ensure a preeminent standard of ethical behaviour.

CHAPTER IV: RESULTS

4.1 Research Question One

Research question one was "what are the most important variables affecting the adoption of EdTech solutions in Indian educational institutions?" There are different variables that influence the adoption of EdTech that include the market size, teacher satisfaction, desire for digital learning, student retention, and the competitive edge for the schools. Based on the Analysis of Variance of these variables, the null hypothesis is rejected. The p-value is less than the alpha value of 0.05 indicating the results do not occur by chance. Table 1 below shows the Analysis of variance of these variables based on the variables.

Table 1: Analysis of variance

Anova: Single Factor

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
6	5	21	4.2	3.7
7	5	25	5	5
6	5	62	12.4	35.3
12	5	48	9.6	3.8
8	5	39	7.8	4.7

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	226	4	56.5	5.380952	0.004155	2.866081
Within Groups	210	20	10.5			
Total	436	24				

From the analysis of the data, the market size and desire for digital learning are the greatest variables influencing the implementation of EdTech in Indian Schools. Market size is

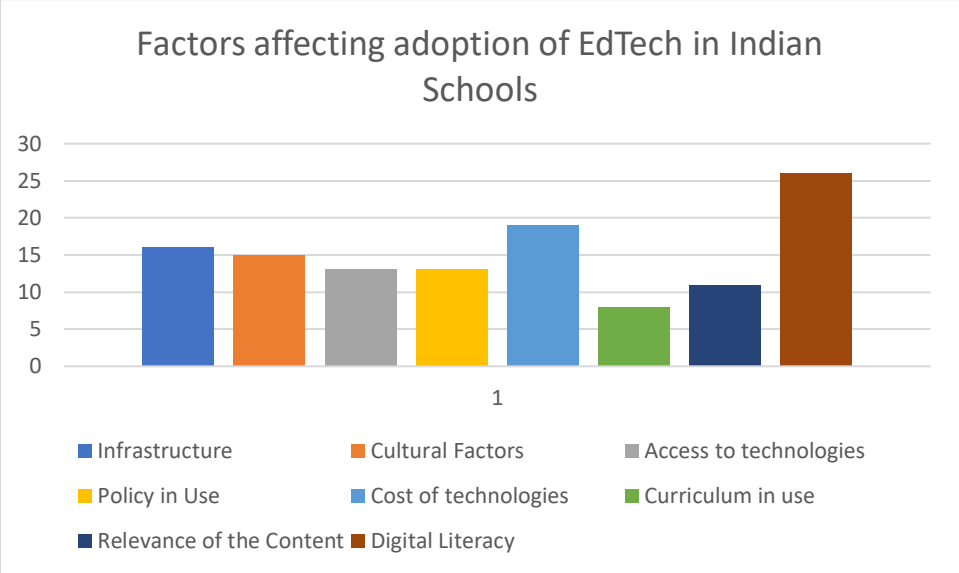
mostly defined by the increased population and the demand for the technology in India. The demand for technologies are influencing the interactions between people and the schools. The participants identify the market size as one of the single-most factors driving the digital transformation. Market demands for the Educational technology has been rising because of the unique needs in the Indian schools. Desire to implement digital learning programs in schools is pushing the uptake of the programs in the schools. Desire for digital learning is reflected in the establishment of the Ministry of Electronics and Information Technology. The respondents have pointed out the desire of digital learning to be a driving force for the educational technology. The respondents have also identified different projects involving the Information Technology in the education. Community laboratory centers are being established across India to support the uptake of the technologies in schools. Desire for digital learning is also important in ensuring that technologies are absorbed in India.

Teacher satisfaction is an important variable in the implementation of educational technology in India. Teachers are important players and stakeholders in the Educational Technology. The participants argue that teachers are trained and are also critical in training other stakeholders. Teacher satisfaction with the technologies defines the steps taken to improve the key activities in the implementation of educational technologies. Schools also use these educational technologies to gain a competitive edge. Gaining advantage over other schools is mostly applicable in the private schools and the need to have more students and offer high quality education services. Indian schools are becoming competitive and the use of educational technologies is meant to gain leverage over other schools. Student retention in schools is maintained by the educational technologies in the schools. Some of

the technologies are critical in the registration and management of the student population in the schools, colleges, and universities. Many schools in India have automated their systems to ensure that different key outcome have high-quality.

The participants have also identified other several factors that affect the adoption of educational technology solutions in Indian educational institutions including the cost of technology, cultural factors, available support systems, curriculum alignment, infrastructure, available policy regulation and support in India, Access to the technologies, and the content relevance. Figure 1 below shows the identification of factors that are relevant and which have influenced the implementation of EdTech in the Indian Education System.

Figure 1: Factors affecting adoption of EdTech in Indian Schools



Source (Author)

From the analysis of data, digital learning is the most important variable that affects the adoption of the EdTech solutions in Indian Schools. An estimated 21.49% of the respondents identify the digital learning among the stakeholder as one of the most important variables in the educational technology implementation. The importance of digital learning is not only for the academic success of the students, but also in the transformation due to the globalization and changing world realities. Successful implementation of the EdTech solutions require the trainers and students to have practical knowledge on the use of these technologies. In Indian schools, the technologies are foreign to the teachers and this makes their implementation in the classrooms difficult. Implementation of the digital solutions in classrooms are also influenced by the advanced technologies that are integrated in the learning systems. Responses indicate that the teachers need to be taken through the digital learning programs to ensure there is alignment between the technologies being employed and curriculum in the Indian schools.

Cost of the technologies in the Indian schools is also a major issue in the implementation of EdTech solutions. 15.70% of the respondents are focusing on the cost of implementation as a major variable affecting the implementation of the Educational Technologies in the Indian Schools. Cost of implementation can be identified from different angles, from the cost of purchasing the materials to the trainings on the use and dissemination of information based on these technologies. Implementing some of the EdTech solutions require investments in both the software and hardware. Schools in India depend on the government capitation that is always affixed at certain amount. Population of the students is also high because of the very high population in India. Implementing the EdTech in India implies that the government purchase new computers and reconfigure the software systems. In

private learning, the implementation of EdTech is also difficult because of the higher cost of implementation. From the responses, costs of implementation of the EdTech includes the purchase of the hardware and software, training of the teachers, costs of electricity, and the cost of running the schools. Consequently, the roll-out of the EdTech solutions in the Indian schools are easily impeded by the higher costs witnessed in these schools. High costs are further compounded by the rising inflation that is witnessed across the world.

Respondents have also identified available infrastructure and cultural factors as major issues affecting the implementation and adoption of the EdTech solutions in the schools. An estimated 13.22% of the respondents agree that lack of proper infrastructure is the main barrier in implementing the educational policies. 13.22% of the respondents also submit that educational technology can best be implemented when there is a proper infrastructure in India. Available infrastructure supports the conventional learning. Majority of the respondents agree that the libraries in the Indian schools have not been upgraded to the levels that can support the educational technologies. In the implementation of EdTech in the schools, there is a need to digitize learning and implement the e-library. The available infrastructures in the schools do not support the e-library services and other learning materials. The teachers do not have the modern systems in handling their key activities and implementing their new systems in the processes. The respondents also argue that lack of cultures and practices in the Indian education systems do not support the growth and development of these schools. The Indian cultures do not provide an opportunity for the implementation of the technologies and handling of different key activities. Cultural beliefs and practices in Indian settings have also been identified to have a positive impact on the key developments in the EdTech solutions.

The educational policy that in use in India do not support the schools enough in the adoption of the technologies solutions. The respondents agree that the government of India do not properly support the implementation of the technology as necessary. Even though the respondents agree that there is an effort to integrate technologies in the education system in India, the efforts are not enough to improve the technologies and ensure the systems work. Access to the technology in India is also a major challenge being witnessed in the implementation of the educational policies in India. From the study, an estimated 10.74% of the respondents identify the available policies as not supportive enough of the educational technology in the schools. Available policies that provide an opportunity for the computer laboratories and encourage dynamism is properly acceptable. India is one of the countries with high population and this can provide necessary opportunity for the growth and development. Educational policies in India are always based on the need to impart education and provide instructions following the laid out pedagogical techniques. Implementation of Educational Technologies require systems that promote dynamism and flexibility.

Relevance of the content is also a major variable in the educational technology solutions in Indian schools. Relevance of the content in these technologies can define the appropriateness of technologies used in these schools and also how these technologies are applied in teaching. Respondents agree that the appropriateness and relevance of the contents in the era of cyberattacks is vital in the rollout of the technologies. Appropriateness and the relevance of content are also linked to the curriculum in use in the schools. The curriculum in use defines what is to be applied and how these systems are critical in creating working systems. The variables that are defined in the process can have

an important means of implementing the key activities and ensuring that the systems work and properly operate. Whereas the government of India has identified several problems and impediments in the implementation of the educational technologies, there are many problems witnessed in the schools that hinder the successful rollout of the digital education programs.

4.2 Research Question Two

Research Question two was "to what extent do factors like resources, technology, and accessibility impact the efficacy of digital transformation in EdTech industry?" In the EdTech industry, digital transformation can be identified from based on the learning, morale, teacher satisfaction, flexibility, and creativity and innovation in the schools. The responses from the participants on the independent variables that include the market size, education technology type applied, teacher satisfaction, desire for digital learning, student retention, competitive edge, cultural factors, policy in use, and the digital resources employed. The study sought to establish the extent to which these factors influence the digital transformation in the educational technology industry. Table 2 below shows the Analysis of Variance from the data.

Table 2: Analysis of variance

ANOVA

Source of Variation	*SS*	*Df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	15.15	4	3.7875	4.063218	0.008267	2.641465
Within Groups	32.625	35	0.932142857			
Total	47.775	39				

Source: Author

Null hypothesis for this study is that factors like resources, technology, and accessibility have no impact on the efficacy of digital transformation in EdTech industry. From the Analysis of Variance, null hypothesis is rejected because the p-value is less than 0.05. From the ANOVA in table 1 above, there is sufficient evidence to believe that the factors like resources, technology, and accessibility impact the efficacy of digital transformation in EdTech industry in India. However, the analysis does not establish the type of relationship between the two variables. In the table 2 below, the regression analysis has been presented to indicate the connection between the variables.

Table 3: Summary Output

Regression Statistics	
Multiple R	0.785511
R Square	0.617027
Adjusted R Square	-0.02126

Standard Error	0.891243
Observations	9

Source: Author

From the summary output of the regression statistics, the multiple R is 0.79, R-Square at 0.617 and adjusted R is -0.02126. The implication is that the dataset fits the model. Therefore, the higher R-square from the data analyzed indicate the high variability in the data. The factors that have been observed has an impact on the efficacy of the digital transformation. From the output, the connections between the two variables can be relied on as it is one of the most important methods in determining the connections. Table 3 below shows the correlations developed between the factors and the efficacy.

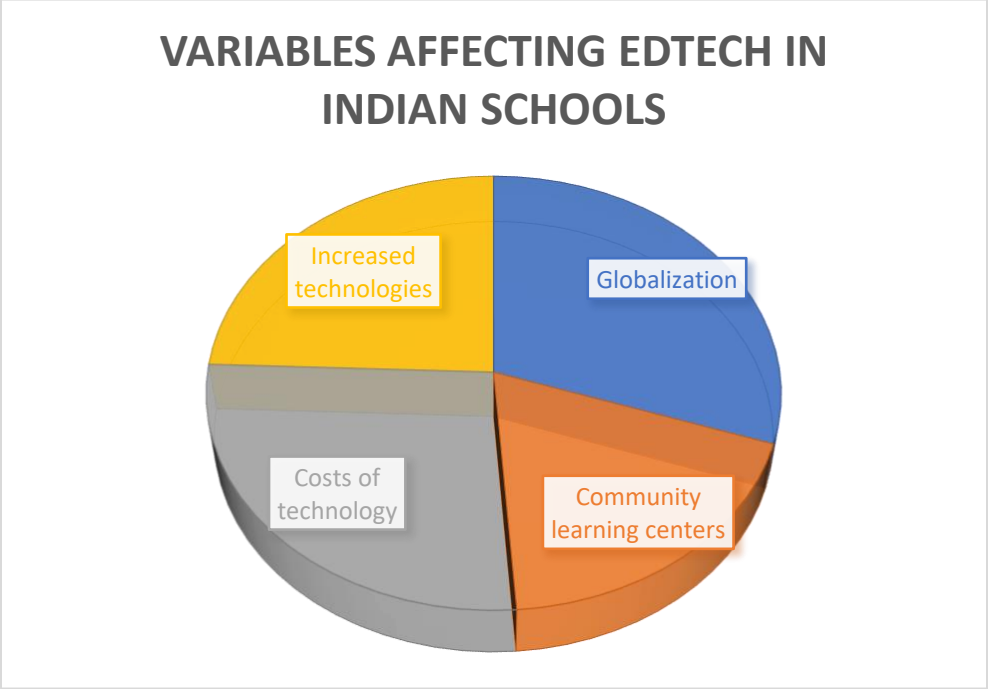
Table 4: Correlation analysis table

	3	3	2	3	4	3	4	3
3	1							
3	0.612372	1						
2	0.301511	0.800095	1					
3	0.456435	0.745356	0.963343	1				
4	0.25	-0.10206	0.075378	0.228218	1			
3	-0.29417	-0.08006	-0.0887	-0.17903	0.539319	1		
4	0.612372	0.583333	0.184637	0.186339	0.408248	0.520416	1	
3	0.912871	0.745356	0.550482	0.666667	0.456435	0	0.745356	1
5	0.918559	0.666667	0.276956	0.372678	-0.15309	-0.52042	0.458333	0.745356

From the correlation analysis, there is a strong positive correlation between the factors and the efficacy of the education technology in Indian schools. In this positive correlation, an increase in environment and factors increases the implementation and absorption of the education technology in the schools. In other words, as the environment becomes well organized, technology in the schools become properly absorbed. However, there are also other factors that have negative correlation on the efficiency in the schools. One of the factors is the cultures and practices. As cultures are practiced in India, the society becomes more conservative and do not readily accept the changes in the use of technologies in the education sector in Indian schools. The observation that is made from the correlation is that the efficacy is pushed by the positive environment and systems that can enable the implementation of the critical infrastructure for the operations.

The connections between market size, education technology, teacher satisfaction, desire for digital learning and literacy, student retention, competitive edge of the knowledge, cultural factors, the policies in use, and availability of digital resources contribute to the efficacy and have positive impacts on the digital learning. From the focus group discussions, majority of the participants agree that resources and costs are the most important factors that influence the efficiency and effectiveness of the educational technology solutions in Indian schools. Members of the focus groups identify the permeation of technology, globalization, and cost of the technology use as the most important factors connected to the implementation of the education technology in the Indian schools. Figure 2 below shows the mentions of different variables affecting the education technology solutions in Indian schools.

Figure 2: Variables affecting EdTech in Indian Schools



From the variables, the participants agree that EdTech is a factor of many variables in Indian schools. EdTech is also influenced by the ability of the individuals to capture different ideas and to navigate different problems in the process. Education is a function of the government and a right of all the citizens in India. However, the rollout depends on the ability of the available infrastructure and facilities to accommodate the existing population. Whereas the young population must always be subjected to these problems, the realities of the EdTech is based on the key activities and systems that can improve the access and rollout of these processes. The variables affecting the Indian schools can have proper systems that can improve the key outcomes and improve the systems. In figure 2, the focus group identified the issues based on the most common and how they had a direct impact on the Indian schools and implementation of the EdTech.

Increased Technology

The use of technology has penetrated India as it has in other parts of the world. The participants feel that there is a need to introduce these technologies in schools and for the children. Even though India has made steps in the use of technologies in schools. India has a large population that relies on the modern technologies for the daily transactions. The participants argue that the internet has led to the rise of online classes as one of the education technologies in India. Online classes are cheap because of the reduced distance between and has proven efficient in some of the courses. However, they also agree that some of the classes require close human interactions. Technologies are also presented in the access to the learning resources. The participants agree that they can easily access books, authored papers, and even manuals through their online platforms. One of the main advantages is that the access of the resources has increased the interactions between the trainers and the students. Students can send their messages to the teachers directly and this has an impact on the actions of the teachers. Online classes and access to the e-learning resources has remained one of the activities with direct impact on the students. The participants submit that the access to the e-resources improves the implementation of educational technology.

Globalization

Globalization has necessitated the use of education technologies in the Indian schools. The participants argue that most of the online classes integrate students and teachers from different countries. The participants argue that they can access the lectures from different professors and trainers from different nationalities giving them a feel to the other ways of doing things, rather than the common pedagogies that have been employed. The learners

in the colleges and universities can access different tutorials based on what is happening outside India. Globalization has enhanced communication and transportation and is breaking the geographical barriers in the education. Participants argue that the educational technologies in India needs to break the geographical barriers and move beyond the cultures. Globalization increases the uptake of education because of the shared experiences in these schools. Educational technologies are also increasing the need to capture the systems and operations in the process. Globalization across the world has increased the access to the educational facilities based on the e-learning resources and libraries in the process. Growth and development in schools are dependent on the technologies that are applied in the education sectors. Indian teachers apply the standard curriculum and the requisite technologies to enable their research and instructions. Critically, the use of the instructional materials and the online systems remain critical in developing a working system and ensuring that the right steps are achieved. Globalization contributes to the absorption of the educational technologies in the Indian schools and this also ensures that the learners understand the use of these new technologies.

Costs of EdTech

The cost of EdTech is also one of the main issues that have direct impact on the implementation of the technology solutions in the Indian schools. Costs of installation and purchase of the computers have also been linked to the EdTech in Indian schools. Mostly, the Indian schools cannot be operated without proper systems that can handle different key outcomes while developing proper systems. EdTech solutions in the schools are also as effective as the trainers and individuals involved in their rollout. The use of EdTech in Indian schools remains critical in developing systems that can handle different problems

and work towards improving the systems and handling the existing processes. In the Indian schools, the capitation by the government dictates the level of technology being rolled out in the EdTech and other systems. EdTech systems in the Indian schools help in the educational development and ensuring that some of the core activities are achieved. Rolling out the EdTech solutions in the schools require intentional approaches that involve training and development of the teachers. The training must also be beyond the instructional and pedagogical activities that can have an impact on the key activities.

Community Digital Learning Centers

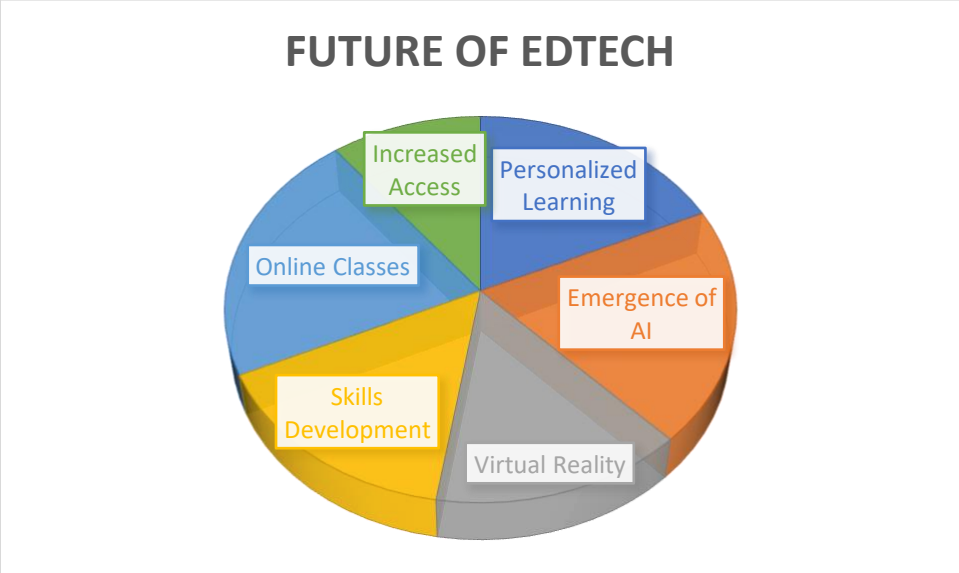
In India, there is an intentional approach to integration of the digital learning through various processes. The participants identify the digital transformation programs in India to be critical in influencing the Educational Technologies in schools. India has community digital transformation learning centers that have been critical in creating a positive outcome in the digital learning. Digital transformation in India and across the world have impacted the schools and introduction of the new systems in the learning. The positive impact of the digital transformation has been identified in the key activities in the schools and learning centers. Courses are also being rolled out in the colleges and universities to promote the innovativeness and creativity in the digital space. Changes in these approaches affect the growth of the educational solutions in India and also lead to changes that have positive impact on the Educational Technologies in the Indian schools.

4.3 Research Question Three

Research question three was "in light of the potential for market expansion and the measures taken by the government, what does the future hold for the EdTech industry in India?"

From the focus group discussions, the future of AI appears bright with the government involvement and opening up of different systems. India's population is high and this is promising in the growth of the EdTech. The potential of EdTech is hinged on the increased technology and the population. Figure 3 below shows the responses and the activities that will likely influence the changes and expansion of the EdTech in Indian schools.

Figure 3: Future of Edtech



Personalized Learning

The future of EdTech is hinged on the need for personalized learning. The participants identify a need for personalized learning because of the diversity and differences among different individuals in their schools. Indian population has had a direct impact on the level

of personalization that is necessary is also dependent on the population. Personalized learning is vital in ensuring that the right knowledge is disseminated. The participants identify the need for personalized learning to push the need for developing the most important technology in the schools. Participants in the focus group discussion also agree that the changing environment necessitates the personalized learning for different courses and to meet the unique needs. Whereas EdTech helps in imparting the knowledge among the learners, the technologies are also meant to increase the key activities and systems.

Emergence of AI

The participants have identified AI as one of the major technologies that affect the EdTech and leads to the acceptance of the technology markets. AI has enabled learning and been used in conducting research studies among the learners. AI and ChatGpt has been mentioned severally by the participants as one of the most important technologies. ChatGpt enables writing of different papers and also helps in building a positive environment for the EdTech learning. However, some of the participants are concerned about the quality of education with the emergence of AI. The concern is due to the loss of human touch because of the existence of the ChatGpt and AI. Whereas the use of AI promotes the efficiency and effectiveness in learning, the participants are concerned about the loss of creativity and innovativeness. Creativity and innovativeness are connected to the practices that the learners present and the development of key skills like the critical thinking. Problem-solving and critical thinking skills are lost when the learners overly on the AI and ChatGPT. Communication skills can also be lost when the participants overly on these technologies. The participants perceive the future to be guided by these technologies and the systems that are crucial.

Virtual Reality

Virtual Reality is one of the technologies and practices that have been mentioned by the participants in the process. Virtual Reality has been critical in developing the EdTech and improving the conditions. The participants agree that the Virtual Reality is being applied to conduct the lectures and will always be at the center of EdTech in the future.

Online Classes

Online classes will increase in future and this will be the center of EdTech in India. Online classes promote the efficiency and effectiveness of different lessons and also ensures that the students can access the right content. Online classes will define the nature of the lessons being presented and will also define the connection between the trainers and their students. Participants are already identifying the Online classes and ensuring that at the center of EdTech is the interactions between the people and the processes. However, the participants are also arguing that the online classes should not replace the traditional teaching models. Traditional teaching models had been based on the need to engage the students and provide critical aspects of growth.

Skills Development

The students will develop important skills through the EdTech solutions. Learning of the diverse activities have always been critical in the holistic growth of the learners. EdTech has a positive future on the skills development since there will be many resources to be relied on by the students and the teachers for their instructions. The instructions leading to the skills development are mostly important in improving the education system. Participants have identified several skills that include programming, data entry, and data

analysis to be some of the skills that they have learned online. Integrating these skills in the schooling process has also been critical in the management of the education system and development of the most important activities. The future on skills development is positive as the EdTech will influence some of the decisions being made.

Access for the EdTech

Majority of the participants agree that the increased access to EdTech will portend a positive environment to the market. Increased population will provide demand for the education services and this requires system that provides services to the communities. Students can access different activities that can have an important step toward developing a creative generation. Participants agree that the increased access to the technologies and resources presents a positive environment to the learners. Indian schools will be based on the need to critically improve the operations and to develop the systems that can increase the use of technologies.

4.4 Summary of Findings

Technology is an integral part of education in Indian schools. Whereas the majority of respondents agree that the use of technology has been widespread, many schools in India still suffer from lack of proper capitation to increase the learning outcomes. The ministry of Education in India plays a vital significant and remedial role in balancing the socio-economic principles and foundations of the country. From the study, the participants agree that the future of education is hinged on the use of technologies. Technologies have always been used in other parts of the world because of the easing of the education. The

participants also identify the costs of using these technologies to be high and also hinged on the problems that are being faced in the costs of both software and hardware. The main variables that have been identified in the EdTech include cost of technology, cultural factors, available support systems, curriculum alignment, infrastructure, available policy regulation and support in India, Access to the technologies, and the content relevance. The most important variables influencing the adoption of EdTech in Indian schools include the market size, teacher satisfaction, desire for digital learning, student retention, and digital learning:

Market Size: India has a large population that witnessing an increase of learners' in different schools. India also receives other learners from different parts of the world. The demand for the technologies in the schools has been on the rise. Participants identified the rise in the market size and the opening up of India to be a driving force in the uptake of technologies in the schools. Market size is influencing the decisions to teach information technologies in the schools and to integrate these technologies in the learning process.

Teacher satisfaction: Teachers help in the instruction of the students. The participants have identified teacher satisfaction as one of the most important steps in increasing the educational technologies and improving the uptake of these services. Teacher satisfaction is always influenced by the effectiveness and efficiency in the service provision and also ensuring that the best outcomes are properly handled.

Student retention: The participants have identified the school technologies in the registration and monitoring of student population to be a reason for the use of some of the technologies. Student retention is a vital feature of a properly functioning education and

school system. The retention of the students in different institutions has been linked to the technologies that are being used and the functioning of the key systems. The participants have also identified the rise in online classes and global students to be crucial in determining the functionalities of the systems and operations.

The participants have also presented various other factors that influence EdTech that include cost of technology, cultural factors, available support systems, curriculum alignment, infrastructure, available policy regulation and support in India, Access to the technologies, and the content relevance.

Cost of Technology: the cost is also a factor identified by the participants to influence the educational technologies. The costs identified include purchasing the hardware and installation of the software in the schools. Cost of technology remains critical in the rollout of the educational technology in the Indian schools. The participants also argue that the rising costs of commodities affect the implementation of the educational technologies.

Cultural factors: The respondents also identify the cultures and practices to be at the center of influencing Educational Technologies in schools. Whereas some cultures create positive environments in the use of these technologies in schools, other cultures promote technophobia in the schools and among teachers. The Indian culture is progressive and permit the use of technologies. However, there are other conservative cultures that abhors the use of technologies. The respondents have pointed out different cultures and their positive impacts on the use of technologies.

Infrastructural factor: Implementation of the Educational Technology systems require proper infrastructures. Technologies require different infrastructures that include the electricity, hardware, and the digital systems. Therefore, infrastructures are always critical in influencing the decisions of the schools and also in the implementation of the systems.

Curriculum Alignment: Alignment of the curriculum to the educational technologies remain critical in the schools. Information Technology education through different curricular have also been identified as vital in the EdTech.

Policy regulation: India's education policy is intertwined with the Information Technology. Critically, the education rollout is based on the technologies being proposed. The policies by the government promote the implementation of technologies in learning institutions. The government has also been providing the capitation to the schools in the process of implementing the EdTech in the schools.

Access to the technologies: Access to the technologies remain critical in ensuring that the technologies can be implemented in schools. Access to the technologies have always been critical in the implementation of educational technologies.

Content relevance: content relevance is also an important aspect identified by the respondents in the study. Critically, the content relevance has also been crucial in handling the educational technology. Many respondents are concerned with the content being rolled out in the educational technology.

Under the second research question, the research established that factors like resources, technology, and accessibility have direct positive correlation with the efficiency of the

EdTech in Indian schools. Resources, technology, and accessibility can have positive impact on the educational technologies and its influence on different key activities while helping in developing the most important variables. To a greater extent, the positive correlation is due to the creation of a positive environment for the educational technology. Majority of the respondents have agreed that the environment for the implementation of technologies from the admission of students to the release of results. The use of resources in the promotion of efficiency has also been determined to has a positive consequence in improving the systems and developing a positive outcome in the schools.

The government of India has been promoting the educational technologies through different programs. Financing of the schools through the introduction of resource centers and the computer laboratories is one of the ways through which Indian government has been promoting EdTech in schools. Critical steps are being taken to resolve the problems and come up with direct solutions to the problems. The results indicate that the government has also been engaging in research to help in the rollout of the technologies and promote development of the systems in the EdTech solutions. The respondents have also identified EdTech to have future because of the support from the Indian government. Indian government has been moving step ahead to install different solutions and come up with some of the solutions to these problems. EdTech solutions have also remained critical in improving the outcomes of learning while developing proper systems to help in improving the solutions. The future of EdTech is bright because of the need for personalized learning. Personalized learning requires the teachers and trainers to meet the unique needs of the learners. EdTech has been critical in handling the problems and improving the outcomes of the students. The future will also be influenced by the virtual reality. Virtual reality will

enable the learners to have a practical feel of the field and this has a positive impact on the students. Practical sessions will mostly be conducted through the virtual reality and this will give the learners the experience desired in the schools. Virtual reality will also lower the cost of learning and performing some of the activities.

Emergence of AI and ChatGPT were also identified by the respondents as factors that spell positive outlook for the EdTech in India. ChatGPT and AI are tools that will aid in research. However, the respondents are also concerned about the loss of creativity and innovativeness in the learning process. Students will most likely use these tools to perform different tasks hence making them to lose the originality that is required. The participants are also concerned about the possibility of loss of human touch in the classes and the problems that affect the connections with the people. Online classes are also on the rise and will mostly influence the future of AI according to the participants. Many schools are relying on the online classes because of the low costs in these classes. These schools are also critical in handling different problems that were initially associated with the traditional classroom. The participants are also concerned that some elements will also be lost in the implementation of the online classes. Teachers cannot properly observe the character growth and development among the students and other learners. The loss of touch is linked to the distance developed between the interphase. Whereas the online classes have a positive outcome among the populations, the loss of touch can be detrimental to the quality of services being offered. Critical steps must be captured in the process and this also has an important step in developing positive outcome among the people. Skills development will also require the use of educational technology to reach many students. Reaching many students at a low cost is also critical in teaching. Teachers have been using different

pedagogies to teach the students, the use of these technologies will have a positive impact in learning new skills and accessing information to develop the skills. The need for increased access to different resources remain critical in improving the skills and developing the teachers and students. EdTech is an important aspect of education in the face of changing realities and the technological advancement across the world. EdTech in Indian schools will improve due to the dynamism of the market and an increase in population.

4.5 Conclusions

EdTech solutions in Indian schools is influenced by the changing realities and the dynamism in India. From the study, the variables affecting the EdTech include the market size, teacher satisfaction, desire for digital learning, student retention, and the competitive edge for the schools. These factors have a direct impact on increasing the key entrenchment of the technologies in the schools. The respondents have also identified other factors that include cost of technology, cultural factors, available support systems, curriculum alignment, infrastructure, available policy regulation and support in India, Access to the technologies, and the content relevance. The study has also established that resources, accessibility, and technologies have strong positive correlation with the efficiency of the EdTech in the Indian schools. The future of EdTech is closely linked to the emergence of AI, online classes, virtual reality, skills development, and access to different resources. The respondents have argued that combination of factors will lead to an increase in the EdTech in India. However, the concern of the respondents is the loss of creativity and innovativeness among the students. Educational technologies reduce the interactions between the teachers and learners and this also affects the monitoring of the students.

Despite the promising future of EdTech in India, some challenges are still witnessed because of the loss of touch between the teachers and learners.

CHAPTER V: DISCUSSION

5.1 Discussion of Research Question One

The first question was "what are the most important variables affecting the adoption of EdTech solutions in Indian educational institutions?" The findings of the study identified different variables that include market size, teacher satisfaction, desire for digital learning, student retention, and the competitive edge for the schools. EdTech in schools is mostly influenced by the digital transformation and technological improvements in a country. India is one of the fastest-growing economics in the world. The uptake of technology in India is also high compared to the other Asian nations. India has one of the most diverse schooling and education systems. The diversity in education of India is such that there are over twenty regional languages and sixty educational boards overseeing education across the country (Bargavi 2022). According to Bargavi (2022), there are over 1.48 million schools in India supporting 265 million students and only 9.5 million teachers. The ratio of teacher to students is still high in India necessitating a need for change. Educational technology is one of the strategies that proves positive in addressing the issue of educational crisis and addressing the educational gap in India. Technology platforms like Digital Infrastructure for Knowledge Sharing, DIKSHA have been implemented in India to increase the efficiency and effectiveness of education (Sigh 2021). DIKSHA technology has provided a platform for energized textbooks and this has improved the connections between the teachers and learners. In technologies like DIKSHA, the use of QR codes have been important in accessing the resources.

India has developed a policy known as the National Digital Education Architecture, NDEAR, and India Enterprise Architecture that supports the Educational Technology in

India. NDEAR and InDEAR have always been designed to enable access to diverse contents in India and to support the capability of teachers to deliver beyond the classroom teaching (Quintero & Williamson, 2021). The existing technologies are based on improving the digital creation, digital repository, and dissemination of the e-resources (Quintero & Williamson 2021). The digital processes that have been followed in India are aimed at improving the access to the education services. The Indian market is demanding an increase in technology and creating systems that can be crucial in improving the outcome. Digital transformation in India can also be traced back to the events of COVID-19 pandemic. Prior to the pandemic, India had not properly relied on these technologies as the mainstream of their education system. According to Archambault *et al.* (2022), digital transformation has been at the center of developing a positive environment for the growth and development of functioning EdTech. COVID-19 was the accelerator of the use of technologies in education because of the introduction of the virtual and online classes, online tests and assessments, and even the online registration systems. Besides, India has also been witnessing the rising need for technologies and this can also be tied to the need to address the problems from increasing population that needs to be supported by the limited resources in India.

In India, the large population provides the market size for the absorption of educational technology. High population in the Indian market can be connected to the ready market for different goods. In education in India, the vast population and many number of schools together with the low number of teachers necessitates an additional number of teachers. Teacher to student ratio has always been critical in understanding the performance and ensuring that different activities are captured (Singh 2020). Market size plays an

important role in ensuring that there is absorption of the technologies. Educational technologies are additional factor in creating a working environment and improving the systems to properly work and ensure that the key outcomes are achieved. According to Bureau (2022), the advanced technologies in the education system is due to the need of providing effective education and imparting the required skills for the students. The learners must have the right skills and this is also reflected in their practices. Properly-established technology helps in promoting the efficiency and this has also been critical in understanding the key aspects of growth. Naik *et al*. (2021) also identified the use of these technologies in universities and colleges before the COVID-19 but attributes it to the rising demands in these institutions. The market size has a direct impact on the absorption technology.

Teacher satisfaction is also an important factor that enables the acceptance and use of the EdTech technologies. Teachers are the main instructors in the education systems and the schools. Teachers are the main staff in the schooling system and the performance of the learners is hinged on their satisfaction. Satisfaction of teachers in the Indian schools are also essential in the penetration of technologies and handling different activities in the school. Mathivanan *et al*. (2021) argue that the adoption of the advanced technologies helps in accessing education in Indian schools and this defines the effectiveness of the education system. EdTech employs different technologies that include the use of computers and installation of different software. From the findings, some teachers can be dissatisfied by the educational technology because of their inherent resistance to change. Some of the teachers may be faced by the technophobia that makes them fear the use of technologies and changes that can affect their lifestyles. Adherence to the technologies can always be

problematic when dealing with the conventional teachers who have always shunned the use of these technologies (Singh 2021). Some teachers have always been conservative to an extent that they do not intend using these technologies in their classrooms. Whereas these technologies have brought excitement to the learning process in Indian schools, some cases where there has been resistance indicate the resolve not to adhere to the changes in technologies. In schools, teachers are the early adopters of the learning technology and their approval of these technologies implies success in the schools. The rollout of these technologies in education requires the teachers to be properly trained on how to use them and also the steps to be followed in reaching many learners. Teachers who are properly trained on how to use these technologies have always been at the center of proper implementation of these technologies (Rodríguez-Martínez *et al*., 2022). The government of India has designed several programs for the teachers that train them and boost their morale. Therefore, teacher satisfaction has been enhanced by inculcating programs that can improve the critical space for the growth and development in the learning institutions.

The desire for digital learning has ensured that different schools adopt the educational technologies. The desire for digital learning is can be mapped following the enrollment of many students to pursue technology courses. Demand for technology courses and lessons has pushed the schools to re-structure their curriculum and create learning environment for their learners (Rodríguez-Martínez *et al*., 2022). Developing a positive learning environment encourages these students to properly engage in the key outcomes and create systems that can have a positive consequence on the actions of other people. The desire for digital learning also creates an environment that can improve the systems and develop some of the most important aspects of growth in the community. Desire for

digital learning is also pushed by the need to have a seamless transition and create proper educational systems that guarantee the quality in education (Sahu and Samantaray 2022). High quality education is also dependent in improving the core outcome and developing positive skills. Learning important information technology skills at a younger age is always critical in improving the outcome of the learners. The desire to incrementally build on their knowledge, skills, and expertise is also due to the changes in the use of technologies from other parts of the world. The world is witnessing a change in the use of technology and this has continued to affect the interactions between different individuals, while ensuring that the quality of education being presented increases (Sahu & Samantaray 2022). Globalization is also pushing many Indians to desire using the technologies. Globalization is breaking the cultural barriers and this ensures that people can access the cultures from different parts of the world. The desire to match the changing technologies across the world has also ensured that the technologies can be absorbed.

Covid-19 pandemic accelerated the use of educational technology in Indian schools. The measures that were being taken by the government were such that the social distancing was being implemented and movements were restricted. In the moments of Covid-19 pandemic, the existing systems worked to create a balance and bridge a gap between the people in the process. The use of these technologies were pronounced during the Covid-19 pandemic and have been maintained post-pandemic. The desire to implement the EdTech solutions in schools were due to the need to continue learning despite the existing pandemic. Whereas many students were affected, the pandemic had a positive impact on the implementation of the EdTech in the schools. The desire was driven by the demand for these technologies and these have been critical in handling the key issues in

the EdTech. EdTech services have also been identified to be promoted by the desirous population. Diversity in the Indian Education system ensures the commitment to the technology use. Diverse population is also due to the need to properly handle the changes and improve the connections between the people and the systems that are offered in the process. Diverse population provides richness in the population and this presents a positive advantage in the implementation of the education technology while developing positive outlook in the system. Critical analysis indicates that the Educational Technology is a new technology that is employed to ensure the critical aspects of growth and development are achieved. Critical appraisal of the diversity in the population also points out to the talents in the economy. The existing talents in the economy ensures that the individuals can access the right technology and this can also be absorbed in the systems.

According to Jaiswal and Arun (2020), the digital market in India was projected to grow to $10.24 billion by 2025. In essence, digital market will be one of the largest markets in India, overtaking the real-estate and food markets. The implication of the growth is a market that captures the aspects of digital transformation and a potential for growth. Different components of the Indian economy will be dependent on the digital transformation and technology by 2025 (Jaiswal and Arun 2020). A combination of factors catapults the growth and development of the EdTech in India that include the need to develop a competitive advantage for the schools, need for the student retention, infrastructure, policy use, and the cultural factors, among other factors. In India, the schooling systems are such that there are private and public schools. Private schools are mostly run as businesses of people. Private schools have been implementing the EdTech as a means of student retention. Student retention mechanisms are designed to handle the

high attrition rates in these schools. The need to increase the enrollment is also critical in the absorption of the technologies in these schools. Critically, the private owners of these schools' area also using the technology to have a competitive advantage and improve the connections that remain crucial in the competition. The Indian education system has also been critical in improving the systems and ensuring that the developments can be achieved. Working with different teams can have a positive impact on the development of the communities and also guarantee the positive environments in the process. Indian education system is also hinged on the devolved system that attracts the positive growth among the learners. Pedagogies employed by the teachers have also been critical for the growth. Therefore, the combination of these factors and systems have been critical in identifying the key activities and ensuring that the systems operate. The use of EdTech is becoming widespread in India and the education system is relying on the ability of the technology to bridge the gap and efficiently promote the outcomes.

From the research question one, the variables that are connected to the implementation of EdTech in Indian schools include the market size, desire to learn, need to retain students, and the need to gain competitive advantage. However, other factors that also influence the implementation of these technologies include the infrastructure. The digital transformation is further hinged on the available infrastructure and its impact on the schools. Digital infrastructure that includes the use of digital highways can have a positive impact on the digital economy. India has made a conscious step toward building infrastructure and developing systems that have positive impact on the community. Whereas the schooling system is diverse, the digital structures in place in the Indian system can be identified to have a positive impact in the learning of the new technology and improvement of the key

outcome among the people. Cultural factors are also variables that affect the absorption of new technologies. India's cultural factors have always been critical in determining positive processes and outcome for growth and development. India is one of the most diverse nations in the world. Different cultures support the digital transformation in India that have also been identified in the schools. The need to implement these technologies is also mostly due to the problems that are faced by the key systems and the need for the improvements in the process.

5.2 Discussion of Research Question Two

The second question was "to what extent do factors like resources, technology, and accessibility impact the efficacy of digital transformation in EdTech industry?" The result from the study indicated that resources, technology and accessibility correlate positively with the efficacy of digital transformation in EdTech industry in India. Efficacy in the EdTech industry can be measured in the terms of the reduced cost of learning, improved outcome, and within the time. Cost, adaptability, and availability of the technologies directly influence the digital transformation and this is connected to their advantages in the educational technologies in the Indian schools. Absorption of technologies depend on these factors that can influence the growth and development across the world (Betts *et al*.,2020). From the study, the absorption of these technologies in schools has a positive impact on the growth and development of the educational services while depending on the steps to be followed in the process. Growth and development in the organization is based on the need to improve the systems and create a working environment for the teachers (Betts *et al*.,2020). Technologies have always been positive in the production process and this has also been connected to the learning experience. However, there have to be available

resources for these technologies to be easily adaptable. In the education systems, adapting the technology will also depend on their accessibility and acceptance by the population. Acceptability of the technologies helps in defining the systems and creating a working environment for the schools to implement the EdTech.

The schooling from elementary grade to level 12 has been dependent on the EdTech technologies in the recent past. The continued use of the EdTech in schools has been necessitated by the available systems and processes that can be identified to have positive influence on the learning. According to Siddiqui (2022) resources like the availability of internet promotes the implementation of the EdTech in the schools because of the ease with which the connections are made. Internet connection is one of the resources that helps the students to connect to the resources and also learn different activities from various parts of the world. Siddiqui (2022) also identified the internet as being important in creating networks across the world and also important in developing systems that work and promote the efficiency in the learning systems. Resources also include the infrastructures that are developed in the economy. The resources include the physical infrastructure and the human resources. Physical infrastructure includes the computers and tablets, other hardware components, and possibly the teleconferencing facilities (Alam 2022). The human resources include the teachers, trainers, and even the software specialists. Critical analysis of the resources indicate that they are vital for the running of programs in the EdTech and developing of the systems that can have an impact on the improvement of technologies. The changing realities in the use of technologies have also remained crucial in improving the connections and developing the commitments for growth and development. From the study, resources have been identified as one of the most critical aspects leading to the

implementation of the Educational Technology in Indian schools. Resources are also connected to the cost of operating them. The costs of acquisition of some of the resources including the computer software and hardware remain critical in improving the systems and creating a working environment for the positive outcome (Aguilera-Hermida 2020). Developing a positive EdTech environment will always be hinged on the ability of the schools to meet the costs of operations. Whereas the government of India has been providing some resources for the implementation of the EdTech, the critical steps that are being followed remain critical in improving the outcome and the policies being developed in the process.

Technology being employed is an important factor that contribute positively to the efficacy of EdTech in schools. Technologies being employed in any educational program should always be socially-acceptable, environmentally-sustainable, legally-permissible, and economically and financially viable. The main technologies being used in Indian schools are those that work toward empowering the learners with the required skills and developing the positive correlations with the key activities. Different technologies have been identified in India that include the application of AI, mobile learning, blended learning, and the digital learning programs that promote the EdTech to different levels and capacities. According to Renz and Hilbig (2023), EdTech is a factor of these new technologies that influence their applications and the steps that are employed in improving their outcome. The available technologies have also made it easier for the innovations and creativity to be properly developed in the schools and the educational system. Globalization and opening up of the world has also been introducing new technologies like the Virtual Reality. Virtual Reality in education has bridged the gap of physical interaction and makes many learners access

their classes through the steps that are acceptable and can be based on the systems that can work. Virtual Reality in the education system has also been vital in improving the connections and ensuring that the EdTech captures the most important aspects of growth and this has also remained essential in the management of the processes. The type of technology that is employed in the EdTech remains critical in the absorption of the EdTech technologies in Indian schools and across the world. Critical steps must be based on the need to develop working systems and the positive outcomes that can be based on improving the connections in the process. The type of technology being relied on can also lead to the acceptance or resistance to change (Sikandar and Rahman 2021). The type of technology being relied on always dictate the complexity of the EdTech being used. Sikandar and Rahman (2021) also argued that the level of technology being used can influence their application in different programs.

Access to technologies is a crucial component that determines the efficacy of the EdTech solutions in the education. Accessible technology is tied to the cost of acquiring the technology, the ability to apply these technologies, and the policies that promote the operations of these technologies. The technical specifications of different technologies differ and this can result to different schools not being able to standardize their technologies. However, there are basic minimums that can be applicable to different technologies and remain important in the accessibility of EdTech. Accessibility of technologies in education is also based on different factors that include limited teacher training, quality concerns, resistance to change, and regulatory challenges (Rani 2022). Limited teacher training limits the access to the EdTech by implementing of different technology programs in Indian school. Teacher training can either sabotage the

implementation of the EdTech programs or accelerate their implementation. Teachers remain important cog in the EdTech rollout in different schools. To realize the EdTech objectives, teachers who are the primary stakeholders must be roped in and properly trained. Training of the teachers ensures the ease of transfer of knowledge to the learners. The existing Indian education system promotes the EdTech in schools and learning institutions. The quality concerns also depend on the teacher training, acceptability, and their ability to help in the transfer of knowledge.

Regulatory challenges are also an important component to the accessibility of EdTech. The increased application of the technologies connected to the emergence of intellectual property rights. Different people have patented their technologies and these have been challenging to the implementation of EdTech among different individuals. Patenting of these technologies are important in protecting the sources and ensuring that the key activities and technologies are protected. Across the world, regulations also exist to help in data protection and to promote privacy and confidentiality. Data privacy is raising a major concern across the world with many people focusing on the ability to be protected from different problems. Regulatory challenges have always been critical in handling the educational systems. According to Blight *et al*. (2020), regulatory measures are vital in creating a positive environment for the absorption of the technologies and ensuring the opportunities. Blight *et al.* (2020) also argue that the regulatory challenges are connected to the need to protect the inventions. The efficacy of the technologies is also hinged on the effectiveness of these technologies and their impacts on building a working system. Development of the new technologies is linked to the need for the improvement of the learning outcomes in different schools. Creating a positive environment is also essential in

improving the connections and developing a properly functioning system for the growth. Jain *et al.* (2021) also argues that in the absence of strict regulatory measures, the teachers can access larger population of students and this promotes the advantages of the EdTech solutions. In the Indian context, the challenges facing the education system can be eliminated when there is a proper use of the EdTech.

One of the main challenges that the adoption of EdTech in India has faced is the skill-based system that is applied as opposed to the knowledge-based approach. The knowledge-based approach of education involves reading of texts and books, watching of movies, and listening before moving on to the next session (Subhashini *et al.* 2022). Defacing one approach with the other is always slow and depends on the acceptability. Skills-based approach applied in the Indian schools is always based on the need to properly impart the relevant skills. The pedagogies between the skills-based approach and knowledge-based approaches have also been changing. However, the resource availability and proper training has a positive impact on the development of the skills. The Indian government and its local authorities have been working toward improving the education system and implementing the technologies that can work and improve their outcome among different schools. Therefore, the factors that have been identified have a strong positive correlation with the efficacy of the EdTech because they influence the absorption of technologies and also engage in the processes that affect the absorption of these technologies and the policies by the Indian government to promote the Information Technology in learning. Even though there are also other factors like teacher training and regulatory challenges, the adoption of EdTech in schools continue to affect the businesses and processes that are positively handled and can have a direct consequence on the reduction of the costs of achieving the objectives.

5.3 Discussion of Research Question Three

The third question was “in light of the potential for market expansion and the measures taken by the government, what does the future hold for the EdTech industry in India?”

From the research question three on the future of EdTech in India, several emerging technologies have been mentioned pointing out to the positive future of EdTech in India. The opportunities presented by the technologies will increase the use of EdTech in schools. New technologies that include the emergence of AI, Virtual Classrooms, Online and mobile classes, gamification techniques employed, blended learning, and digital learning are some of the technology changes that will affect the future of technology and the expansion of the EdTech in India (Bhutoria 2022). Emergence of Artificial Intelligence in learning and their use in schools is one of the new technologies that provide opportunities for the people to access education and increase the efficacy among different individuals. Hermida (2021) argued that the presence of AI and ML have continued to personalize the learning process and increase the connections with different individuals. Personalization of learning is always critical in improving the outcome of the people and ensuring that the key activities can be determined and that the processes can have positive outcome in the processes. The world is moving towards personalized training and learning and the Machine Learning and Artificial Intelligence is stepping in to bridge the glaring gap (Bhutoria 2022). In the future, schools will be based on the use of Machine learning to compliment teachers. Even though the Machine Learning has been pointed to have several weaknesses that include lack of human touch, the steps being followed have always been critical in developing positive outcome in the learning processes (Ameer and Vineeth 2021). Therefore, the future EdTech is highly supported by the Machine Learning and

Artificial Intelligence and their impact on building systems that can have critical impacts on the outcomes. Technologies that will be employed in the future will model the character of the learners and help them creating discipline. According to Ameer and Vineeth (2021) the technologies based on the EdTech will be critical in improving the outcome and ensuring the objectives of digital learning are achieved. Over time, the EdTech will be important in providing the practical experience to the learners and ensuring that the outcomes can be mapped and properly monitored. EdTech has a positive future in India and this will also be tied to the spread and development of other technologies.

Blended learning is also a promising technology that will most likely affect the EdTech in future. Blended learning is system where the online learning methods are used together with the conventional methods. The use of blended learning is gaining momentum as a new way of connecting to the individuals and ensuring that the key outcomes can be realized (Arthur-Nyarko, Agyei and Armah 2020). Blended learning method has also been important in ensuring that the correct systems are employed and the critical steps are improved in the process. Blended learning methods are also being employed to favor both the learners and teachers in the process (Arthur-Nyarko, Agyei and Armah 2020). In India, several colleges and universities are relying on blended learning as a means of creating a positive environment and ensuring that the EdTech can improve the connections with different individuals. The future of education is also based on the abilities to impart skills and knowledge as a means of ensuring the right processes are followed (Zimmer and Matthews 2022). Blended learning is also a critical step that helps in creating a positive environment for the growth and development while also improving the skills that can have a proper working environment (Arthur-Nyarko, Agyei and Armah 2020). Mobile learning

is also a system that will have a future and will also be based on the need to increase the outcomes. The students are increasingly using their mobile devices as a means of accessing the resources and increasing the key outcome among different individuals. Development of the core activities and systems are also based on these technologies that have a promising future. Mobile learning among the Indian students is also due to the access to many opportunities and it also bridges the gap of physical distance. Students across the country can join a class and engage in the same activity simultaneously. Mobile classes will increase in the future because of the lowering of costs that it presents. The mobile classes are also hinged on other infrastructure that include the availability of internet (Arthur-Nyarko, Agyei and Armah 2020). Internet connections have always been critical in promoting the connections between different people in diverse regions. India being a vast country can also rely on these technologies to engage in the steps of building a working environment for the EdTech.

Virtual learning and gamification in the learning process are technologies that are also being used to attract many learners and help the schools gain competitive advantage over other individuals. Competitive advantage that is presented in the virtual learning is such that the learners can even attend the practical sessions remotely. Virtual learning promotes remote classrooms and this have been beneficial in cases where the physical infrastructures are lacking. In the EdTech industry, the video-based learning continues to have a direct impact as it connects the learners to their instructors and work toward building systems that are based on the improvements. According to Zheltov (2022), video-based learning helps in the delivery of content virtually to the learners and can be critical in improving the outcome among the learners. There is a positive projection on the use of

video-based learning and the gamification in the future because of the contents that are being delivered and the systems that it helps in creating across the time. Virtual learning and gamification has also remained critical in improving the schools. India is one of the highly innovative countries when it comes to virtual learning and the gamification (Bligh *et al*., 2022). The impact of this on the future is direct and will most likely be replicated in all the schools in India in the future.

India is one of the largest populations and economies in the world. The high population and economy is a potential for the EdTech market. The population growth of India is also high signaling an increase in the core activities and improving the connections between different factors leading to the growth in India (Bligh *et al.,* 2022). The opportunities in India points out to a positive outlook of the EdTech in India and the potential of increased use in India. Over time, the changing realities have also influenced different activities and helped in building systems that have positive outcome in the process. High population growth in India has also been connected to the improved activities and the proper functioning of the systems (Sahu and Samantaray 2022). EdTech in India also has a potential because of the policies that are being postulated by the government. The government of India has remained at the center of improving the key activities and ensuring that the most important steps are followed. Development of the key outcome have also remained important in improving the environment for the development of EdTech. The combination of factors affecting the growth of the EdTech industry are mostly connected to the benefits that are drawn from these technologies. According to Elmalai *et al*. (2021), EdTech has presented the advantage that makes the teachers to offer their lessons without going through the problem of a limited classrooms. The class size has

always been limited the teachers and students. The high population of students in India demands an infinite class-size that can only be offered when the EdTech solutions are implemented in the schools. Implementation of these systems in the schools is advantageous as they also increase the quality of education being offered. Rees Lewis *et al*. (2019) also pointed out that the technologies and tools that are employed have a positive impact on increasing the innovativeness of the learners. In the future, premiums will be put on the innovativeness and creativity of learning. Therefore, the support that EdTech gets will be high and most likely influence the growth and development in the schools. The future of EdTech will be influenced by the happenings from other parts of the world and the need to improve the effectiveness across the world.

The future of EdTech in India is promising as the government support also promises the possibility of growth. The market size, desire for digital learning, and the teacher satisfaction in the use of EdTech are also critical in the growth and development of EdTech in Indian schools. The schools in India have also presented a positive impact on how the EdTech are presented and handled. Handling of these systems can have an impact on improving the growth and development while improving the core outcomes in the future. Handling different activities have an important step in building the critical aspects of the growth. EdTech has also been employed in managing the systems and ensuring that the critical outcomes remain important in handling different aspects. The Indian system supports the digital creativity and improvement of the key outcome that can have an impact on the development of the systems.

CHAPTER VI:

SUMMARY, IMPLICATIONS, AND RECOMMENDATIONS

6.1 Summary

The main summary of this study is that EdTech industry in India is growing and is mostly influenced by market size, teacher satisfaction, desire for the digital learning, student retention, and the need to have the competitive edge against other schools and previous systems.

- **Market Size:** India's population is one of the world's largest and this implies that there is a large market for the technological products services. The large population of India is such that the number of learners in the schools are also high and teacher to learner population is high. The combination of population and diverse learning institutions that are highly and viciously spread across India provides a gap for the implementation of EdTech. Therefore, the market size in India highly influences the implementation of EdTech in the Indian school, from the registration, to online learning, and monitoring and assessment of the learners in India.
- **Teacher Satisfaction:** Teachers are vital stakeholders with direct interests in the learning. Teacher satisfaction defines the method of implementation and extent of the implementation of the EdTech. Teacher satisfaction is derived from their training, benefits and remuneration, and other emoluments. India has many teachers who can implement EdTech. From the study, the teachers are dissatisfied by the limited physical classrooms. Introduction of the limitless classrooms through the use of online and mobile learning remain critical in

building processes that can have an impact on the learning. Despite their liking and approval of the EdTech, some teachers also exhibit the technophobia that is because of the fear of new technologies. The fear of new technologies can harm the growth and development of the EdTech.

- **Digital learning:** The world is witnessing a change and there is a digital revolution across the world. Digital revolution has been promoting the rush to have digital learning and knowledge among different people. Learning and engaging in the digital learning remains one of the most important steps that increase the connections between the people. The desire for digital learning among different groups have always been important in handling different problems and ensuring that the problems are critical in achieving the objectives of EdTech. Digital learning has also been connected to the workings of the systems and developments based on the processes that are important in the process.
- **Student Retention:** The need to have high student retention and low attrition rates in schools have prompted the need to implement the EdTech in the Indian schools. Student retention is a sign of working EdTech technologies in the schools. The use of EdTech is also an important step in the registration of the learners while encouraging the growth of the student population. Student retention steps have also been critical in ensuring that the growth is improved and steps followed identified in the process. Therefore, in the Indian schools, implementation of the EdTech has continued to influence the key activities and based on the outcomes that can improve the systems. Development of the

schools can be based on the systems that follow the growth and improvement of the key outcomes.

- **Competitive Edge:** India's schools still exist in the space of competition among themselves. Private schools are also still competing on the admissions and the quality of education offered. The ranking of schools in India have promoted the schools to implement the EdTech as a means of gaining the competitive edge over their rivals. The implementation of the EdTech among the schools to gain competitive edge over others has a positive impact on improving the quality of education and also leading to the efficiency in the education systems. Therefore, implementing the EdTech as a competitive edge is an important variable in the India's schools as it creates a positive environment for growth and development.

The research study has also established that the factors like the resources, technology, and the accessibility have strong positive correlation with the efficacy of digital transformation in the EdTech industry. In other words, as the resources increase, the efficacy of digital transformation in the digital transformation increases. The continued use and availability of technologies also increases the efficacy of the digital transformation in EdTech. These factors singly and jointly have positive contribution to the increased efficacy in the digital transformation in the EdTech Industry. The research has identified the growth of the EdTech to be based on the infrastructure, dependent on the cost, and also influenced by the cultural factors, among other aspects that have remained important in the process. EdTech has also been critical in improving the core aspects of the growth and influencing the key activities.

The future of EdTech in India is bright because of many factors that include the new innovations and technologies that include Artificial Intelligence and Machine Learning, Virtual Learning, Mobile learning, and blended learning. India also has high population that increases the market size and the digital learning is also promoted by the existing government policies that are also positive in the growth and development of these technologies.

- **Artificial Intelligence and Machine Learning:** Artificial Learning and the Machine Learning are inventions that are supporting the growth of the EdTech in the classrooms in India. Artificial Intelligence is a technology that is opening up the learning in Indian schools and has a promising future. The use of machine learning in the EdTech will also open up different opportunities and also be used as an opportunity to increase the learning and to promote the efficiency. The use of Artificial Intelligence continues to influence the outcomes that can influence the EdTech in different schools.
- **Mobile and online Learning:** The online and mobile learning is an important step that is bridging the gap of physical limitations and promotes the limitless teaching by the teachers. Since the student population have been on the rise in India, the opening up of the mobile learning promotes the efficiency. The future of learning in India will be based on the mobile and online learning technology. The penetration of the mobile phones and internet usage is high in India and this has been defining the basis for the EdTech in India. Mobile learning also helps in improving the creativity and innovativeness of the learners even as it reduces the distance and creates limitless classrooms. Mobile learning has also

remained critical in improving the access to different lectures and improving the learning aspects in different schools. Open universities that have been developed have also been due to the presence of the mobile and online learning.

- **Blended Learning:** The future of EdTech is also based on the blended learning. Blended learning is a combination of the conventional learning systems and the digital learning systems. Blended learning systems is being used in addressing the loss of human touch in the EdTech and other technologies. Loss of human touch is always due to lack of the systems to address the key activities and the inability of the teachers to monitor the behavior of their students. Therefore, the introduction of blended learning is an innovation that is supporting the EdTech among the people. Blended learning is always presenting the advantages of technologies while reducing the demerits of traditional learning methods. The study has established that the blended learning will have a positive impact on the virtual classrooms and this spells an important step in improving the EdTech.
- **Virtual Learning and Gamification:** The use of virtual reality and gamification technologies in the learning process helps in presenting the required experience and ensuring that the right steps are followed in achieving the key objectives among different individuals. Virtual reality has also been identified to have a positive impact on presenting the outcome and increasing the connections with different individuals. Handling the problems depend on the need to improve the systems and create a working environment for the EdTech to be implemented.

Therefore, the future of EdTech is promising because of the existing opportunities and the support that the Education System gets from the government. Education has been developing from the capacitation it receives from the government and this has also been based on the key activities generated from other practices. The policies in use by the government is creating an open environment for the application of Information Technology in the schools. EdTech is an important technology that integrates different components with the aim of realizing the efficiency in the learning systems. In India, the schools have been working toward improving their key activities and developing a working environment in the education and schools.

6.2 Implications

The implication of the research is that EdTech is influenced by those factors that influence the development and penetration of technologies across the world. Before 2020, Indian schools had started using the EdTech solutions but it did not remain the technology of choice among the people at the time. Covid-19 pandemic prompted many schools to continue using the EdTech as their medium. Since the introduction of EdTech in schools, many schools have adopted the technology because of the advantages that they have gained. Whereas the technologies being used can connect the students and teachers directly, the impact of the EdTech has gained prominence, not only in India, but also across the world. Many students were immigrating to India to access education. After the introduction of the EdTech, most international students prefer their online classes because of the costs that have been reduced drastically. The cost of education has been managed while the quality is still maintained. The students can also access learning resources and submit their assignments while also getting assessed. Efficiency of the EdTech has also

been maintained in the time taken to complete the syllabus and improve on the attrition rates. From the study, the impact of EdTech has been determined to be direct and can influence the learning outcome among the people.

The implementation of new technologies that include Artificial Intelligence, blended learning, Virtual Reality, and online classes imply that the quality of learning is improving with the increase in the reduction in the challenges facing the education system. The use of these technologies also promotes the efficiency through auto-grading systems that can monitor and assess the progress of different students. Promotion of the digital education has also remained critical in allowing the learners to access the resources from different parts of the world and also to promote their interactions in the process. Technologies that are being relied on in the EdTech have proven to have proper systems that can monitor the changes and improve their systems. Therefore, the following summarizes the implications of findings from this study:

- ***Future of EdTech***: EdTech has a positive outlook and requires proper environment to continue growing. The future of EdTech will mostly be influenced by the coming inventions and innovations and will also be influenced by the opportunities that are presented in the economy.
- ***Role of government***: The role of government in the EdTech in the future will mostly be regulatory. The regulatory role will also be connected to the available systems and the policies that are developed to achieve the requisite outcomes. Government of India has already come up with various policy papers on education. However, these will also be influenced by the diversity and the connections with different communities in India.

- ***Indian Community:*** The Indian community will influence the education system that will mostly be based on the need to necessitate the changes. Changes in learning will mostly be coming from the problems that are captured and the steps that are followed in the process.
- ***Globalization:*** Globalization will also affect the EdTech in Indian schools and also influence how the schools roll out their technologies. The technology rollout will be beneficial for the growth and development of the systems while ensuring that the key activities are implemented in the process. Globalization has affected the world by promoting the sharing of knowledge and improving the connections between people and different systems. EdTech in India will mostly be influenced by the globalization and localization that will be crucial in the growth of the education system.
- ***Market Size:*** India has one of the largest population in the world. The implication is that this provides the market for the technology and also the human resource for different industries. The population also provides talent responsible for the creativity and innovation in the Indian schools. The large market size of India is also connected to the diversity that remains important in presenting different problems. Therefore, connection between the population and market size has been important in influencing the people and creating the market sizes among different individuals.
- ***Role of Teachers:*** Teachers are the integral part of the EdTech who are implementing the contents of the EdTech. EdTech implementation requires the input of teachers who must also remain satisfied by the process. In the future,

teacher training and recruitment will involve the use of technologies that are critical in handling the problems. Teachers will be essential in managing the problems identified in the process and will also remain critical in improving the systems.

6.3 Recommendations for Future Research

1. Impact of EdTech on Student Performance

A future study should be conducted on the impact of EdTech on the student performance. The study should explore different types of EdTech and how they will influence the performance of the learners in the process. A future study should also be based on how the EdTech influences the learners' performance and their impact on handling different activities over time. In the exploratory study, the need to properly develop the learners and handle different activities. The future of EdTech should be analyzed based on the contribution that it will make on the learners and India's economy. An exploratory study will be objective in revealing the connections between the EdTech application and the student performance. The future of the EdTech is also based on the quality of education that will be offered. The quality of education offered looks at different ideas and follows most critical element that must be identified and can be followed through to achieve the results.

2. An investigative Study on the EdTech on the Teacher Satisfaction

Teachers are the primary stakeholders besides the students and parents. An investigation of the use of EdTech in schools on their satisfaction is critical in ensuring that different aspects of changes due to the implementation of EdTech is analyzed. Teacher satisfaction is always vital for the achievement of different results. This investigative study will also

be critical in understanding how the teacher satisfaction can improve the performance and how this can have a positive outcome among the individuals. India has one of the largest populations in the world with an education system that attract many people from different parts of the world, the investigation would be vital in the identification of gaps and a recommendation of how these gaps can be bridged. The study is also a quantitative study that will reveal different aspects of the teacher satisfaction and establish their connection with the EdTech.

3. The impact of EdTech on skill-based learning

The study that seeks to investigate the correlation between the use of EdTech in school and development of the skill-based learning is critical among different individuals in the schools. The skill-based learning has increased in India and the connection between EdTech and skill-based approach can be critical in creating the systems and making the recommendations for the improvement of the quality of education in India. EdTech has also remained critical in influencing the practices and developing some of the learning outcome in the Indian schools. The analysis is based on the critical steps followed and the increased quality of learning. Skill-based versus knowledge-based learning have been critical in designing the pedagogies and instructional materials for different students. Therefore, this study will investigate several factors that contribute to the successful implementation of EdTech in different schools.

4. Analysis of the Ethical Concerns of EdTech

EdTech relies on technologies that have presented the ethical concerns across the world. The ethical issues at the center of implementing the EdTech concerns the protection of data

and security issues including the cybersecurity issues. Identification of the ethical concerns and their impacts on the EdTech and its implication on the quality of Education. Analysis of the ethical concerns will be important in providing a roadmap to realization of the digital learning. Identification and analysis of the ethics in EdTech are always critical in handling different aspects of education. A qualitative analysis of these ethical concerns would be important in identifying the differences in styles and improvement of the key outcomes in the study. In the future, there is a need to analyze how the EdTech will impact the learners and possibly influence the teacher satisfaction and morale. Therefore, the need to analyze the unique needs of the people and ethical requirements can also be linked to the problems associated with the implementation of the technologies in the education systems.

5. Improvement of Quality of Education in India based on EdTech

The goal of education systems is always to provide high quality education and influence the changes. High quality education is a subject of different factors that include availability of teachers, the right technologies, access to the learning resources, and good assessment and monitoring strategies. The future study should be based on the steps used to improve the quality of education in India following the implementation of EdTech in the schools. In other words, the study seeks to answer the question of "what will be done to improve the quality of education in light of the implementation of EdTech in their systems?" In future, the studies should focus on the steps that will improve the quality of education and handle the possible changes.

6.4 Conclusions

The study establishes that the most important variables affecting the EdTech in Indian schools include the market size, teacher satisfaction, desire for digital learning, student

retention, and the competitive edge for the schools. The market size is dictated by the population and India has one of the largest populations in the world. From the large population exhibited in India, it is critical in establishing a working market and developing systems that can improve the core activities in the process. The potential for these markets is also important in the penetration of these technologies. Teacher satisfaction has also been determined to be an important variable in the implementation of EdTech. The need to retain students and improve their attrition rates. Some schools also engage in EdTech to gain competitive advantage. From theory, implementation of EdTech has presented many opportunities to both the learners and the teachers. The study has reinforced the theories and frameworks that have been important across the world. Therefore, the variables directly influence the implementation of EdTech in the schools and education.

The study has also established that there is a strong positive correlation between resources, technology, and accessibility and the efficiency of digital transformation in EdTech industry. From the theory and literature review, the resources and technology defines the key success of EdTech in different parts of the world. India's EdTech is hinged on these factors that are also important in creating the requisite environment for the application of these technologies. EdTech have also remained critical in improving the outcomes and building the connections to easily access the e-learning resources. Some of the advantages that the EdTech presents include the ease of administration, reduced costs, and improved efficacy that are tied to the improvements of different aspects of growth, among other important aspects. The use of EdTech has also continued to connect different learners across India and from other parts of the world. Whereas EdTech solutions had been implemented before 2020, Covid-19 pandemic led to the increase in the use of these

technologies. The Covid-19 pandemic led to new revolution from where many activities where being done following the use of internet and the use of computers that connect different individuals and learners.

The future of EdTech is bright with the high population of India providing an increased market size for the EdTech. Positive environment is also developed by engaging in recent innovations and inventions that include Artificial Intelligence, Machine Learning, blended learning, virtual reality, and mobile classes. Therefore, the future of EdTech is influenced by the technologies and the desire for the digital learning that is witnessed in India. The government of India is also based on the need support education system following the implementation of technologies. Government policies, cultural factors, and globalization are some of the factors that have been identified to have a positive impact and outlook on the EdTech. Future studies should look at the impact of these technologies on the quality of education. Technology is also dynamic as it changes with the changing realities over time. The need to have a positive change in the world has also been connected to the realization of the educational policies and systems. The study has achieved its objectives and outlined the most important steps in handling the problems. Identification of the key issues in the EdTech is vital in promoting the positive learning environment in the Indian schools.

APPENDIX A:

SURVEY COVER LETTER

January 18, 2024

Dear Participant,

My name is Soumya Paik from Swiss School of Business and Management Geneva. I am conducting research on Digital Transformation in The Edtech Industry in India. I am inviting you to participate in the study as a respondent to the survey because you meet the selection criteria for this study. Privacy and confidentiality will be maintained throughout the course of this study. Your data will be kept for only 30 days then deleted. You can withdraw from the study at any point of the study.

Thank you very much for agreeing to participate in this survey.

Sincerely,

Soumya Paik

Mobile: +91881135720, Email Address: soumya@ssbm.ch

Instructor's Name: Dr. Jennifer Clarke

Instructor's Email Address: jennifer@ssbm.ch

APPENDIX B:

INTERVIEW QUESTIONS

Dear Participant,

The aim of this survey is to collect data for an academic study on Digital Transformation in EdTech in India. Kindly fill the parts of survey as indicated. Your details will be kept private and confidential and will be destroyed after the completion of this study.

1. How often have you used Educational Technologies?

   ……

2. In a scale of 1 to 5, where 1 is the lowest and 5 is the highest, how do you perceive the following to affect the Educational Technologies in India
   a. Market Size
   b. Teacher satisfaction
   c. Student retention
   d. Competitive advantage
   e. Digital Literacy
3. Which other factors do you think influence the use of educational technology in India?

   ……..

4. How has the Educational Technology benefited the schools in India?

   ……..

5. What are some of the challenges witnessed in the use of Educational Technologies in Indian schools?

.....

6. Where 1 mark no effect and 5 marks to a greater extent, how does the following affect the efficacy of digital transformation in EdTech in India?
    a. Resources {1} {2} {3} {4} {5}
    b. Technology {1} {2} {3} {4} {5}
    c. Accessibility {1} {2} {3} {4} {5}
7. What are the factors that are most important in defining the resources in the EdTech in India?
    a. Cost {1} {2} {3} {4} {5}
    b. Staff {1} {2} {3} {4} {5}
    c. Software {1} {2} {3} {4} {5}
    d. Hardware {1} {2} {3} {4} {5}
    e. Cultures {1} {2} {3} {4} {5}
8. In your view, what is the future of EdTech in Indian schools?

    .....
9. What are some of the inventions that will influence the EdTech in India?

    .....
10. What should be done in the future to improve the quality of EdTech?

    .....

Thank you for Participating.

APPENDIX C:

FOCUS GROUP DISCUSSION

Group 1	Online asynchronized discussion	January 24, 2024	8 participants between the 18 and 50. The group had 5 males and 3 females both who were admitted to the discussions
Group 2	Online asynchronized discussion	January 24, 2025	9 participants between the age of 18 and 45 years. The group consisted of 5 females and 4 males. The selection of the participants was random.
Group 3	Online asynchronized discussion	January 26, 2024	7 participants between 24 and 40 years. The group had 4 males and 3 females.

APPENDIX D:

INTERVIEW CONSENT FORM

Interview Consent Form

Research project title: DIGITAL TRANSFORMATION IN THE EDTECH INDUSTRY IN INDIA

Research investigator: Soumya Paik

Research Participants name:

This interview is designed to take a maximum of 5 minutes. There are no risks associated with this interview, but you have a right to withdraw from the study at any point. This is an interview for academic study and the interviewees must be informed on the ethical procedures. The following will be done during the survey:

- The interview will be recorded and a transcript will be produced
- You will be sent the transcript and given the opportunity to correct any factual errors
- The transcript of the interview will be analysed by Soumya Paik as research investigator
- Access to the interview transcript will be limited to Soumya Paik and academic colleagues and researchers with whom he might collaborate as part of the research process
- Any summary interview content, or direct quotations from the interview, that are made available through academic publication or other academic outlets will be anonymized so that you cannot be identified, and care will be taken to ensure that other information in the interview that could identify yourself is not revealed
- The actual recording will be destroyed
- Any variation of the conditions above will only occur with your further explicit approval

Or a quotation agreement could be incorporated into the interview agreement

Quotation Agreement

I MAY ALSO BE QUOTED VERBATIM. WHEN QUOTED VERBATIM, INDICATE WHETHER YOU AGREE WITH ANY OF THE FOLLOWING STATEMENTS

	I wish to review the notes, transcripts, or other data collected during the research pertaining to my participation.
	I agree to be quoted directly.
	I agree to be quoted directly if my name is not published and a made-up name (pseudonym) is used.
	I agree that the researchers may publish documents that contain quotations by me.

Indicate that you further agree that all or part of the content of your interview may be used;

- In academic papers, policy papers or news articles
- On our website and in other media that we may produce such as spoken presentations
- On other feedback events
- In an archive of project as noted above

In signing this form, I agree that;

1. I am voluntarily taking part in this project. I understand that I don't have to take part, and I can stop the interview at any time;
2. The transcribed interview or extracts from it may be used as described above;
3. I have read the Information sheet;
4. I don't expect to receive any benefit or payment for my participation;
5. I can request a copy of the transcript of my interview and may make edits I feel necessary to ensure the effectiveness of any agreement made about confidentiality;
6. I have been able to ask any questions I might have, and I understand that I am free to contact the researcher with any questions I may have in the future

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