Journal of Informatics Education and Research
ISSN: 1526-4726
Vol 5 Issue 3 (2025)

Digital Transformation in Education: A Case from India

Dr. Tasha Javed
Research Associate, S. P. Mandali's Prin. L. N. Welingkar Institute of Management Development and Research, E-mail-tashajaved@gmail.com

Abstract
The present study has been aimed to explore impact of digitalization on the students. Specifically, the present study has considered impact of access to digital resources, institutional support, digital literacy, peer collaboration and technology integration on perceived outcomes; and impact of perceived outcome on academic satisfaction. For that reason, a sample of 600 students has been gathered from the selected institutions accredited with the ACBSP accreditation across India. The results of the structural equation modelling have indicated access to digital resources as the most significant antecedent of perceived outcome followed by technology integration, institutional support, digital literacy and peer collaboration. Further, perceived outcome has also shown significant impact on academic satisfaction of the students. These insights provide recommendations to policy makers and educators to bridge the digital divide, improve student learning environments and drive change.

Keywords: Academic, Digitalization, Education, Resources, Technology, Satisfaction

Introduction
Digital tools and integrated technology play vital role in today's education. With the rapid advancement of technology in this 21st century, digital innovation has become indispensable to enhance learning, collaboration and overall learning. Research shows that digital resources improve learning outcomes by supporting inquiry, teamwork and individual learning (Wang et al., 2021). Now-a-days, the ability to use technology for communicating, learning and solving problems (for academic and professional success) is termed as Digital Literacy (Nguyen et al., 2019).

Teachers who successfully integrate technology into the classroom can create comprehensive lessons that meet the needs of diverse students. For example, digital resources such as learning management systems, virtual laboratories and collaboration tools such as Microsoft Teams and Google Docs facilitate collaboration and reorganize the learning process (Sharma and Jain, 2021). The COVID-19 pandemic has caused the world to shift to digital learning, replacing face-to-face classrooms with online learning environments. While this shift demonstrates that technology can enhance learning in some contexts, it also creates serious problems such as barriers to accessing the digital layer and differences in digital knowledge among students (Kofoed et al,2021)

Studies have shown that students who receive support at school and have digital literacy skills can adapt to the online learning environment and stand out from their peers (Hitrec and Kovac, 2011; Wang et al., 2021). digital platforms increasingly emphasize collaborative collaboration as an important aspect of teamwork. Collaborative tools can enhance student's knowledge sharing and problem-solving skills while also developing important skills such as collaboration and communication (Roschelle et al., 2000; Alessio et al., 2020). Despite significant advances, challenges such as unequal access to the internet, insufficient

knowledge and skills and lack of support especially in low-income communities still exist (Kohler et al.,2020; Warschauer et al.,2021). One needs investment in infrastructure development, skills development and equal access of digital tools by using a multifaceted approach that addresses these issues holistically. The successful outcome of this depends on good pedagogical practices in digital literacy to all categories of students inclusive of the degree of learning assistance and collaborative learning. This intentional equalization and leveraging of internet technologies with the current issues facing education will provide better transition in learning for the future learners and enhances their opportunity to succeed in life in the digital age.

Literature Review

Most educationalists appreciate that digital resources can bring about a prodigious transformation in educational improvement and learning results. The contemporary research has emphasized the importance of platforms, like Google Classroom, Slack, and Microsoft Teams, to enhance student collaboration, critical thinking, and problem-solving capabilities (Alessio et al., 2020). These platforms are not just a tool, but an effective method of acquiring the skills vital for individuals for taking leadership roles and teamwork (Sharma and Jain, 2021). Furthermore, Kohler et al. (2020) perceived that institutions can leverage a return on investment in the digital layer since there will be financial injections to IT services and ongoing education and building of infrastructure, thus making the digital resources effective (Bell et al., 2021).

Also, Nguyen et al. (2019) found that adapting digital literacy courses to meet students' needs can improve their ability to navigate online learning environments and increase their engagement in learning. The instructional strategies utilized by teachers use also play an important role in making the most of digital resources. Personalised learning through technology-based learning has led to enhance student satisfaction and achievement (Tan et al., 2022). Teachers who use student- centred approaches technology integration, focusing on personalised feedback and active learning report higher student engagement and retention rates (Hsu and Ching, 2018). Collaboration and integration through digital platforms continue to be key component of effective educational strategies.

Rochelle et al. (2000) describe how collaboration facilities immediate problem solving and knowledge sharing which is important for team strength and effective learning. However, Alessio et al. (2020) noted that these platforms need clear guidance and strong support to solve problems such as communication and coordination difficulties. The COVID-19 pandemic is a stress test for education, highlighting the potential and challenges of digital transformation. While existing research provides a good understanding of the benefits and challenges of digital transformation in education, there is a lack of research particularly with reference to India in terms of accessibility, support in schools, digital literacy and collaboration between learning interests and outcomes. This highlights the need to examine interaction of these factors in the development of education in India and so is the intention of this paper.

Research Methodology

Being primary in nature, the study focused on university students across India, selected to represent different regions to provide a better understanding. A total of 17 schools with Accreditation Council for Business Schools and Programs (ACBSP) accreditation were

selected since these institutions have passed the rigorous quality scrutinization process laid by ACBSP for excellence in business education. To ensure regional distribution the schools were selected from four administrative regions of India, that is, north, east, west and south. Accordingly, Lovely Professional University, Punjab (Northern Region); ASBM University, Odisha (Eastern Region); SIES School of Management, Maharashtra (Easten Region); SCMS Cochin Institute of Management in Kerela (Southern Region) have been selected. A total of 150 students were selected from each school and a total of 600 responses were collected. Data collection took place over eight weeks from September to October 2024 in both paper and electronic formats to facilitate accessibility.
Accordingly, 52% of the respondents are reported to be male and 48% female respondents. Majority of the respondents (75%) were college students and 25% were university students, giving an idea of the different levels of education. The age distribution was predominantly in the 18-25 age group, like the higher education population. Socio-economic diversity is clearly stated. 60% of the participants are from urban areas, 30% from semi-urban areas and 10% from rural areas. This diversity reflects their different approaches to digital resources and technology models. Academically, the interviewees came from a variety of disciplines. 40% study business, 25% engineering, 20% arts and humanities and 15% science. Thus, encouraging digital education collaboration. Digital literacy levels are uneven. While 70% reported average to high proficiency with digital tools, 30% said they were not very familiar with them. This highlights the need for digital literacy programs. The population at large supports the spread of exploration across India's diverse student groups, education levels and regional backgrounds.
Further, a well-structured questionnaire has developed to collect the responses from the students. The preliminary draft of the questionnaire has been pilot tested on a sample of 50 students and two of the subject-matter experts. Based on the responses and the comments, the final draft of the questionnaire has been framed.

Apart from the demographic profile of the students, the questionnaire includes assessment of the students on the scales namely perceived outcomes, institutional support, access to digital resources, peer collaboration, technology integration, digital literacy and academic satisfaction. The five-item scale used to measure access to digital resources was derived from the work of Nguyen et al. (2019), Tan et al (2022) and Warschauer et al. (2021) and it has been defined as the extent to which the students have access to various digital resources like e-library, e-books, online lectures etc. Further, technology integration has been defined the extent to which the digital tools have been incorporated in the learning environment and it has been assessed through a three-item inventory developed based on the research work done by Hsu and Ching (2018); Koehler et al. (2020), and Bell et al. (2021).

Digital literacy can be understood as the extent to which the students are able to use, navigate, etc. through the available digital resources. The development of the five-item scale assessing digital literacy includes four items developed based on the research attempt of Ng (2021), Nguyen et al. (2019); and Sharma and Jain (2021).

Further, peer collaboration has been defined as the extent to which the students work cohesively and in coordination with other students through digital platforms and while working on digital platforms. The development of the scale was based on the research work done by Roschelle et al. (2000); Alessio et al. (2020) and Tan et al. (2022) and a total of four items have been developed. The institutional support has been defined as the extent to which

the educational institutions are facilitating the use of digital learning through trainings sessions, IT support, etc. A total of five items have been developed based on the research done by Bell et al. (2021); Nguyen and Luo (2019).

Perceived outcomes are defined as the perception of the students regarding the fact that the use of digital tools and the integration of technology into the learning environment is effective in enhancing their learning capabilities, engagement levels and their educational experience. It has been assessed through six items developed from the research attempt of Nguyen et al. (2019); Wang et al. (2021); and Hitrek and Kovacs (2011).

Academic satisfaction refers to the level of contentment perceived by the students after using the digital tools for their learning needs. It has been assessed through six items developed from the research attempts of Hsu and Ching (2018), Bell et al. (2021) and Alessio et al. (2020).
Further, the Cronbach alpha value for the questionnaire was noticed to be higher than 0.7 for all scales, thereby, indicating higher internal consistency. Exploratory factor analysis has been utilized to explore the factor structure. Based on the latent root criterion, single factor solution was noticed in case of all the scales with percentage of variance ranging from 54.6 per cent to 76 per cent and the values of communalities and factor loadings are also noticed to be higher than the minimum acceptable value recommended by Hair et al. (2019), that is, 0.50. Further, the convergent validity has been confirmed by employing confirmatory factor analysis approach. Accordingly, the values of factor loadings are, and average variance extracted are noticed to be higher than 0.70 and 0.50, respectively corroborating with the recommendations of Hair et al. (2019). The discriminant validity of the measures has also been examined by evaluating correlation between the variables and no correlation coefficient value is noticed to be higher than 0.50 in case of all the aforesaid variables. This indicates the statistical aptness of the data.

Theoretical Model

Based on the extensive review of the literature, a theoretical model has been developed. Shown in the Figure 1, perceived outcomes have shown impact of access to digital resources, institutional support, digital literacy, peer collaboration and technology integration. Further, perceived outcomes have shown impact on academic satisfaction.

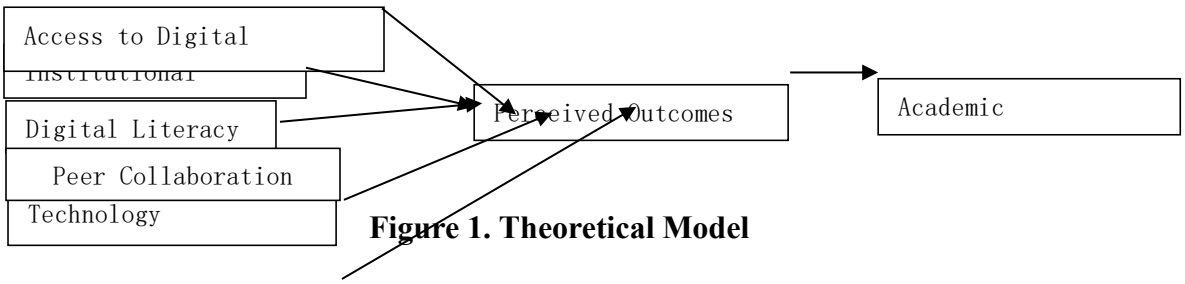

Figure 1. Theoretical Model

Data Analysis

The empirical validation of the theoretical model has been done by employing structural Equation Modelling (SEM) since it examines multiple relationships at a single point of time. Accordingly, the values of critical ratio have been examined in case of all the six paths.

Path	Parameter Estimate	Critical Ratio

Access to Digital Resources → Perceived Outcomes	0.58	7.52**
Technology Integration → Perceived Outcomes	0.45	6.84**
Digital Literacy → Perceived Outcomes	0.39	6.21**
Institutional Support → Perceived Outcomes	0.42	6.7**
Peer Collaboration → Perceived Outcomes	0.30	4.45**
Perceived Outcomes → Academic Satisfaction	0.67	8.15**

Table 1. Results of Parameter Estimates and Critical Ratios

Note: ** Statistically Significant at 1 per cent level of significance.

As shown in the Table 1, the values of critical ratios are noticed to be statistically significant at 1 per cent level of significance. This indicates statistically significant paths in all the six cases, thereby, inferring that access to digital resources, technology integration, digital literacy, institutional support and peer collaboration exhibit significant impact on perceived outcomes and the perceived outcomes exhibit significant impact on academic satisfaction level of the sampled students. To substantiate these findings, the model fit indices have also been examined.

Index	Reported Value	Referential Value
CMIN/DF	1.85	< 5
RMSEA	0.045	< 0.06
GFI	0.95	≥ 0.90
AGFI	0.93	≥ 0.90
CFI	0.96	≥ 0.95

Table 2. Model Fit Indices

As shown in the Table 2, the model fit indices have indicated model fitness. The CMIN/DF ratio is 1.85, which complies with the criteria determined by Kline (2016) and indicates a good correlation with the degrees of freedom. The RMSEA value is 0.045 and CFI value is 0.96, which are consistent with the models developed by Hu and Bentler (1999) and Hooper et al (2008), indicating a good model fit. Both the GFI (0.95) and AFGI (0.93) exceeded the thresholds reported by Byrne (2016), confirming that the data structure was well represented. These findings clearly demonstrate model fitness in the present case. Thus, this model has been finalized and the same has been represented in the Figure 2.

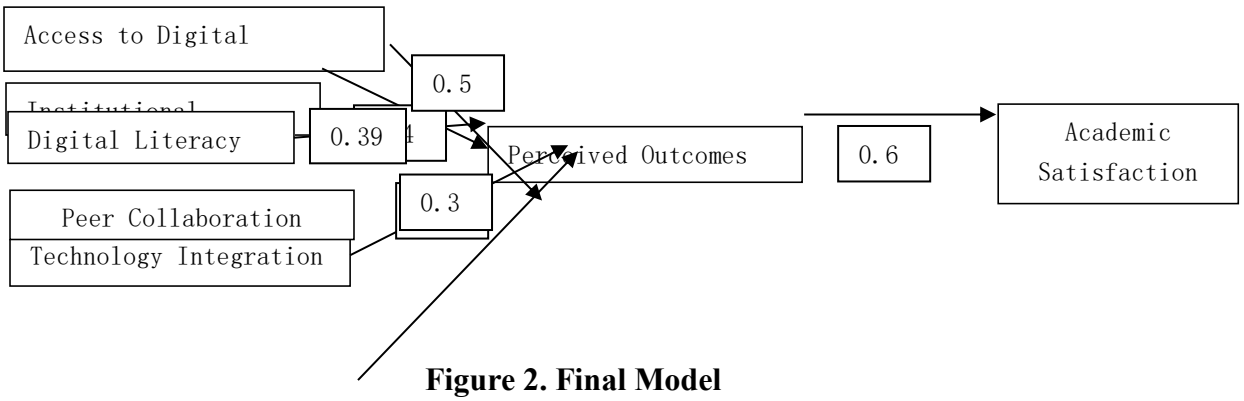

Figure 2. Final Model

As shown in the Figure 2, access to digital resources, technology integration, digital literacy, institutional support and peer collaboration exhibit significant impact on perceived outcomes and the perceived outcomes exhibit significant impact on academic satisfaction level of the sampled students. The positive coefficient values have indicted direct relationships. Among the antecedents of perceived outcomes, the coefficient value is noticed to be relatively higher in case of access to digital resources (0.58). This indicates that the access to digital resources exhibits relatively higher impact on perceived outcome flowed by technology integration (0.45); institutional support (0.42); and digital literacy (0.39). While the impact of peer collaboration is noticed to be relatively least but statistically significant. Further, perceived outcomes have also shown statistically significant positive impact on academic satisfaction with coefficient value of 0.67.

Students with better access to tools and platforms are more engaged in their learning processes and achieve better outcomes. This corroborates with the findings of Warschauer at al. (2021) and Nguyen et al. (2019). Further, it has been found that more integration of digital tools in the learning environment will enhance the perceived outcome corroborating with the study of Hsu and Ching (2018). The results of the present study have also shown that when the students have the requisite institutions support for using the digital resources like training or help for the IT department, their perception regarding the utilization of the digital resources in learning scenario also enhances and vice versa. These findings align with the findings of Khong et al. (2024).

Digital literacy has also shown significant impact on perceived outcome. This infers that more information regarding the application and usage of digital resources for learning, more favourable will be the perception of the students regarding the usage of technology in their learning activities. This corroborated with the findings of Sharma and Jain (2021). Also, when the students work collaboratively while using the technology in their learning process, their perception regarding the usage of technology enhances, thereby, substantiating the findings of Roschelle et al. (2000). Further, the present study has highlighted that with the favourable perceived outcomes, the academic satisfaction of the students also enhances and vice-versa which is consistent with the findings of Nguyen et al. (2019).

Implications

Theoretical Implications

These findings contribute to the body of knowledge on digital change in education by providing valuable theoretical insights into digital resources, school support and student outcomes. This research highlights importance of digital resources for academic success and suggests that access to these resources is the most important predictor of perceived outcomes.

This finding is consistent with research in the source that shows that having simple tools can improve personal outcomes. Furthermore, the importance of integrating technology and digital literacy suggests that having digital tools is not enough
Furthermore, the findings are based on social constructivist theory, which emphasizes the importance of interaction and relationships in the learning environment and that peer collaboration plays an important role in improving visual outcomes. Finally, the strong effect of cognitive achievement on learning satisfaction is linked to studies on psychological development.

Practical Implications

These insights offer recommendations to policymakers, educators and educational institutions to improve educational outcomes in the digital age. First, it is important to ensure equal access to digital resources, especially among young people with appropriate funding and technology tools. Governments and Schools can work together to support the development of internet-based products and services to bridge the digital divide. Schools should develop special training programs for teachers to help them easily integrate technology into their teaching. This will include creating interactive, student-generated digital content to encourage participation. The education system should include digital courses that must be studied at the postgraduate level, including training and certification, to use digital tools to achieve educational and professional goals. Faculty are provided with IT services, training and continuing professional development. These measures can help solve technological problems faced by students and teachers and create more educational opportunities. Schools can also support peer learning by encouraging collaborative activities, thus improving participation and learning outcomes. Finally, the strong link between perceived outcomes and interest in learning shows the importance of the approach to learning. Schools should regularly monitor student interest from feedback and adjust their digital strategies accordingly. For Example, playing games on digital platforms and getting quick feedback can increase engagement and motivation. These practical insights not only address current challenges in digital learning, but also lay the foundation for collaborative, participatory and student-centred classrooms.

Conclusion

This study highlights the transformative power of digital tools and the role of technology integration in improving learning outcomes and students' satisfaction. The results show that access to digital resources, key organisational roles, digital literacy and integrated play a significant role in shaping students' education. By analysing the most important predictors of observed outcomes such as resource use and technology integration. The study provides detailed information on how to do this process to create good education. The findings emphasize that infrastructure and technology related issues need to be addressed to ensure equitable access to digital education.

Directions for Future Research

This study provides important insights using primary data and quantitative analysis, but it also has several limitations that can be explored in future research. Focusing on Indian Universities limits the applicability of the findings to other regions. Future research can consider cross country comparisons to identify socio-cultural differences that after the adoption of digital education. Furthermore, relying on personal interests can lead to biases such as social desirability. Using mixed methods such as Quantitative interviews can lead to

better understanding. While this study identified key elements such as digital literacy and home support, future research could explore other factors such as mental preparation, consumer digital literacy and teacher-student relationships in digital environments. Longitudinal studies could examine how the impact of digital learning evolves over time. Finally, examining the impact of new technologies such as artificial intelligence and virtual reality could provide a deeper understanding of the digital transformation of education.

References

1. Alessio, H. M., Malay, N., Maurer, T. W., Bailer, A. J., & Rubin, B. (2020). Interaction of teaching presence and social presence on the performance of online students. *Journal of Interactive Online Learning, 18*(1), 25–45.
2. Bell, F., Brown, A., & Bryson, J. (2021). The role of institutional support in successful technology adoption. *Education and Information Technologies, 26*(2), 1375–1390. https://doi.org/10.1007/s10639-020-10410-7
3. Byrne, B. M. (2016). *Structural equation modelling with AMOS: Basic concepts, applications, and programming* (3rd ed.). Routledge.
4. Hair, J. F., Risher, J. J., Sarstedt, M., & Ringle, C. M. (2019). When to use and how to report the results of PLS-SEM. *European Business Review, 31*(1), 2–24. https://doi.org/10.1108/EBR-11-2018-0203
5. Hooper, D., Coughlan, J., & Mullen, M. R. (2008). Structural equation modelling: Guidelines for determining model fit. *Electronic Journal of Business Research Methods, 6*(1), 53–60. https://doi.org/10.21427/D7CF7R
6. Hsu, L., & Ching, Y. (2018). Exploring the role of institutional support in faculty development for online teaching. *The Internet and Higher Education, 36*, 1–9. https://doi.org/10.1016/j.iheduc.2017.09.002
7. Hu, L. T., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modelling: A Multidisciplinary Journal, 6*(1), 1–55. https://doi.org/10.1080/10705519909540118
8. Hitrec, D., & Kovac, M. (2011). E-learning environments and their effect on student performance. *Proceedings of the International Scientific Conference on Information Technology and Development of Education ITRO*, 49–56.
9. Khong, E. M., Seow, A. N., & Lam, S. Y. (2024). The influence of perceived institutional support and social competencies on online learning satisfaction: A private higher education student perspective. *Issues and Perspectives in Business and Social Sciences, 4*(2), 202–218. https://doi.org/10.33093/ipbss.2024.4.2.7
10. Kline, R. B. (2016). *Principles and practice of structural equation modelling* (4th ed.). Guilford Press.
11. Koehler, M. J., Mishra, P., & Cain, W. (2020). What is technological pedagogical content knowledge (TPACK)? *Contemporary Issues in Technology and Teacher Education, 20*(1), 10–20.
12. Kofoed, M., Gebhart, L., Gillis, M., & Sarkar, S. (2021). Zoom goes the syllabus: The impact of online learning on student performance. *Economics of Education Review, 83*, 102121. https://doi.org/10.1016/j.econedurev.2021.102121
13. Nguyen, T., Keppell, M., & Stelzer, L. (2019). The impact of digital literacy on students' collaborative work in higher education. *Educational Technology Research and Development, 67*(6), 1531–1549. https://doi.org/10.1007/s11423-019-09665-y
14. Ng, W. (2012). Can we teach digital natives digital literacy? *Computers & Education, 59*(3), 1065–1078. https://doi.org/10.1016/j.compedu.2012.04.016

15. Roschelle, J., Pea, R. D., Hoadley, C. M., Gordin, D. N., & Means, B. (2000). Changing how and what children learn in school with computer-based technologies. *The Future of Children, 10*(2), 76–101. https://doi.org/10.2307/1602690
16. Sharma, P., & Jain, P. (2021). Soft skills and collaborative tools: Enhancing the employability of students. *Journal of Applied Research in Higher Education, 13*(2), 401–417. https://doi.org/10.1108/JARHE-06-2019-0145
17. Tan, C. H., Sulaiman, H., & Abdullah, A. (2022). Personalized learning in the digital age: A systematic review. *Educational Technology & Society, 25*(3), 150–165.
18. Wang, Z., Su, C., & Ma, J. (2021). An empirical study on the effectiveness of digital resources in improving students' academic outcomes. *International Journal of Educational Research, 107*, 101752. https://doi.org/10.1016/j.ijer.2021.101752
19. Warschauer, M., Zheng, B., Niiya, M., Cotton, S., & Farkas, G. (2021). Balancing the dual aims of equity and quality in digital education. *Computers in Education*.