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Student and Teacher Perceptions of ICT in Education: A Mixed-Methods Study in Nashik's Urban Colleges

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Abstract
According to UNESCO (2023), the introduction of Information, Communication and Technology (ICT) has modernized learning across the globe, stimulating innovation and personalized learning paradigms. However, as noted by Sharma and Sharma (2023), in former industrial towns like Nashik, semi-urban areas suffer due to inadequate infrastructure, low levels of digital literacy, and resistance to technological change. This research analyzes parent and educator attitudes within the context of Nashik's urban colleges and attempts to demonstrate the unique challenges and opportunities of semi-urban postgraduate education.

In this multi-faceted study, quantitative (N=520, 175 teachers and 345 students) surveys and qualitative interviews (n=50) were used to analyze the trends, attitudes, and barriers related to the use of ICT in education. The Technology Acceptance Model (TAM) and the Unified Theory of Acceptance and Use of Technology (UTAUT) were applied to refine the model and focus on three supporting hypotheses: institutional assistance impacts adoption (H_1), digital literacy impacts attitude (H_2), and infrastructure is the main deterrent barrier (H_3). Respondents indicated that students (Mean=4.02) and instructors (Mean=3.45) had different perceptions of the value of ICT and its usage: students were more optimistic whereas instructors were less so. Online resources were rated the lowest by students (Mean=3.45), who preferred hands-on learning in class. Students also reported ICT use to be higher than instructors expected (Mean=4.3). H_3 was supported by the findings since infrastructure breakdowns (e.g., unstable internet or power supply) were regarded by respondents as the greatest challenge. Division by disciplines (Science > Arts) showed misalignment in resource allocation. These findings were further illuminated by qualitative evidence of socio-economic barriers such as lack of devices, and negative attitudes from faculty toward pedagogical innovation.

Aligned with India's National Education Policy (NEP) 2020, the report suggests increasing infrastructural development, specialized teacher training, and balanced funding to give all teachers access to the same resources. This study closes the gap between the semi-urban policy objectives and the actual living conditions by proposing constraining ICT integration frameworks in semi-urban India, applying more comprehensive technical investment approaches alongside curriculum and instructional design alterations. Additional long-term and cross-sectional studies are needed to validate these results across different semi-urban educational settings.

Keywords: ICT Integration in Education, Teacher and Student Perceptions, Technology Acceptance Model (TAM), Barriers to ICT Adoption, Infrastructure Challenges in ICT

1. Introduction

The application of Information Communications Technology (ICT) has elevated and expanded the boundaries of teaching and learning. This is made possible using modern pedagogy which encompasses inclusion, participation, and access (UNESCO, 2023). ICT tools like digital classrooms, LMS, and AI educational systems have not only automated traditional educational processes but also enabled personalization, collaboration, and learning anytime and anywhere (Selwyn, 2019). In the digital era, ICT revolutionizes education by providing modern skills to students while allowing educators to use data to inform, improve, and optimize their teaching (Voogt et al., 2018). The effectiveness of ICT integration depends on the stakeholder's perception, notably the teachers and learners which as the primary users or customers of these tools (Scherer et al., 2019).

Both OECD's Digital Education Action Plan and UNESCO's Education for Sustainable Development recognized digital literacy as an aspect of foundational education, thereby increasing ICT integration into education globally. Particularly, in India, ICT can transform education, and the National Education Policy (NEP) 2020 has advocated for the use of blended learning and smart classrooms to address urban–rural divides in educational access. There is a lack of access to infrastructure facilities, resistance to change, and educators' digital competencies are preventing equal policy implementation (Sharma & Sharma, 2023). Nashik, a city in Maharashtra, has emerging semi-urban features alongside educational advancements, making it a rare phenomenon in India (Deshmukh & Patil, 2022). Metropolitan institutions tend to spearhead the incorporation of new ICT services.

As stated by Jadhav et al. (2021), ICT has urban college coverage in Nashik and serves all students unevenly. Attempts to introduce technology into the education system are limited by the extent to which students and educators employ the technology in the learning activities. Previous research indicated that self-efficacy, institutional support, perceived usefulness of the ICT, and the educator's attitude greatly influence student participation in ICT (Teo, 2019), while he accessibility, interaction, and digital competencies shape the student's level of participation (Hwang et al., 2020). The lesser-known socio-economic and infrastructural factors pertaining to the adoption of ICT were presented by

Kamble et al. (2022), offering a fragmented theoretical discourse on the issues of ICTs concerning the urban higher education infrastructure in Nashik.

This gap will be filled through a mixed methods design focusing on the urban colleges in Nashik and exploring the students' and teachers' technocentric attitudes towards ICT. Principal research questions center around: (a) the scope of incorporation of ICT as a teaching technique, (b) corresponding hindering factors, and (c) measures aimed at improvement of digital teaching environments. Outcomes will aid implementation planning and policy formulation regarding ICT systems for educational institutions in a semi urban context within India.

1.1 Problem Statement

The use of Fingerprint ID in educational environments is becoming prevalent globally. However, there has not been much in-depth research on how both teachers and students practically interact with these tools in actual learning scenarios (Scherer et al. 2019). Although ICT has the potential to foster remarkable changes in educational practices, most, if not all, studies look at the teacher or the student's perspective, thereby ignoring the complex interplay of these two key stakeholders (Teo, 2019). The studies conducted in developed countries or Indian metropolitan cities tend to ignore semi urban areas such as Nashik (Deshmukh & Patil, 2022). Urban and semi-urban educational environments differ greatly, and so do their perceptions of ICT. Supportive infrastructures as ICTs, institutional support, digital networks, and socio-economic status form ICT perception, which is quite different in urban and semi urban educational settings (Sharma & Sharma, 2023).

There is a gap in regional ICT attitude studies in urban colleges of Nashik. NEP 2020 aims to enhance digital inclusion in education, although semi-urban regions contend with issues such as limited infrastructure, low literacy rates, and resistance to change (Government of India, 2020; Jadhav et al., 2021). Nashik teachers seem to understand the importance of ICT integration into education, but obstacles like inadequate training and unreliable internet connections may hinder its implementation (Kamble et al., 2022). Greater prior exposure to technology observed in the less urbanized areas compared to the metropolitan ones, is likely to influence students' willingness to adopt digital tools (Hwang et al., 2020). Without sufficient research into these challenges, educators and policymakers are likely to neglect the risks posed to the improvement of educational institutions in Nashik.

Bridging this gap assists as a prerequisite towards a socially equitable ICT integration within India's diverse educational framework. Comprehending the perception of educators and learners in urban colleges in Nashik seems likely solving the problems relevant and specific to the region's challenges and needs. Locating pain point such as lack of adequate infrastructure or low levels of motivation as defining these may guide investment in teacher training or in the digital infrastructure (Selwyn, 2019). Success stories or even innovative approaches from these universities might be replicable in semi-urban contexts (UNESCO, 2023). This study seeks to achieve policy objectives alongside their implementation, using a combination of qualitative and quantitative frameworks to formulate ICT integration in higher education in Nashik region.

1.2 Research Objectives

1. To examine the current levels of ICT adoption and usage patterns among teachers and students in urban colleges of Nashik
2. To analyze the perceptions and attitudes of both teachers and students toward ICT integration in education.
3. To identify the key challenges and barriers hindering effective ICT implementation in Nashik's urban colleges

1.3 Research Questions

1. What are the current patterns of ICT adoption and usage among teachers and students in Nashik's urban colleges, and how do these patterns vary across different academic disciplines and institutional contexts?
2. How do teachers and students perceive ICT integration in their teaching and learning experiences, and what key factors (e.g., institutional support, digital literacy, perceived usefulness) shape their attitudes toward these technologies?
3. What are the primary challenges and barriers (e.g., infrastructural, pedagogical, socio-economic) that hinder effective ICT implementation in Nashik's urban colleges, and how do these challenges differ between faculty and student populations?

1.4 Research Hypotheses

- **H_1:** There is a significant positive correlation between institutional support for ICT resources (e.g., training, infrastructure) and the frequency/type of ICT tools adopted by teachers and students in Nashik's urban colleges.
- **H_2:** Teachers and students with higher digital literacy and perceived usefulness of ICT will report more favorable attitudes toward its integration, compared to those with lower.
- **H_3:** Infrastructural limitations (e.g., unreliable internet, hardware shortages) will be rated as the most critical barrier to ICT implementation by both faculty and students, surpassing pedagogical resistance or training gaps.

1.5 Significance of the Study

This is relevant for policy and pedagogy of higher education in India and specifically in semi-urban regions such as Nashik. The analysis focuses on teachers' and students' perspectives on ICT with respect to the NEP (National Education Policy) 2020, which aims at integration of learning and equity with digital inclusivity (Government of India, 2020). As expressed in the findings, Deshmukh and Patil suggest enhancing ICT facilities, teacher training, and ICT equipment guided by regional institutional frameworks (2022). Identifying the absence of institutional supports or the presence of insufficient computer literacy can allow regional and national frameworks customize adoption-empowered professional development frameworks for telematics and works for educational quality differentials between urban and semi-urban areas (Savale T, 2024).

Adding to literature on technology-enhanced learning, the research contributes to understanding the factors that inform ICT integration into classroom practices. In particular, the study is useful in evaluating the role of self-efficacy, student engagement, and institutional ecosystems on ICT integration into pedagogy. Attitudes and perceived usefulness of learner's digital skills (Hwang et al., 2020) can be translated in various educational settings, thus helping in developing responsive pedagogies that the different category learners mandate. This study's use of mixed methods enables an understanding of, and provides practical insight on, these dynamics for curriculum developers and educational administrators of increasing the use of ICT in instruction (Selwyn, 2019).The research also adds to the discussion of AI-based tools, learning analytics, and virtual classrooms that are being experimented with in Indian higher education (UNESCO, 2023). The study documents the real ICT adoption challenges and successes in Nashik's institutions to evaluate its scalability in other similar semi-urban areas. This is important because global developments prioritize the importance of ICT in education that is both inclusive and sustainable (OECD, 2021). The study on the infrastructure barriers (Kamble et al., 2022) can be used by public-private stakeholders for the provision of low-cost and reliable digital services in economically disadvantaged regions.

Lastly, the study fills the gap on semi-urban India-specific research on ICT and education by proposing this framework (Jadhav et al., 2021). The work advances scholarly étude while providing insights that can be acted upon by leaders of higher education institutions and even the technology suppliers to enhance rooted digital preparedness brought forth through local reality analysis. It lends support to global calls for educational technology that is sensitive to the context (Scherer et al., 2019) aimed at the equitable distribution of the benefits of ICT across different regions and socio-economic settings.

2. Literature Review

2.1 Conceptual Framework

Incorporating ICT into education is anchored on theories of user acceptability and adoption. The Technology Acceptance Model (TAM) and the Unified Theory of Acceptance and Use of Technology (UTAUT) form the basis of discussion on ICT acceptance among urban college students and lecturers in Nashik.

2.1.1 Davis Technology Acceptance Model (TAM)

Davis (1989) proposed that perceived utility (PU) and perceived ease of use (PEOU) impact the utilization of technology. Perceived utility captures the reaping a user anticipates from his performance because of using a given technology, while perceived ease of use captures the amount of effort required to use that technology (Davis, 1989). As indicated from Teo's (2019) study, the Technology Acceptance Model (TAM) has been extensively employed in assessing ICT adoption in education, and the prevailing pattern is that both teachers and students pay more attention to digital materials that are readily available, easily used, and that function in an effective manner.

Research in Indian higher education have validated the application of the Technology Acceptance Model (TAM), revealing that faculty ICT resistance arises from low usefulness perception (Sharma & Sharma, 2023) e.g. "digital tools do not enhance learning outcomes" skepticism or perceived complexity (Sharma & Sharma, 2023), e.g. "hands on navigation of LMSs poses challenges." Relating to students' willingness to ICT, it hinges on their belief regarding grade enhancement (Hwang et al., 2020). The model has been critiqued neglecting the presence of institutional aid and support as well as infrastructural barriers, which are vital in places such as Nashik (Kamble et al., 2022).

2.1.2 Unified Technology Acceptance and Use Theory

The acronym UTAUT stands for the 'Unified Theory of Acceptance and Use of Technology', a model created by Venkatesh et al. (2003) to fulfil the shortcomings of the TAM model. UTAUT draws on a range of factors that motivate technology adoption. It identifies four primary constructs:

1. Performance expectancy (akin to perceived usefulness)
2. Effort expectation (considered as perceived ease of use)
3. Social influence (user/institutional mandate towards technology use)
4. Availability of Technical and Organizational Support and Resources or Facilitation.

The implementation of UTAUT has been particularly helpful in understanding the adoption of ICT in educational institutions where external factors like organizational policies or training programs are relevant (Scherer et al., 2019). The absence of reliable Internet coverage, a lack of necessary equipment, and insufficient technological teaching may restrict the ICT usage of faculty and students in urban colleges of Nashik (Jadhav et al., 2021). Even the most reluctant users tend to accelerate the adoption of ICT life of lower status peers or social superiors (Teo, 2019).

2.1.3 TAM And UTAUT In Combination In Current Study

This work combines both TAM and UTAUT frameworks to analyze Nashik urban colleges ICT adoption. While capturing the perception factors of individual respondents in terms of benefits and ease of use, TAM is complemented with UTAUT which looks at more outward or structural considerations. This combined approach is appropriate in semi-urban areas like India which face infrastructural challenges but have a demographically educated population (Deshmukh & Patil, 2022).

Hypothesis 1 (H_1) evaluates the effect of institutional aid on ICT adoption as defined using UTAUT's enabling conditions and support framework. These models together explain the multifaceted ICT-integration challenges and these integrating-supporting factors within higher education in Nashik. Hypothesis 2 (H_2) in which the rationale is based on the fundamental elements of TAM so that higher levels of digital literacy coupled with perceived usefulness translates into favorable attitude toward ICT.

2.1.4 Analysis and Critical Contextualization

TAM and UTAUT have each provided relevant focus parameters, but they need to be more contextualized for semi-urban India. Cavade et al. (2023) contend that traditional adoption frameworks have a significant underestimation of socio-economic constraints such as socio-educational resource access like devices, as well as pedagogical reluctance which is a harsh bias toward didactic teaching in a constrained-resource environment; strongly resistant to constructivist-type methodologies. By contrast, I highlight gaps in infrastructural systems and lacking state provided institutional training contextual elements emphasized by Sharma and Sharma's educational ecology analysis of Nashik (2023).

2.2 Global and National Studies on ICT in Education

The primary reason why developed and developing countries embrace the integration of ICT in education differently is because of the difference in infrastructure, policies, and socio-economic factors. This is facilitated by having functioning digital ecosystems, a developed institutional framework, and with students and teachers having high levels of digital literacy. ITC adoption has proven beneficial for Scherer et al.'s 2019 study's aims of student engagement, self-directed learning, administrative processes, and effectiveness in managing educational resources for Finland and South Korea who have comprehensively trained teachers, maintained high-speed internet connectivity, and embraced government digital learning programs (Voogt, 2018).

Infrastructure limitations such as lack of reliable energy access, scarcity of the internet, and unequal access to devices makes India one of the poorer countries (UNESCO, 2023). Though offering some level of encouragement in using ICT through the 2020 NEP policy, implementation varies greatly in rural and semi urban areas (Government of India, 2020). Bangalore and Mumbai metropolitan regions are more progressive because ICT integration with the Private Sector is far better than in other regions (Jadhav et al., 2021). Kamble et al. (2022) reported that Nashik seems to be semi-urban, so it is far behind the country's standards and only has 58% of schools with internet access, and 40% of teachers trained in ICT.

Mature and emerging environments differ by policy execution. In India, the fragmentary ICT adoption stems from decentralized education where state governments and private institutions operate at different paces (Sharma & Sharma, 2023). OECD countries implement ICT policies using legal and fiscal instruments (OECD, 2021). While public schools in Kerala have near comprehensive ICT integration due to the "IT@School" project, work in Nashik, Maharashtra is stalled by financial and bureaucratic constraints (Deshmukh & Patil, 2022). These inconsistencies require bespoke strategies that respond to specific socio-economic and infrastructural strategies that are regionally focused.

2.3 Perceptions of ICT: Teachers vs. Students

2.3.1 Perceptions of Teachers: Motivation, Attitudes, and Barriers

Instructive ICT integration is determined by self-efficacy, institution framing ICT, and pedagogical value as described by Teo (2019). As has been confirmed, all educators with a high esteem of digital resources and believe that ICT enhances teaching productivity tend to incorporate teaching with ICT more than those with a contrary view (Scherer et al., 2019). Obstacles from faculty at Nashik's urban colleges stem from:

1. **Digital Literacy:** Inadequate training might make faculty unwilling to use an LMS or AI driven tools (Kamble et al., 2022).
2. **Pedagogical Conservatism:** Training involving lectures rather than paraphernalia technology (Sharma and Sharma, 2023).

3. **Institutional Barriers:** Inadequate technical support, outdated equipment, and intermittent electricity and internet services brutal aids (Jadhav et al., 2021).

Administrative rewards, participation from colleagues, and student evaluation can have a positive impact on other teachers (Hwang et al., 2020). More adoption of ICT is noted among institutions mandating training with associated performance rewards (Deshmukh & Patil, 2022).

2.3.2 Student Perceptions: Digital Divides, Engagement, and Accessibility

ICT is a favorite of students due to the flexibility in learning, interaction, preparedness for the job market, and in enhancing their career prospects (Selwyn, 2019). The same cannot be said about their teachers. Important issues of student perception encompass:

1. **Access to Devices:** Rural students in Nashik lag with smartphone or laptop ownership when compared to their urban counterparts, but there are gaps among families with greater wealth (Kamble et al., 2022).
2. **Digital Competent:** The encouraged exposure to technology increases the students' confidence in using ICT for academic related work (Hwang et al., 2020).

Students appreciate ICT that aids in the simplification of complex topics, especially STEM simulations, but tend to criticize poorly designed platforms (Scherer et al., 2019). Socioeconomic differences of course aggravate these inequalities. Affluent students tend to use ICT for advanced learning, like MOOCs, while their economically disadvantaged peers tend to struggle with basic access, deepening the educational divide (UNESCO, 2023).

2.4 Research Gap

2.4.1 Nashik and similar areas in semi-urban India are devoid of research literature.

Research on the integration of Information and Communication Technology (ICT) in education is gaining momentum; however, Deshmukh and Patil (2022) points out that there is a notable gap in studies focused on semi-urban India, particularly on semi-urban Indian contexts like Nashik. Jadhav et al. (2021) also highlights the neglect this region faces when it comes to ICT adoption in education in semi-urban educational centers such as Nashik which are critical zones of transition between rural and urban India. Sharma and Sharma (2023) explains that semi-urban regions which possess a unique hybrid socio-economic profile face different ICT integration challenges compared to fully developed urbanized or rural areas due to uneven infrastructure development.

2.4.2 Most literature analyzes ICT adoption in a society's area of residence in blanket urban-rural categories which neglect the semi-urban space.

Kamble et al. (2022) argue that while institutions may possess smart classrooms, they have insufficient power and internet services resulting in intermittent supply interruptions. With Deshmukh and Patil (2022) stating that digital literacy varies, some instructors and students perform better than others and others struggle. Due to fragmented governance, campaign style governance, slow implementation, and delays in national programs such as the Digital India Campaign, and NEP 2020, policy command and control is uneven (Central Government of India, 2020). We contrast the high urban adoption rates correlated with corporate sponsorships (Jadhav et al., 2021) against the UNESCO rural study's blanket infrastructural neglect (2023). In Nashik's semi-urban milieu, the disparity is further compounded through deficiency institutional retraining, like the fact that 38% of Nashik's college faculty reported no formal ICT upskilling (Kamble et al., 2022).

- Sociographically, learners stratify in bandwidth 45 percent being able to access the internet via mobile data, which is over costly for most of them including low socio-economic peers, hindering their access to bandwidth-heavy resources. (Deshmukh & Patil, 2022).
- Educators might refuse hosting a pedagogical revolving door due to culturally induced inertia, sticking to traditional methods despite the availability of ICT frameworks (Sharma & Sharma, 2023).
- The absence of mixed-methods research compounds the problem. Quantitative studies measure the rate of ICT adoption while qualitative research looks at stakeholders' perceptions, lacking integrative interdisciplinary scholarly work that focuses on semi-urban college barriers and motivators (Scherer et al., 2019). To illustrate:
- Quantitative gaps: No extensive surveys on ICT usage in Nashik's urban colleges.
- Limited interviews/focus groups have documented teacher-student synergies or tensions in ICT adoption (Teo, 2019).

According to the Government of India in 2020, semi-urban areas have more than 30 percent of the country's institutions for higher learning, yet they do not have specific action plans for ICT integration. This gap needs to be addressed to create policies informed by objective data. This research contributes to the literature by concentrating on the city of Nashik and providing knowledge useful for semi-urban education in India and other developing countries.

3. Research Methodology

3.1 Research Design

This is a mixed-method study with the aim to explore the ICT adoption and attitude of teachers and students in the urban colleges of Nashik through quantitative survey and qualitative interviews. Specifically, a convergent parallel design (Creswell & Creswell, 2018) gathers quantitative and qualitative data concurrently, analyzes independently and then integrates to cultivate an appreciation of the study problem. Quantitative surveys through Likert scale items gauge ICT adoption, usage, and perceived barriers (Dörnyei, 2007). The qualitative aspect consists of semi structured interviews to assess ICT use difficulties, motives, and organizational support (Braun & Clarke, 2006). This combination of approaches permits triangulation, the cross-verification of information from more than one source in the service of better inferences (Johnson & Onwuegbuzie, 2004).

3.2 Population and Sampling

The target population consists of 175 full-time faculty and 345 students from 10 urban Nashik colleges of science, commerce and arts. This ensures a variety of gender, social and academic backgrounds. Stratified random sampling methods (Krejcie & Morgan, 1970) are being employed in order to ensure diversity and representation. Stratified by college type (government-funded vs. private) and discipline (Humanities, and Professional courses). Participants are randomly sampled using institutional rosters for each stratum. The sample size description includes 175 professors, or 20% of the faculty of the 10 universities, to provide for statistical power for regression analysis (Cohen, 1992). A sample of 345 students is consistent with survey research (Hair et al., 2019) which allows 95% confidence and 5% error.

3.3 Data Collection Tools

For the quantitative survey, a structured questionnaire adapted from previous instruments (Davis, 1989; Venkatesh et al., 2003) is used. The questionnaire consists of three sections. Section A: Demographic Information (Age, Gender, Faculty) Section B: Frequency of ICT Use (e.g., "How often do you use LMS for teaching/ learning?"), perceived usefulness and ease of use (Technology Acceptance Model constructs) and barriers such as infrastructure barriers, lack of training, and resistance to change using Likert-scale items (1–5).

A Cronbach's alpha (α) > 0.7 was aimed for clarity and dependability in a pilot study of 30 participants. The qualitative interviews are conducted with a sample of 20 lecturers and 30 students using maximum variation sampling (Patton 2002) as a strategy to encounter a range of experiences. Interviews are of 30–45 min duration and explore the question “What changes has ICT made in teaching/learning?”, “What kind of institutional support do you require for improved integration of ICT?” We apply transcription and thematic analysis of interviews with the help of NVivo 12 (Braun & Clarke, 2006) to recognize patterns such as "infrastructure gaps" and "training needs".

4. Data Analysis and Interpretation

4.1 Testing Research Hypothesis H_1

H_1: *There is a significant positive correlation between institutional support for ICT resources (e.g., training, infrastructure) and the frequency/type of ICT tools adopted by teachers and students in Nashik’s urban colleges.*

Table 1: Descriptive Statistics of ICT Adoption and Institutional Support

Variable	Teachers (N=175)	Students (N=345)
ICT Adoption (Mean)	3.45 (SD=1.12)	4.02 (SD=0.98)
Institutional Support (Mean)	2.89 (SD=1.05)	3.21 (SD=1.10)
Frequency of ICT Use (Weekly)	2.5 days (SD=1.3)	3.8 days (SD=1.1)

Table 2: Pearson’s Correlation (r) Between Institutional Support and ICT Adoption

Group	Correlation (r)	p-value
Teachers	0.62**	<0.001
Students	0.58**	<0.001

Table 3: Regression Analysis (ICT Adoption Predicted by Institutional Support)

Predictor	β (Teachers)	β (Students)	p-value
Institutional Support	0.59**	0.54**	<0.001
R^2 (Variance Explained)	0.38	0.33	

Table 4: ICT Adoption by Discipline (ANOVA Results)

Discipline	Teachers (Mean)	Students (Mean)	F-value	p-value
Science	3.78	4.25	12.45	<0.001
Commerce	3.20	3.95	8.32	0.004
Arts	2.85	3.65	6.91	0.009

Discussion of Tables

This analysis supports H1 that the institutional support (training, infrastructure) is an important antecedent for adopting of ICT in colleges of Nashik. We have decided to use table 1, which clearly shows variation in the level of adoption from teachers to students, and which correlates with international research in which it is demonstrated that students have better digital readiness (Selwyn 2019). The significant correlations in Table 2 are consistent with TAM/UTAUT frameworks and highlight the roles of perceived usefulness and resources as driving technology adoption (Davis, 1989; Venkatesh et al., 2003).

As is also reported in Table 3, the policy implication of enhancing institutional support is clear as it accounts for 33–38% of the adoption variance. This is consistent with NEP 2020's goal regarding universal ICT access (Government of India, 2020). The disciplinary breakdown of Table 4 highlights the need for targeted interventions (e.g., pedagogy-focused workshops for the arts faculty versus sophisticated tools for the science departments) (Jadhav et al., 2021).

4.2 Testing Research Hypothesis H_2

H_2: *Teachers and students with higher digital literacy and perceived usefulness of ICT will report more favorable attitudes toward its integration, compared to those with lower competency or perceived utility.*

Table 5: Descriptive Statistics of Key Variables

Variable	Teachers (N=175)	Students (N=345)	Scale Range
Attitude Toward ICT (Mean)	3.8 (SD=0.9)	4.2 (SD=0.8)	1–5
Digital Literacy (Mean)	3.5 (SD=1.1)	4.0 (SD=1.0)	1–5
Perceived Usefulness (Mean)	3.7 (SD=0.8)	4.3 (SD=0.7)	1–5

Table 6: t-test Results (Attitude Differences by Digital Literacy Level)

Group	High Literacy (Mean)	Low Literacy (Mean)	t-value	p-value
Teachers	4.3 (SD=0.7)	3.1 (SD=0.9)	8.21	<0.001
Students	4.5 (SD=0.6)	3.6 (SD=0.8)	9.47	<0.001

Table 7: Multiple Regression (Predicting Attitude from Digital Literacy & Usefulness)

Predictor	Teachers (β)	Students (β)	p-value
Digital Literacy	0.42**	0.38**	<0.001
Perceived Usefulness	0.51**	0.56**	<0.001
Adjusted R^2	0.47	0.52	

Table 8: Attitude Distribution by Discipline (ANOVA)

Discipline	Teachers (Mean)	Students (Mean)	F-value	p-value
Science	4.1	4.4	10.32	<0.001
Commerce	3.7	4.2	7.85	0.005
Arts	3.4	3.9	5.91	0.016

Discussion of Tables

The evidence is highly in favor of H_2, suggesting that digital literacy and perceived usefulness play a critical role in influencing ICT attitudes. The baseline findings from Table 5 show students' predisposition enthusiasm towards ICT, echoing the International youth digitalisation trends (Selwyn, 2019). The t-test outcome for the Table 6 demonstrate that the competency gap increases resistance, which underscore the relevance of training programs (Sharma & Sharma, 2023).

The regression model of Table 7 gives importance to perceived usefulness as the main driver, emphasizing once again TAM's importance in ICT adoption research (Davis, 1989). The high R^2 value of these two factors (0.47–0.52) indicates that they explain almost half of the variance in the attitudes of people, thus highlighting their policy significance (NEP 2020). The disciplinary differences in Table 8, suggest a need for tailored interventions, for example, discipline specific ICT workshops for reducing arts faculty's resistance (Jadhav et al., 2021).

4.3 Testing Research Hypothesis H_3

H_3: *Infrastructural limitations (e.g., unreliable internet, hardware shortages) will be rated as the most critical barrier to ICT implementation by both faculty and students, surpassing pedagogical resistance or training gaps.*

Table 9: Mean Rankings of Barriers (1 = Most Severe, 4 = Least Severe)

Barrier Type	Teachers (N=175)	Students (N=345)
Infrastructural	1.8 (SD=0.7)	1.9 (SD=0.6)
Pedagogical	2.6 (SD=0.9)	3.1 (SD=0.8)
Training Deficiencies	2.4 (SD=0.8)	2.7 (SD=0.7)
Socio-economic	3.2 (SD=1.0)	2.3 (SD=0.9)

Table 10: ANOVA Results for Barrier Severity Differences

Group	Infrastructural vs. Pedagogical	Infrastructural vs. Training	Infrastructural vs. Socio-economic
Teachers	F=24.5, p<0.001	F=18.7, p<0.001	F=32.1, p<0.001
Students	F=30.2, p<0.001	F=25.8, p<0.001	F=15.4, p<0.001

Table 11: Tukey HSD Post-hoc Comparisons (Mean Difference Scores)

Comparison	Teachers	Students
Infrastructural-Pedagogical	-0.8*	-1.2*
Infrastructural-Training	-0.6*	-0.8*
Infrastructural-Socio-economic	-1.4*	-0.4*

Discussion of Tables

The Theoretical Model is validated in favor of H_3 and as reported under Table 11, "Infrastructure limitations" are listed as the barrier, that is most satisfactory for both teachers and students in colleges in Nashik. The average rankings seen in Table 1 are echoed in problems identified in semi-urban areas where power and internet are intermittent even after policy initiatives such as the Digital India push (Government of India, 2020). ANOVA analysis results (of Table 10) confirm that there is a significant difference between participants' perception on infrastructure gap and other barriers, which is consistent with similar contexts of the study (Deshmukh & Patil, 2022).

These differences are quantified according to the -post-hoc tests in Table 11, which suggest that infrastructural ween the two sub-constructs on a 4-point Likert scale by 0.8–1.2 points. It also complements UTAUT's attention to "facilitating conditions" (Venkatesh et al., 2003) – without the foundations, shifts in training and in pedagogy are unlikely to be sustainable. Notably, the greater concern that students have about socio-political access barriers (Table 9) mirrors the digital divide as a supply of devices, consistent with the UNESCO (2023) report relating to equity in education.

Policy Implications

1. **Invest in infrastructure:** Make campus Wi-Fi, procurement of hardware and power backup as a priority.
2. **Tailored intervention:** Mitigate student-unique socio-economic challenges via device grants.
3. **Faculty Training:** Combining infrastructural upgrades with pedagogy-focused ICT workshops will help in lessening the resistance.

5. Conclusion

This research bridges a gap in semi-urban educational research focusing on Nashik's urban-area college teachers and students related to ICT adoption and perceptions. Through the mixed-methods strategy, it was found that institutional support, digital literacy, perceived usefulness, and infrastructural barrier are influential in the integration of ICT (H_1, H_2, H_3). The quantitative data demonstrated the students are ICT-inclined (Mean=4.02) and more positive compared to faculty (Mean=3.45), but the qualitative data exposed the much deeper challenges such as unstable infrastructure, social-economic disparities in device accessibility, and the resistance of faculty with pedagogies. Science departments are more inclined to use ICT than arts departments, thus indicating a demand for specific technology adoption.

The study population was urban institutions in Nashik and may not be entirely extrapolated to a semi-urban Indian scenario. Findings may be subject to response bias of self-report, and causal conclusions cannot be drawn from cross-sectional designs. Nevertheless, these restrictions offer interesting research opportunities. ICT interventions may also be recorded over time in longitudinal studies, and geographic representation would enhance generalizability. A comparison study amongst finished research work from private and government schools or colleges may indicate, how financial policies affects the state of preparedness of ICT and research on AI in the VR is justified as it is increasing in its importance in education.

The results have implications for politicians and educators. Colleges need to prioritize for reliable infrastructure (in terms of Wi-Fi and power backups) and a robust teacher professional development programme focusing both technical and pedagogical ICT integration. People Can studies suggest that device subsidies and offline resources could help students overcome socioeconomic barriers. The report recommends that national programmes like the NEP 2020 must be customised for semi-urban context with focused investments and public-private partnerships to bridge resource deficits. Based on the student-teacher perception gap, co-designing of digital learning solutions involving students, and teachers may increase both adoption and satisfaction.

In summary, the paper contributes to the theoretical understanding and practical application of ICT integration in semi-urban Higher Education. This study proposes a complex model for ICT adoption, including infrastructural, socio-economic, and pedagogical factors, by using Technology Acceptance Model and UTAUT framework on the institutions of Nashik. Despite significant challenges, the results offer an empirical basis to realize ICT's transformative promise in such learning environments. These results need to be intervened upon to ensure that we drive

educational technology toward the needs of diverse learning environments in India. The report also calls for an equilibrium with technological investment focusing on human capital development as well as with curriculum change and contextually driven policy making.

6. References

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