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Mobile-First and LMS-Centric E-Learning Tools: Adoption and Preference Trends in Karnataka's Higher Education

Shalini P
Research Scholar, Fellow Program in Management (FPM), ISBR Business School, Bangalore

Dr. Balachandar S
Professor, Head – Centre of Teaching and Learning, ISBR Business School, Bangalore

Dr. M R Jhansi Rani
Professor, OB & HRM, Director, Research Centre, ISBR Business School, Bangalore.

Abstract
This research investigates the changing trends in e-learning tool uptake in the higher education system in Karnataka, and particularly the increasing use of mobile devices and Learning Management Systems (LMSs). Based on the Unified Theory of Acceptance and Use of Technology (UTAUT), the study identifies how performance expectancy, effort expectancy, and social influence determine the behavioural intentions of students and Faculty in utilizing digital learning environments. Utilizing a mixed-method approach, primary data was gathered through organized questionnaires from 600 participants - 400 students and 200 faculty of urban and rural colleges in Karnataka. The findings present a clear preference for mobile-first learning, with smartphones as the most common device used by students. The most used platforms were Google Classroom and Moodle, with students liking Google Classroom for its mobile optimization and Moodle being liked by faculty for its academic use. Regression analysis indicated that effort expectancy and performance expectancy strongly affected adoption, while social influence played a minor role. Importantly, rural users demonstrated high intention to use e-learning tools despite infrastructural issues, indicating a motivated but underserved population. The research highlights the importance of mobile-friendly, low-bandwidth learning solutions and systematic instructor training to bridge digital skill gaps. It suggests a hybrid approach that combines access through mobile and institutional backup and advocates more investment in rural digital infrastructure. By understanding critical behavioral drivers and access inequalities, this study contributes to policymaking, digital equity, and long-term e-learning plans in Indian higher education.

Keywords: E-learning Adoption, Mobile-First Learning, Learning Management Systems (LMS), UTAUT Model, Higher Education in India.

Introduction
The growing use of digital technology across education has hugely changed how teaching and learning occur within higher education globally. In India, this change was expedited by the COVID-19 pandemic, which compelled institutions to transition precipitously from the conventional classroom to online platforms Dhawan, 2020 and Agarwal & Kaushik, 2020). This dislocation spurred the use of different e-learning technologies and mobile devices, not only as stopgap measures but as part of a longer-term digital learning infrastructure. Although early attempts were characterized by improvisation that stemmed from emergencies, institutions have since shifted toward organized, blended, and mobile-centric pedagogies of instruction and learning.
Karnataka, being among India's top states in higher education, has witnessed a sudden spike in digital platform usage across students and teachers. Government efforts including the Karnataka LMS, MOOC platforms like SWAYAM, and extensive availability of cheap

smartphones have further spurred e-learningDas,2025. Yet inequalities in digital infrastructure access—especially between urban and rural colleges—still affect the adoption of technology and to what degree it is realized across the state. Rural and low-income students tend to use only smartphones with limited data plans, while their urban equivalents might have laptops, high-speed internet, and institutional digital care Kapur, 2020 and Laskar, M. H. 2023. Here, mobile-first learning, in which smartphones are the dominant device for consuming educational material, is a hallmark of e-learning in India. Smartphones provide portability, affordability, and app-based convenience that makes them more convenient for students, especially in resource-scarce contexts (Almaiah et al., 2020). At the same time, Learning Management Systems (LMSs) like Moodle and Google Classroom have emerged as focal points for providing lectures, tests, and learning materials. These tools are used more and more by educators for managing courses and by students for adaptive learning. Their effectiveness, though, is strongly reliant on digital literacy, motivation, and institutional support of users Sangeeta & Tandon, 2020.

Literature review

Knowledge of the behavioral adoption patterns among faculty and students is essential to create effective digital learning environments. On this front, the Unified Theory of Acceptance and Use of Technology (UTAUT) developed by Venkatesh et al. (2003) provides a well-documented theoretical framework. UTAUT suggests four major factors—Performance Expectancy (PE), Effort Expectancy (EE), Social Influence (SI), and Facilitating Conditions—that affect the behavioral intention to use technology. Amongst these, PE and EE are generally the best predictors in studies of education, whereas SI and Facilitating Conditions are institution culture- and socio-economically dependent (Tarhini et al., 2014).

The mass deployment of e-learning technologies within Indian higher education, particularly in response to the COVID-19 pandemic, was at once a strategic shift and reactive compulsion. In Karnataka, this digital transition was most apparent in urban areas such as Bengaluru, where there were already digital infrastructure and ICT-readiness present, allowing the transition to occur very quickly Mathur, S. K. (2006) (Arora et at., 2021). The transition, though, quite severely exposed the urban-rural digital divide. Urban students experienced stable internet, contemporary devices, and digitally literate staff, and all these allowed smoother learning. In contrast, rural colleges faced challenges including unreliable electricity, poor connectivity, and a lack of digital training among both educators and learners Balabantaray & Samal, 2022; Lakshman et al., 2022. Studies show that rural students received fragmented content, limited feedback, and minimal technical support, leading to disengagement and technological fatigue (Panakaje et al., 2022). The cumulative effect of socio-economic and gender-related obstacles further excluded rural female students, particularly those belonging to poor economic backgrounds, from privacy and possession of learning instruments (Deka, 2021; Joshi, 2021). In the absence of strategic policy actions, e.g., subsidized provision, rural-centric ICT courses, and focused infrastructure improvements, India's digital education initiative will only exacerbate extant disparities.

The Unified Theory of Acceptance and Use of Technology (UTAUT), developed by (Venkatesh et al. 2003), offers a strong theoretical framework to study technology adoption in this context Davis, F. D. (1989). In Karnataka's higher educational institutions, research confirms that Performance Expectancy (PE) is a determining factor encouraging both students and instructors to use e-learning—particularly in urban areas where users feel that electronic aids improve educational results. Effort Expectancy (EE), or ease of use, is a

significant barrier to rural learners, whose low level of exposure to technology reflects low confidence and high cognitive load. In addition, Social Influence (SI) , comprising peer support and institutional requirements, is also a key factor, especially within the rural context where community support largely determines technology use (Patil & Joshi, 2023). However, Facilitating Conditions (FC) —such as device availability, technical support, and institutional readiness—continue to disproportionately favor urban HEIs (Dwivedi et al., 2023). Addressing this imbalance is crucial for equitable adoption. As India's education ecosystem continues to digitalize, region-specific adaptations of UTAUT and evidence-based policies are imperative to enable inclusive, sustainable, and scalable e-learning across diverse geographies.

The UTAUT model has been used by a number of studies effectively in Indian and global educational environments (Hetharion et al.,2025). For instance, (Alalwan et al., 2017) highlighted the importance of trust and ease of use in adopting technology, particularly in resource-constrained situations. In the same vein, examined the sustained use of LMS platforms and revealed how behavioral intention is influenced by experience, social influence, and infrastructural environments. These results validate the applicability of UTAUT in examining the student and instructor motivations to implement digital platforms across various learning environments.

Yet, the majority of previous research has either been student-centric or generic in its concept of e-learning adoption, with little attention to the differentiated roles of faculty members and territorial variations. In addition, as mobile-first learning becomes increasingly prevalent, there have been few empirical studies that examined the influence of this device choice on the adoption of organized platforms such as LMSs. Thus, there is an urgent need to study how mobile-first conduct and LMS adoption overlap with UTAUT constructs, especially in a regionally varied state like Karnataka.

This study fills these gaps by studying the preferences, behaviors, and factors of influence for adoption of e-learning tools among both students and teachers of Karnataka's higher education institutions. Through examination of survey results from 600 participants at urban and rural universities, the research aims to find not only what is being utilized, but why they are being utilized, and how different demographic and contextual variables influence these choices. This research contributes both theoretically and practically to the knowledge about digital education, with a concentration on sustainable, inclusive adoption of mobile-first and LMS-centric learning approaches.

In this regard, the present paper investigates the following objectives

1. To ascertain the most widely adopted e-learning tools in Karnataka's higher education sectors.

2. To analyze urban–rural disparities in access and adoption of e-learning platforms.

3. To utilize the UTAUT model to comprehend the behavioral intention and actual use of digital learning tools by students and staff.

Consistent with these goals, the research examines a set of hypotheses concerning performance expectancy, effort expectancy, and social influence. The study also accounts for variations in patterns of technology use across urban and rural institutions, and between

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students and teachers. Through a consideration of these topics, the paper seeks to present findings of relevance to institutional decision-makers, policy planners, and ed-tech developers interested in supporting equitable and effective digital learning in India.

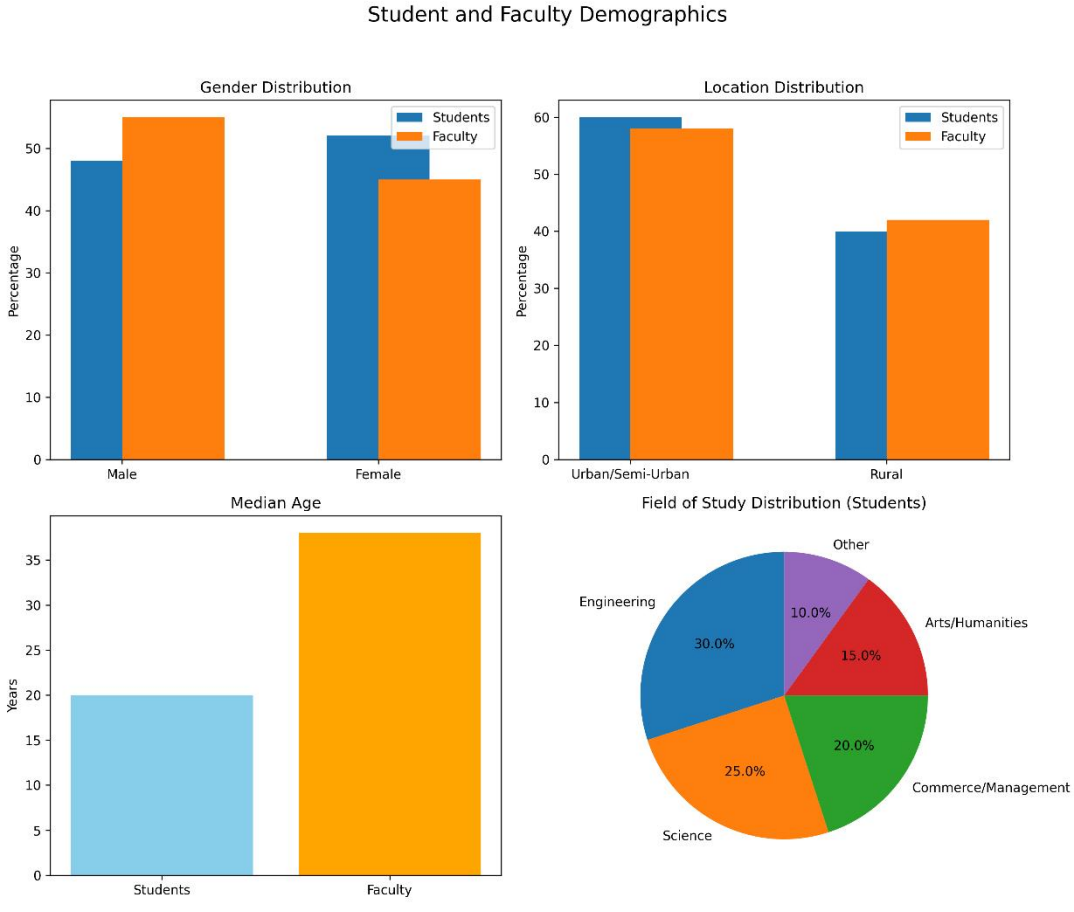
Methodology

The current research utilized a quantitative design, to examine e-learning tool choice among students and teachers in Karnataka higher education. The salient part was a standardized survey given to a large sample size, with a smaller proportion of respondents undergoing follow-up interviews. The research was carried out across 25 institutions of higher education in Karnataka, across 12 districts. These consisted of universities, engineering colleges, polytechnic colleges, and general degree colleges from both urban and rural settings. This institutional and geographical diversity enabled comparisons of adoption practices between urban and rural sectors that made sense. Participants who were eligible for the study were enrolled as undergraduates or postgraduates and had utilized e-learning tools during the previous year. The faculty participants had to be actively involved in teaching during the same timeframe and made use of online learning tools for teaching.

600 valid responses were maintained for analysis, of which 400 were students and 200 faculty members. The sample was representative in terms of demographics. 52% were female and 48% male among the students, with a median age of 20 years. Approximately 60% of them were from semi-urban or urban campuses, and 40% from rural campuses. The respondents among the faculty had a median age of 38 years, 45% female and 55% male; 58% were in urban campuses, and 42% in rural areas. Students were enrolled in different fields of study including engineering (30%), science (25%), commerce and management (20%), arts and humanities (15%), and others (10%), reflecting the enrollment distribution of higher education in the state.

Table 1. Sample Composition by Demographic Attribute

Category	Subgroup	Students (N = 400)	Faculty (N = 200)



Gender	Male	192 (48%)	110 (55%)
	Female	208 (52%)	90 (45%)
Location	Urban/Semi-Urban	240 (60%)	116 (58%)
	Rural	160 (40%)	84 (42%)
Median Age	—	20 years	38 years
Field of Study	Engineering	30%	—
	Science	25%	—
	Commerce/Management	20%	—
	Arts/Humanities	15%	—
	Other	10%	—

The questionnaire was developed following the Unified Theory of Acceptance and Use of Technology (UTAUT) model Venkatesh et al. (2003) using validated constructs from earlier research (Tarhini et al., 2014; Abbad, 2021). The questionnaire was comprised of five sections: demographics, access to digital equipment, use of online e-learning platforms, UTAUT constructs (Performance Expectancy [PE], Effort Expectancy [EE], Social Influence [SI]), and actual use and behavioral intention. The items were rated using a five-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree).

Performance Expectancy was measured using five items that assessed users' beliefs about how e-learning tools impacted academic performance or teaching effectiveness. Effort Expectancy had four items measuring ease of use and technical complexity. Social Influence was measured with three items per group that examined peers', instructors', or institutions' expectations. Behavioral Intention was measured through three willingness statements to persist using e-learning tools after the pandemic. Usage behavior was captured through frequency of use as reported and preferred devices.

The questionnaire also contained items to assess accessibility and usage of devices and e-learning platforms. They were asked to report their predominant learning devices (laptop, desktop, smartphone, or tablet) and named the most used platforms (Moodle, Google Classroom, SWAYAM, MS Teams/Zoom, etc.). Additionally, a checklist of potential barriers (e.g., insufficient internet, insufficient training) was added to qualitatively assess facilitating conditions that are applicable to UTAUT.

The tool was originally formulated in English and checked by bilingual specialists. Translation into Kannada was provided for those more fluent in the local language. Still, most did the English version due to its popularity as the instruction medium. There was a pilot test with 10 students and 5 teachers, followed by slight changes for clarity and contextual purposes.

To establish reliability, Cronbach's alpha for all three UTAUT constructs was computed: PE ($\alpha = 0.88$), EE ($\alpha = 0.84$), and SI ($\alpha = 0.79$), each of which was greater than the desired threshold of 0.70 (Nunnally, 1978). Exploratory Factor Analysis (EFA) conducted with Principal Components with Varimax rotation verified the scales' validity, yielding three factors in line with PE, EE, and SI. The factors accounted for a total of 68% of variance, suggesting good construct validity.

Data were collected during March and May 2025. The questionnaire was administered online through Google Forms. It was voluntary and all participants provided informed consent prior

to filling the questionnaire. Reminders were sent to enhance response rates, and data were cleaned by eliminating incomplete or careless responses.

Quantitative analysis was conducted with IBM SPSS (Version 26) and Minitab (Version 19). Descriptive statistics were applied to report device preferences, platform usage, and UTAUT construct scores. Group differences (urban vs rural, student vs faculty) were tested using independent sample t-tests and chi-square tests. Pearson correlation analysis was conducted to investigate relationships between PE, EE, SI, and behavioral intention.

To evaluate predictors of technology adoption, multiple regression models were developed with PE, EE, and SI as independent measures, and Behavioral Intention as the outcome. Variance inflation factor (VIF) scores were checked and found to be in acceptable ranges (all < 2.5). Logistic regression was also employed to evaluate predictors of high actual usage, including taking two or more online courses or spending more than 3 hours a week on LMSs.It was also a two-way ANOVA that was used to examine interaction effects between location (urban/rural) and role (student/faculty) on behavioral intention. This aided in establishing whether contextual variables affected adoption across different subgroups.

Results

Participant Demographics and Context

600 valid responses were used in this study consisting of 400 students and 200 teachers. The student respondents had an average age of 20.4 years (SD = 2.1), with an almost even gender distribution of 52% female (n = 208) and 48% male (n = 192). Among faculties, the average age was 37.9 years (SD = 9.5), and gender was also relatively even with 45% female (n = 90) and 55% male (n = 110). In terms of geography, 77.5% of students (n = 310) reported their background as semi-urban or urban, whereas 22.5% (n = 90) were rural. Of faculty respondents, 60% (n = 120) were housed in urban campuses and 40% (n = 80) at rural campuses or branch colleges.

The majority of student respondents were undergraduates (72%), followed by those in postgraduate studies (24%) and doctoral studies (4%). The faculty experience varied from less than 5 years (30%) to over 20 years (15%), with the median around 10–12 years. Participants were drawn from different academic fields, with engineering (30%), science (25%), commerce/management (20%), arts and humanities (15%), and other fields like education and law (10%). The disciplines of faculties were similarly distributed to guarantee academic diversity. Data collection was done in early 2022, when the majority of the participants had both gone through remote learning during the pandemic and had returned to hybrid or face-to-face teaching. In fact, 100% of instructors and 96% of learners affirmed having recent experience with online learning and teaching methods.

Device Ownership and Usage Preferences

One of the key findings supports the “mobile-first” trend in higher education. Among students, 95% reported owning a smartphone, while only 38% had access to a personal laptop or desktop computer. The digital divide was especially evident when comparing rural and urban students: only 22% of rural students owned a laptop, compared to 45% in urban areas. Conversely, faculty enjoyed greater access to computing devices, with 88% claiming to own a laptop and 90% owning smartphones. This difference mirrors institutional provision for faculty, as well as differing needs in content production compared to consumption.

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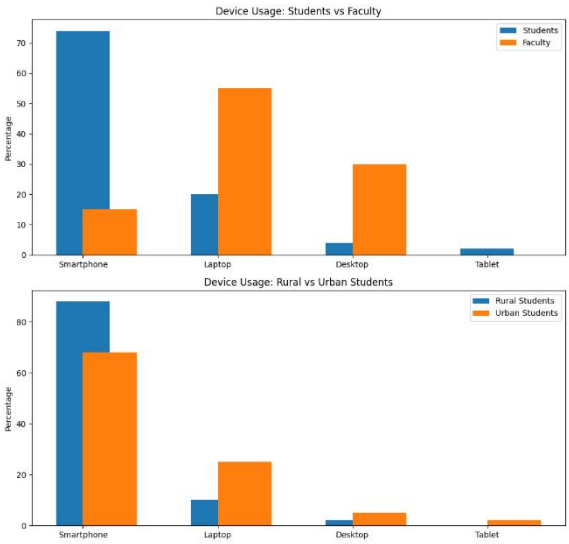
When queried about their primary device used to access online learning platforms, 74% of students used a smartphone, 20% used a laptop, 4% used a desktop computer, and 2% used a tablet. Among staff, the trend varied: 55% used only a laptop, 30% a desktop, and 15% a smartphone. This indicates that students, particularly rural students, depended on mobile devices because they were affordable and available to them, while staff used laptops or desktops in order to carry out more advanced tasks like preparing materials or dealing with multiple sites.

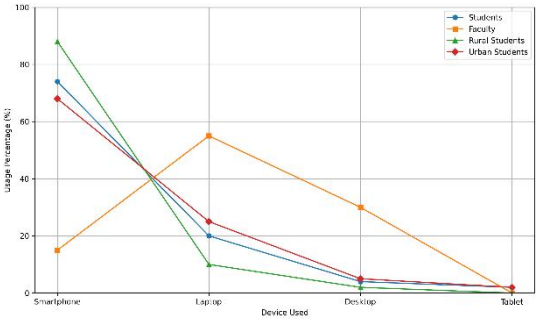
Table 2. Primary Device for E-Learning by Role and Location

Device Used	Students (%)	Faculty (%)	Rural Students (%)	Urban Students (%)
Smartphone	74	15	88	68
Laptop	20	55	10	25
Desktop	4	30	2	5
Tablet	2	—	—	2
Smartphone	74	15	88	68



A chi-square test also found that rural students were more likely to use smartphones than urban students (χ^2 (1, N=400) = 14.5, $p < 0.001$). Moreover, female students were more inclined than male students to adopt smartphones for e-learning (87.3% vs. 75.4%), mirroring larger gender-based disparities in access to computing in India (Frontiers in Education, 2021) (Nayak, J. K. 2018).

Platform Usage and Preferences



Students and teachers were both queried regarding their experience with and usage of different e-learning systems. Among students, 78% had utilized Google Classroom, the most commonly used platform. Moodle-based systems, such as the Karnataka LMS, were utilized by 50% of students and 48% of teachers. SWAYAM had greater awareness (70%) but lower frequent use, with only 30% of students having taken at least one course. Among teachers, 60% supported SWAYAM admission for enrichment or credit transfer, and 20% had themselves taken courses on the platform.

Google Classroom was the preferred platform of 40% of the students, then Moodle (25%). On the other hand, instructors showed a slightly higher preference for Moodle (35%), while 30% of them preferred Google Classroom. Notably, platforms like WhatsApp were informally used

by more than 90% of both students and instructors to share PDFs, video lectures, and class announcements, particularly in rural colleges where LMS access was spotty.

Self-Reported Engagement and Usage

Students indicated they spent an average of 3.5 hours per week on e-learning activities during the current (blended) semester, ranging from almost zero to more than 10 hours per week. Faculty reported an average of 2 hours per week on e-learning tasks like posting course materials and grading online. Although this was much lower than the highest in fully-online instruction in 2020–21 (~15 hours/week), it still signifies continued interaction with online tools in blended forms.

In response to questions regarding future use, 87% of students reported that they intended to use e-learning tools in the future, with a mean behavior intention score of 4.1 on a 5-point Likert scale. For faculty, the mean intention score was 4.3. There was no statistically significant difference between urban and rural students (urban = 4.15, rural = 4.0, $p = 0.18$), demonstrating a mutual intent to persevere regardless of infrastructural differences. Nevertheless, qualitative responses by rural staff indicated insufficient confidence due to limited institutional support, despite their desire to embrace digital tools.

UTAUT Construct Scores

Composite scores for the UTAUT constructs were computed. Students indicated a high Performance Expectancy (PE) with a mean score of 4.23 (SD = 0.62), whereas faculty was slightly lower at 4.10 (SD = 0.68). The difference was not statistically different ($t(598) = 1.98$, $p = .058$). Urban students were significantly higher on PE (4.30) compared to rural students (4.05, $p < 0.001$), as they were likely to have better infrastructure to support their positive experience.

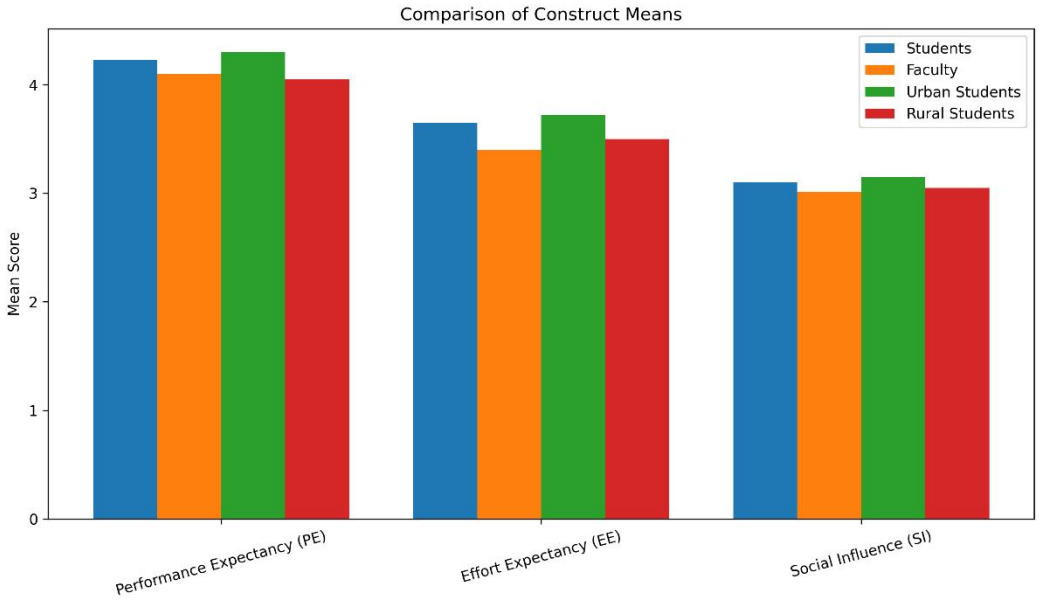
Effort Expectancy (EE) ratings were 3.65 (SD = 0.80) for students and 3.40 (SD = 0.88) for faculty, with faculty reporting higher difficulty using technology ($t(598) = 3.59$, $p < 0.001$). Technical issues and limited digital familiarity, particularly among rural faculty, were common interview themes.

Social Influence (SI) received the lowest mean scores: 3.10 for students and 3.01 for instructors. Most participants did not state that peer or institutional pressure highly influenced their use of e-learning tools. But instructors in government schools whose LMS use was compulsory reported higher SI scores. Female respondents in both groups reported a marginally higher SI score than male respondents (3.2 vs 2.9, $p < 0.05$), indicating possible gender-based sensitivity to external encouragement (Khechine et al., 2014).

Table 3. UTAUT Construct Scores by Group

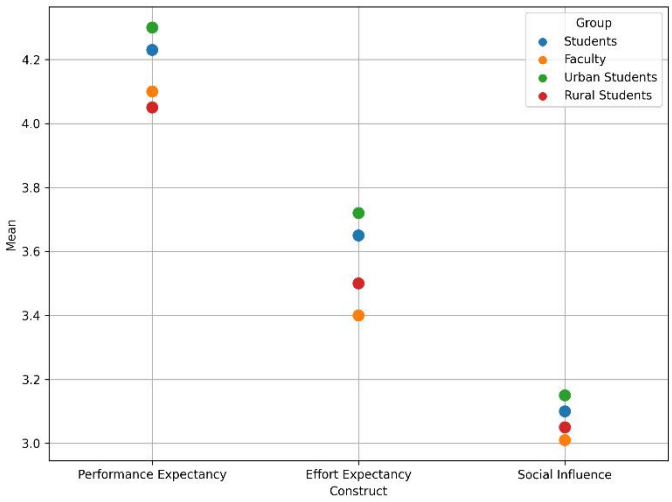
Construct	Students (Mean)	Faculty (Mean)	Urban Students	Rural Students
Performance Expectancy (PE)	4.23	4.10	4.30	4.05
Effort Expectancy (EE)	3.65	3.40	3.72	3.50

Social Influence (SI)	3.10	3.01	3.15	3.05



Regression Analysis and Behavioral Intention

Regression models validated that Performance Expectancy ($\beta = 0.39$, $p < 0.001$) and Effort Expectancy ($\beta = 0.22$, $p = 0.003$) were the significant predictors for behavioral intention. Social Influence was not a predictive variable ($\beta = 0.05$, $p = 0.19$) when the other factors were held constant. These results mirror UTAUT theory, highlighting the key role of perceived usefulness and ease of use in motivating the adoption of technology Venkatesh et al. (2003).



Grouping students and faculty separately showed that among students, all three factors were significant, that is, SI ($\beta = 0.11$, $p = 0.04$), whereas among faculty, the only significant factor was PE ($\beta = 0.45$, $p < 0.001$), and EE was marginal ($p = 0.08$). This indicates that students are more socially affected in their adoption behavior compared to faculty, who are inclined towards functionality and convenience.

Logistic regression revealed that strong intention strongly predicted usage (Odds Ratio ~3.5, $p < 0.001$). Environmental facilitators such as access to the internet also positively contributed (OR ~2.0, $p = 0.01$). With both intention and infrastructure taken into account, urban-rural usage differences ceased to be statistically significant, suggesting that resource disparities, rather than motivation, cause differences.

Discussion

The present study sought to investigate the adoption of e-learning tools among higher education institutions in Karnataka on two key dimensions: the "mobile-first" learning

behavior and UTAUT factors—performance expectancy (PE), effort expectancy (EE), and social influence (SI)—impacting the behavioral intention to adopt technology. The study also accounted for contextual variations between urban and rural users and compared attitudes of students and faculty members. The findings reflect a rich insight into the adoption of digital learning in India, consistent with international research yet foregrounding the region-specific issues and findings of importance to policymakers and institutional actors alike.

The findings are consistent with the high applicability of the UTAUT model Venkatesh et al. (2003) to this context. Of the key constructs, performance expectancy is the most powerful predictor of behavioral intention to use e-learning tools, among both students and teachers. This finding concurs with a number of previous studies that highlighted the perceived usefulness of technology as a key Adoption Driver (Tarhini et al., 2014; Abbad, 2021). Both groups, in our sample, recognized that e-learning platforms benefited their performance in teaching or learning—by providing flexibility, rich multimedia content, and ease of communication and evaluation. The relatively high average PE values (>4.0 on a 5-point scale) indicate that though there was initial resistance amidst pandemic-forced digital changes, users now see the long-term utility of these platforms.

Effort expectancy also significantly influenced intention, particularly in students. Easy-to-use tools were embraced more easily, a finding endorsed by previous studies (Mailizar et al., 2021; Almaiah et al., 2020). The student response in interviews mirrored this: when services such as Google Classroom were easy to use and mobile-optimized, students participated more enthusiastically. When sites such as Moodle were not mobile-optimized or presented technical obstacles, interest was low Muthuprasad et al., 2021. While Moodle's features were well-liked by teachers (e.g., for assignments and quizzes), the learning curve was frustrating. These results resonate with previous research that identified that bad interface design or insufficient training may greatly restrict adoption (Abbad, 2021 and Bervell et al., 2018). The faculty's lower EE scores (mean = 3.40) in comparison to students (mean = 3.65) emphasize the necessity for continuous professional development and focused technical support Abdelmola et al. 2021.

Social influence, on the other hand, was the poorest predictor of intention. Even as some students and teachers attested to being urged by their peers or institutions towards the use of digital tools, the majority of respondents indicated that their adoption decisions were influenced less by external forces than by personal or academic requirements. This is in accordance with Sangeeta and Tandon (2020), who noted that e-learning adoption was influenced minimally by institutional pressure once users became accustomed to the platforms. There were, however, exceptions. In government colleges that had the Karnataka LMS implemented, teachers responded with greater social influence—often supplemented by administrative oversight and peer pressure. Surprisingly, female participants reported slightly elevated SI scores, implying that they might be more likely to respond to social or institutional pressures (Dwivedi et al., 2019).

Regression analysis confirmed these trends. Performance expectancy yielded the greatest beta coefficient in predicting behavioral intention, and effort expectancy followed. Social influence did not become important once the impact of PE and EE were held constant. These findings affirm previous models, including the Technology Acceptance Model, wherein perceived usefulness generally takes precedence over other measures in predicting technology adoption. For subgroup analysis, students were more socially influenced than teachers, which

means that student decisions may still be influenced partially by peer use or teacher promotion. In contrast, faculty members judged technology largely on the basis of its perceived usefulness and ease of incorporation into teaching activities.

A second significant finding concerns the urban–rural divide. Rural students' access to laptops was significantly lower and they relied more on smartphones, with shared or borrowed phones being a common practice. Notwithstanding these disadvantages, their e-learning behavioral intention was not significantly lower than that of their urban counterparts. This implies a high level of motivation to engage in e-learning, even where infrastructural challenges exist. Yet their usage was hindered by poor connectivity, technical support, and reduced ability to familiarize themselves with deeper functions of LMS software Andersson, 2008 and van de Werfhorst et al., 2022. Rural staff also noted similar limitations, some of whom explained in interviews that they did not have access to training or devices that were trustworthy. This intention-usage gap highlights the importance of enhancing digital infrastructure and support services in rural institutions.

The "mobile-first" phenomenon in Karnataka mirrors wider national trends of evidence that smartphones are the most prevalent device for online learning among Indian students (Kapur, 2020). Our data reinforced this trend: 74% of students indicated that they used smartphones as their main learning device. Although mobile access has obviously broadened the scope of e-learning, it also creates issues related to design and usability of content. Several students confessed that reading lengthy documents, engaging in coding exercises, or engaging with complicated interfaces on tiny screens was problematic. Staff also had concerns over assessing student learning within a mobile-first environment. So while mobiles provide greater access, they don't necessarily provide full support for deep learning or content development. This necessitates the creation of mobile-optimized content and blended learning approaches that interleave mobile access with occasional offline or desktop-based activities.

The research also identified variations in platform use. Google Classroom was used more among students because it is easy to use and mobile-accessible. Faculty members, on the other hand, used Moodle if they had been trained and had received support at their institutions because it offered greater assignment control, quizzes, and tracking over students. SWAYAM, although government-promoted, was a supplementary platform that found its major use only among advanced learners or suggested by faculty members for additional credit. This disparity between awareness and frequent use of SWAYAM is consistent with studies showing that MOOC platforms are not utilized unless they are mandated or incentivized (Bast, 2021). Informal tools such as WhatsApp remained dominant in both rural and urban campuses, frequently acting as an unofficial LMS. This highlights the importance of incorporating low-data, mobile-based solutions into regular learning frameworks.

Lastly, the research gives proof of optimistic future intentions. The students and faculty reported high behavioral intention measures (~4.1–4.3 on a scale of 5), which suggests that they intend to keep using digital tools even when regular classes resume. This is a transition from short-term or crisis-based utilizations to more long-term uptake of e-learning in mainstream education. Yet for this to be successful, institutions must remove effort expectancy and facilitating condition barriers. Issuing devices, digital skills training, enhancing platform design, and establishing a better institutional culture are necessary next steps.

Implications and Recommendations

On the basis of findings, some few important recommendations may be inferred:

Improve Training and Technical Assistance: Faculty staff, particularly in rural colleges, require systematic training in order to gain confidence in exploiting LMS platforms. Workshops, user guides, and peer mentoring might mitigate the effort expectancy gap.

Invest in Digital Infrastructure: Rural institutions need improved internet connectivity, access to devices, and maintenance services Sindakis&Showkat,2024. Collaborations with telecom companies or government initiatives such as PMGDISHA may be explored to close the gap.

Encourage Mobile-Friendly Design: Since most of the students learn through smartphones, LMS websites need to be optimized for small screens, low bandwidth, and asynchronous access. Responsive design and user-centric features should be made the priority for developers.

Leverage Social Influence Strategically: Though not the most robust predictor in general, SI may be enhanced by leadership endorsements, peer example, and recognition programs. As an illustration, effective adoption by faculty champions may be made prominent as role models.

Use Hybrid Models: Blended learning strategies incorporating online venues and on-site meetings should be considered by institutions. Such flexibility is combined with combating the drawbacks of fully virtual learning, particularly in environments lacking resources.

Track and Assess Usage: LMS usage statistics must be continuously reviewed to bridge gaps and enhance implementation. Students and teachers' feedback loops will assist in refining approaches.

Future Research Directions

Longitudinal research on e-learning adoption behavioral changes after the pandemic would be an interesting area to research in the future. Comparative studies involving different Indian states or private universities would also help to generalize the findings. An interesting research avenue is analyzing how new learning platforms based on AI and online assessment tools affect teacher effectiveness and student performance. In addition, mixed-method studies such as this one can be enhanced by larger qualitative samples and the incorporation of learning analytics to triangulate behavioral intention with platform activity logs.

Conclusion

This research offers important information about the shifting scene of e-learning within Karnataka's higher education landscape. Through an analysis of students' and instructors' preferences, understandings, and usage patterns across city and rural campuses, it verifies the increasing predominance of a "mobile-first, LMS-centric" model. The ubiquity of smartphones and educational platforms like Google Classroom and Moodle indicates a shift in the digital education paradigm where flexibility, convenience, and user comfort guide take-up over institutional requirements or peer pressure.

Based on the Unified Theory of Acceptance and Use of Technology (UTAUT) model (Venkatesh et al., 2003), the research solidifies that effort expectancy and performance expectancy are the strongest predictors of behavioral intention. Both students and instructors

will adopt e-learning tools more if they perceive that these tools will enhance academic or teaching performance, and when the platforms are straightforward to use. Conversely, social influence, though existing, had a relatively small impact in shaping adoption decisions—particularly in non-mandated contexts. These results are consistent with earlier research in developing settings (Tarhini et al., 2014; Abbad, 2021), indicating that perceived usefulness and ease of use continue to be omnipresent drivers of digital technology adoption in education.

Notably, the research finds a self-motivated user group, with the majority of the participants—regardless of background—having strong intentions to stick to digital tools post-pandemic. This indicates that the shift to online learning, which was initially out of necessity, has spurred a consistent change of behavior. Yet, gaps in infrastructure and access still linger. Rural students and teachers tend to experience constrained ownership of devices, sporadic internet access, and inadequate institutional support, which inhibits their capacity to actively engage in digital learning spaces. These differences highlight the reality that the adoption of e-learning is not necessarily an individual readiness issue, but rather an institution- and infrastructure-readiness issue (Miah, M. 2024, March 25).

From a policy and planning viewpoint, the results highlight that the success of digital transformation in education lies beyond the provision of hardware alone. It also involves capacity development initiatives, ongoing training for the faculty, and the creation of content that is mobile-optimized and low-bandwidth friendly. Additionally, institutions have to create a culture that is supportive of going digital, allowing room to experiment with new tools and integrating user feedback into platform development and pedagogy design.

This study also adds to the scholarly body of knowledge on technology acceptance models in multilingual and regional learning environments. It shows that UTAUT continues to be a useful and versatile tool for examining digital learning behavior, but also points to the necessity for more context-sensitive, sensitive models that account for infrastructural disparities and socio-cultural forces—especially in large, multicultural nations such as India.

Looking forward, the journey of Karnataka's institutions through the pandemic can be a microcosm for digital transformation in education in India. It reflects both the resilience of students and teachers and the ongoing structural challenges that need to be overcome. As the nation and state transition towards a hybrid or blended future for higher education, the report indicates investments in inclusive, pedagogically rational, and mobile-friendly digital solutions will prove key. No less vital is developing feedback loops—via research conducted continuously and consultation with stakeholders—to ensure that digital learning keeps pace with the altered requirements of users.

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