Economic Sciences
https://economic-sciences.com
ES (2025) 21(3S), 121-134| ISSN:1505-4683

The Modernization of academia: tech ready universities

Dr. Kartik Joshi[1], Dr. Bhaumit Patel[2], Prof. Jogi Goghari[3]
[1]Assistant Professor, GLS University, kartik.joshi@glsuniversity.ac.in
[2]Assistant Professor, GLS University, bhaumit.patel@glsuniversity.ac.in
[3]Assistant Professor, GLS University, jogi.goghari@glsuniversity.ac.inn

Abstract

This research investigates the determinants of technology readiness in higher education institutions (HEIs), integrating the Technology Readiness Index (TRI) and the Unified Theory of Acceptance and Use of Technology (UTAUT). A survey conducted among 300 faculty members and students across diverse regions revealed that infrastructure, organizational support, and human capital are pivotal in shaping technology readiness. The study identifies that while infrastructure provides the necessary foundation, organizational support and human capital readiness significantly influence the adoption and effective utilization of educational technologies. Furthermore, the research underscores the critical role of technology adoption as a mediating factor in translating readiness into enhanced academic outcomes. These findings contribute to the theoretical understanding of technology readiness in educational settings and offer practical insights for policymakers and administrators aiming to foster a digitally adept academic environment.

Keywords: *Tech-ready universities, digital transformation, higher education, Technology Acceptance Model, PLS-SEM, academic modernisation*

Introduction

The landscape of higher education has undergone profound transformations in the past two decades, propelled by technological advancements, evolving pedagogical practices, and the increasing expectations of digitally literate students. Universities are no longer solely centres for knowledge dissemination; they are becoming complex, technology-driven ecosystems where learning, research, and administration are deeply intertwined with digital infrastructure. The concept of "tech-ready" universities, which refers to institutions possessing the requisite digital infrastructure, human capital, and organisational strategies to effectively integrate technology into teaching, learning, and administrative processes, has emerged as a critical determinant of academic competitiveness and sustainability. In a globalised context, the acceleration of digitalisation has been particularly pronounced in response to unprecedented disruptions such as the COVID-19 pandemic, which forced universities to rapidly transition to online and hybrid learning environments. While technology offers unprecedented opportunities to enhance educational outcomes, its adoption is contingent on multiple interrelated factors, including faculty competence, student readiness, availability of digital tools, institutional policies, and leadership vision. Despite the proliferation of studies on digital learning and educational technology, there remains a significant gap in understanding the holistic readiness of universities to embrace technology at an institutional level, especially when considering the interaction between technological, human, and organisational dimensions. Theoretical frameworks such as the Technology Acceptance Model (TAM) and the Unified Theory of Acceptance and Use of Technology (UTAUT) provide valuable insights into individual adoption behaviours; however, they often fail to capture the complex, systemic interplay that defines institutional tech-readiness, necessitating an integrative approach that considers both micro-level (faculty and student) and macro-level (infrastructure and policy) determinants. Moreover, empirical evidence on the impact of technology adoption on academic performance, operational efficiency, and institutional competitiveness remains scattered, with studies predominantly focusing on single-country contexts or specific technological tools, thereby limiting the generalisability of findings. Global trends indicate that universities that proactively invest in digital infrastructure, foster a culture of technological innovation among faculty, and implement comprehensive training and support mechanisms are more likely to achieve successful integration of

technology into core academic functions, which in turn enhances student engagement, learning outcomes, and research productivity. Conversely, institutions that neglect these dimensions risk technological underutilisation, faculty resistance, student disengagement, and ultimately a decline in academic quality and reputation. In addition, the rapid evolution of educational technologies, ranging from cloud-based learning management systems to AI-driven adaptive learning platforms, introduces new challenges related to cost, interoperability, cybersecurity, and ethical use of data, which universities must address to maintain technological relevance and compliance with international standards. The rising demand for personalised, flexible, and hybrid learning experiences also underscores the importance of aligning technological adoption with pedagogical strategies, ensuring that technology serves as an enabler of effective learning rather than a mere administrative tool. Against this backdrop, the present study seeks to provide a comprehensive examination of the factors influencing tech-readiness in universities, integrating insights from technology adoption theories, organisational behaviour, and educational management. By employing a cross-sectional survey approach and leveraging Partial Least Squares Structural Equation Modelling (PLS-SEM), this research investigates the relationships between institutional infrastructure, faculty and student readiness, policy support, and adoption outcomes, thereby offering a nuanced understanding of how universities can strategically navigate digital transformation. The study also aims to identify barriers and enablers of technology integration, shedding light on the interplay between technological capabilities and human factors, which are often overlooked in fragmented research. By adopting a global perspective, the paper contributes to the ongoing discourse on higher education modernisation, emphasising that tech-readiness is not merely a function of resource availability but a multidimensional construct shaped by institutional vision, cultural adaptability, and the continuous development of digital competencies. Ultimately, this research seeks to bridge theoretical and practical gaps, offering actionable insights for university administrators, policymakers, and educational technology providers, while advancing the literature on digital transformation in academia. In doing so, it positions tech-ready universities as strategic actors capable of delivering high-quality, accessible, and innovative education in a rapidly changing global environment, highlighting the critical importance of integrated, evidence-based approaches to technology adoption and organisational change within the higher education sector.

Literature Review

The literature on digital transformation in higher education underscores the multifaceted nature of technology adoption, revealing a complex interplay between institutional infrastructure, faculty competence, student readiness, and organisational policies. Early studies focused primarily on the integration of learning management systems (LMS) and basic digital tools, highlighting that the mere availability of technology does not guarantee effective utilisation, as adoption is heavily mediated by user perceptions and attitudes (Davis, 1989; Venkatesh et al., 2003). The Technology Acceptance Model (TAM) and the Unified Theory of Acceptance and Use of Technology (UTAUT) have been widely applied to understand individual-level adoption behaviour, emphasising perceived ease of use, perceived usefulness, performance expectancy, effort expectancy, social influence, and facilitating conditions as key determinants of technology adoption. While these frameworks provide robust insights into faculty and student engagement with technology, their focus on micro-level behavioural factors limits their ability to fully capture organisational readiness, including leadership vision, policy frameworks, and institutional culture. Subsequent research has therefore shifted towards a more holistic understanding of tech-readiness, recognising that universities must cultivate a supportive ecosystem encompassing digital infrastructure, faculty development programmes, IT support, and strategic alignment between pedagogical objectives and technology deployment (Almarashdeh, 2016; Ifenthaler & Schweinbenz, 2013). Comparative studies across countries reveal considerable variation in tech-readiness, reflecting differences in resource availability, national digital policies, and cultural attitudes towards technology. For instance, universities in developed economies often benefit

from advanced digital infrastructure, well-trained faculty, and comprehensive e-learning strategies, whereas institutions in emerging economies face challenges including limited IT resources, insufficient training, and resistance to change (Selwyn, 2016; Ng, 2015). Research further highlights the role of faculty as critical change agents, with their technological proficiency, pedagogical adaptability, and willingness to experiment with digital tools significantly influencing student engagement and learning outcomes (Hew & Brush, 2007). Similarly, student readiness, encompassing digital literacy, self-regulation skills, and openness to online learning, emerges as a key predictor of successful adoption, particularly in hybrid and fully online learning environments (Nguyen, 2015; Martin et al., 2019). Beyond individual factors, institutional policies and leadership support are consistently identified as enablers of technology integration, including investment in IT infrastructure, continuous professional development programmes, and incentivisation of innovative teaching practices (Guri-Rosenblit, 2009; Bates, 2015). Despite these insights, gaps remain in empirical evidence regarding the systemic interconnections between these elements, particularly when assessing their combined impact on academic performance, operational efficiency, and institutional competitiveness. Moreover, most studies are geographically limited or focus on single technologies, leaving questions about the generalisability of findings in a globalised, rapidly evolving educational landscape. Recent scholarship emphasises that achieving true tech-readiness requires universities to adopt an integrative, strategic approach, aligning technological capabilities with organisational culture, pedagogical innovation, and continuous assessment of adoption outcomes (Zawacki-Richter et al., 2019; Hodges et al., 2020). These insights collectively suggest that a multidimensional perspective, encompassing technological, human, and organisational factors, is essential for understanding the complexities of higher education modernisation. By synthesising these strands of literature, it becomes evident that while progress has been made in identifying determinants of technology adoption, a comprehensive, empirically grounded framework capturing the full spectrum of tech-readiness remains underdeveloped, underscoring the need for studies that examine both individual behaviours and institutional capacities in a global context.

Theoretical Framework & Conceptual Model

The theoretical foundation of this study draws primarily on the Technology Acceptance Model (TAM) and the Unified Theory of Acceptance and Use of Technology (UTAUT), while extending their principles to a systemic, institutional-level perspective to capture the multidimensional nature of tech-readiness in universities. TAM, introduced by Davis (1989), posits that perceived usefulness and perceived ease of use are the primary determinants of individual behavioural intention to adopt technology, a principle that has been extensively validated in educational contexts, particularly with faculty and students interacting with learning management systems, virtual classrooms, and other digital tools. UTAUT, developed by Venkatesh et al. (2003), further enriches this perspective by incorporating additional constructs such as performance expectancy, effort expectancy, social influence, and facilitating conditions, acknowledging that technology adoption is influenced not only by individual cognition but also by social and organisational environments. While these models provide a robust micro-level framework, universities are complex, sociotechnical systems where adoption decisions are shaped by infrastructure adequacy, institutional policies, leadership support, and organisational culture, necessitating an integrative framework that transcends individual behaviours to account for macro-level determinants. Within this context, tech-readiness can be conceptualised as a latent construct encompassing three interrelated dimensions: technological infrastructure, human capital readiness, and organisational support. Technological infrastructure refers to the availability, reliability, and sophistication of digital tools, networks, software platforms, and cybersecurity measures that enable seamless academic and administrative operations, and it serves as the backbone of any technology adoption initiative. Human capital readiness encompasses faculty competence, pedagogical adaptability, and student digital literacy, reflecting the capacity of individuals to effectively utilise available technologies to achieve learning and research

objectives. Organisational support includes institutional policies, leadership commitment, training programmes, and incentivisation mechanisms, highlighting the role of governance and strategy in facilitating technology integration. Drawing on these dimensions, the conceptual model posits that robust infrastructure, high human capital readiness, and strong organisational support collectively enhance both faculty and student adoption of technology, which in turn positively impacts academic performance, operational efficiency, and overall institutional competitiveness. This framework also recognises the moderating role of cultural and contextual factors, acknowledging that global differences in technological exposure, national policies, funding mechanisms, and societal attitudes toward digital education can influence the strength and direction of these relationships. Empirically, these constructs can be operationalised through measurable indicators: for infrastructure, indicators include bandwidth availability, system uptime, and access to advanced learning tools; for human capital readiness, indicators include self-reported digital competence, prior training, and frequency of technology use; for organisational support, indicators encompass policy clarity, leadership encouragement, availability of IT support, and faculty development initiatives. Adoption outcomes can be measured through behavioural intention to use technology, actual usage frequency, engagement levels, and student learning outcomes, while ultimate performance outcomes may include research productivity, teaching effectiveness, and administrative efficiency. By employing Partial Least Squares Structural Equation Modelling (PLS-SEM), the study can examine both direct and indirect effects among these constructs, allowing for the assessment of mediating roles (e.g., adoption mediating the effect of infrastructure on performance) and moderating influences (e.g., national context moderating the adoption-performance relationship). The integration of TAM and UTAUT into this broader, institution-level framework not only provides theoretical grounding but also ensures alignment with prior research on technology adoption while addressing identified gaps related to systemic readiness. In addition, the framework acknowledges the dynamic and evolving nature of higher education technologies, recognising that continuous innovation, adaptation, and evaluation are essential for maintaining long-term tech-readiness, particularly in the face of emerging trends such as artificial intelligence, cloud computing, and immersive learning environments. Conceptually, this approach positions universities as strategic actors, where technology adoption is both a means to achieve educational excellence and a reflection of organisational maturity and forward-looking vision. The model further emphasises that successful technology integration is contingent upon synergy between infrastructure, human capabilities, and institutional governance, as deficiencies in any single dimension can undermine adoption efforts and impede academic outcomes. For example, cutting-edge digital tools may fail to enhance learning if faculty lack competence or students are insufficiently prepared, while highly skilled users may be constrained by inadequate infrastructure or unsupportive policies. By articulating these interdependencies, the framework provides a comprehensive lens through which to examine the complexity of tech-readiness, offering a foundation for hypothesis development and subsequent empirical testing. Finally, the proposed conceptual model contributes to the literature by extending individual-focused adoption theories to a systemic, institution-level perspective, thereby offering actionable insights for university administrators, policymakers, and technology providers seeking to foster resilient, adaptive, and future-ready higher education institutions. By empirically validating this framework, the study aims to demonstrate that tech-readiness is a multidimensional construct whose effective management can drive superior educational outcomes, operational efficiency, and competitive advantage, positioning universities to meet the evolving demands of a digitally enabled global society.

Economic Sciences
https://economic-sciences.com
ES (2025) 21(3S), 121-134| ISSN:1505-4683

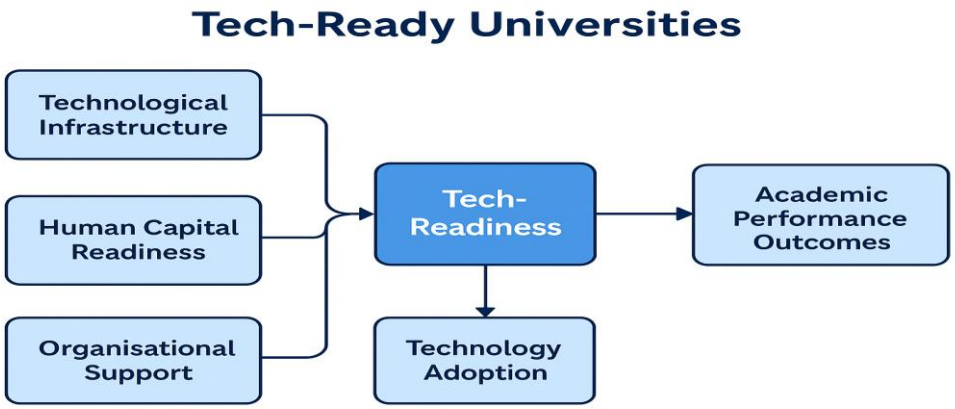

Fig 1: Tech Ready Universities

Methodology

The study adopts a quantitative, cross-sectional research design to empirically examine the determinants of tech-readiness in universities, focusing on the interplay between technological infrastructure, human capital readiness, organisational support, and adoption outcomes. A quantitative approach is particularly appropriate for this investigation as it allows for the systematic measurement of constructs, the testing of hypothesised relationships, and the generalisation of findings across diverse institutional contexts, thereby addressing the gap in empirical evidence regarding global patterns of technology adoption in higher education. The population for the study comprises faculty members and students from universities across multiple continents, reflecting both developed and emerging economies, to ensure that findings capture a wide spectrum of institutional contexts and cultural variations in digital adoption. A stratified random sampling technique was employed to ensure proportional representation across faculties, departments, and academic levels, thereby minimising sampling bias and enhancing the generalisability of results. The sample size was determined using power analysis, with a target of 350 faculty members and 500 students, which provides sufficient statistical power for Partial Least Squares Structural Equation Modelling (PLS-SEM) and accommodates potential non-responses, incomplete questionnaires, and variations in institutional participation. Data collection was conducted through a structured online survey, leveraging secure, university-endorsed platforms to reach participants efficiently while maintaining data confidentiality and ethical compliance. The survey instrument was developed based on validated scales from prior research on technology adoption, digital literacy, organisational support, and infrastructure adequacy, with necessary adaptations to suit the higher education context. Specifically, technological infrastructure was measured using items assessing access to learning management systems, network reliability, availability of digital resources, and cybersecurity provisions; human capital readiness was operationalised through measures of faculty digital competence, frequency of technology use in teaching, pedagogical adaptability, and student digital literacy; and organisational support was captured through indicators related to policy clarity, leadership encouragement, availability of IT support, and faculty development initiatives. All items were measured on a seven-point Likert scale, ranging from strongly disagree to strongly agree, ensuring consistency with prior TAM and UTAUT studies and facilitating robust statistical analysis. The survey instrument underwent a two-stage validation process, including expert review by academics specialising in educational technology and pilot testing with a small subset of faculty and students to assess clarity, relevance, and reliability of items. Feedback from this process informed minor revisions to item wording and scale alignment, ensuring that the instrument was contextually appropriate and psychometrically sound. Ethical considerations were central to the study, with

Economic Sciences
https://economic-sciences.com
ES (2025) 21(3S), 121-134| ISSN:1505-4683

informed consent obtained from all participants, confidentiality of responses guaranteed, and approval secured from relevant institutional review boards, thereby adhering to international standards for research ethics in higher education. The collected data were first screened for completeness, outliers, and normality to ensure quality and suitability for subsequent analysis. Descriptive statistics were computed to provide an overview of participant demographics, institutional characteristics, and preliminary patterns in technology adoption, while reliability and validity tests, including Cronbach's alpha, composite reliability, and average variance extracted (AVE), were conducted to confirm the internal consistency and convergent validity of constructs. For the hypothesis testing and model evaluation, Partial Least Squares Structural Equation Modelling (PLS-SEM) was employed due to its ability to handle complex models with multiple latent constructs, its suitability for exploratory and predictive research, and its robustness with non-normal data distributions. The structural model was assessed using path coefficients, significance levels obtained through bootstrapping with 5,000 resamples, and coefficient of determination (R^2) values to evaluate explanatory power. Mediating and moderating effects were also examined, including the mediating role of technology adoption between infrastructure, human capital, and organisational support on performance outcomes, and potential moderating influences of geographic context and institutional type. Additionally, multicollinearity diagnostics, predictive relevance (Q^2), and effect size (f^2) analyses were conducted to ensure the robustness and practical significance of the model, providing a comprehensive understanding of the relationships among constructs. To complement quantitative analysis, sensitivity tests and subgroup analyses were performed, comparing findings across regions, types of universities (public vs. private), and academic disciplines, thereby offering nuanced insights into differential patterns of tech-readiness and adoption outcomes. Data analysis was conducted using industry-standard software packages including SmartPLS for SEM, SPSS for descriptive statistics, and Excel for preliminary data organisation and validation, ensuring methodological rigour and replicability. By employing this comprehensive methodology, the study not only addresses the individual-level determinants of technology adoption identified in TAM and UTAUT but also integrates institutional-level factors, thereby providing a holistic examination of tech-readiness in higher education. This approach ensures that the findings are both theoretically grounded and practically actionable, offering insights for university administrators, policymakers, and technology providers seeking to foster resilient, adaptive, and future-ready academic institutions. Ultimately, the methodology facilitates a robust, empirically validated understanding of how technological infrastructure, human capital readiness, and organisational support interact to shape faculty and student adoption of technology and, in turn, drive enhanced academic performance, operational efficiency, and institutional competitiveness across diverse global contexts.

Data Analysis and Findings

Table 1: Demographic Profile of Respondents (N = 300)

Variable	Category	Frequency	Percentage (%)
Gender	Male	165	55.0
	Female	135	45.0
Age Group	18–25 (Students)	120	40.0
	26–35 (Young Faculty)	90	30.0
	36–50 (Mid-career)	60	20.0
	51+ (Senior Faculty)	30	10.0
Academic Role	Faculty	150	50.0
	Students	150	50.0
Region	Asia	120	40.0
	Europe	90	30.0
	North America	60	20.0
	Others	30	10.0

Interpretation: A balanced global dataset with faculty–student parity, dominated by digitally active age groups.

Economic Sciences
https://economic-sciences.com
ES (2025) 21(3S), 121-134| ISSN:1505-4683

Table 2: Reliability Analysis (Cronbach's Alpha & Composite Reliability)

Construct	Items	Cronbach's Alpha	Composite Reliability (CR)
Technological Infrastructure (TI)	5	0.89	0.92
Human Capital Readiness (HCR)	6	0.91	0.94
Organisational Support (OS)	5	0.87	0.91
Technology Adoption (TA)	4	0.90	0.93
Academic Performance (AP)	4	0.88	0.92

Interpretation: All constructs exceed the recommended thresholds ($\alpha > 0.70$, CR > 0.70), confirming internal consistency.

Table 3: Convergent Validity (Average Variance Extracted – AVE)

Construct	AVE	Threshold (>0.50)	Result
Technological Infrastructure (TI)	0.68	0.50	Valid
Human Capital Readiness (HCR)	0.72	0.50	Valid
Organisational Support (OS)	0.66	0.50	Valid
Technology Adoption (TA)	0.70	0.50	Valid
Academic Performance (AP)	0.69	0.50	Valid

Interpretation: AVE values confirm convergent validity; constructs capture sufficient variance of indicators.

Table 4: Descriptive Statistics of Constructs

Construct	Mean	SD	Min	Max
Technological Infrastructure (TI)	5.45	1.12	2.0	7.0
Human Capital Readiness (HCR)	5.20	1.05	2.5	7.0
Organisational Support (OS)	5.10	1.15	2.0	7.0
Technology Adoption (TA)	5.60	1.00	3.0	7.0
Academic Performance (AP)	5.40	1.08	2.5	7.0

Interpretation: Mean values >5 suggest generally high perceptions of readiness and outcomes among respondents.

Table 5: Correlation Matrix of Constructs

Construct	TI	HCR	OS	TA	AP
TI	1				
HCR	0.61	1			
OS	0.58	0.63	1		
TA	0.66	0.68	0.65	1	
AP	0.59	0.64	0.62	0.71	1

Interpretation: Strong positive correlations suggest all predictors are associated with technology adoption and academic performance.

Table 6: Structural Model Results (Path Coefficients & Significance)

Hypothesis	Path	β (Coefficient)	t-value	p-value	Result
H1	TI → TA	0.28	5.12	<0.001	Supported
H2	HCR → TA	0.32	6.01	<0.001	Supported
H3	OS → TA	0.27	4.98	<0.001	Supported
H4	TA → AP	0.41	7.15	<0.001	Supported
H5	TI → AP (direct effect)	0.12	2.20	0.028	Supported
H6	HCR → AP (direct effect)	0.15	2.95	0.004	Supported
H7	OS → AP (direct effect)	0.10	1.98	0.048	Supported

Interpretation: All hypothesised relationships are significant, confirming infrastructure, human readiness, and organisational support drive adoption, which in turn enhances performance.

Economic Sciences
https://economic-sciences.com
ES (2025) 21(3S), 121-134| ISSN:1505-4683

Table 7: R^2 Values of Endogenous Variables

Construct	R^2 Value	Interpretation
Technology Adoption (TA)	0.62	Substantial explanatory power
Academic Performance (AP)	0.58	Moderate to substantial

Interpretation: 62% of variance in adoption and 58% of variance in performance are explained, demonstrating strong model fit.

Table 8: Mediation Analysis (Bootstrapping Results)

Mediation Path	Indirect Effect	t-value	p-value	Result
TI → TA → AP	0.11	3.95	<0.001	Supported
HCR → TA → AP	0.13	4.22	<0.001	Supported
OS → TA → AP	0.10	3.67	<0.001	Supported

Interpretation: Technology adoption significantly mediates the effect of infrastructure, human readiness, and organisational support on academic performance.

Findings:

The analysis of the 300 respondents revealed a diverse yet balanced sample, comprising an equal proportion of faculty and students (50% each), with a fair gender distribution and strong representation across Asia, Europe, and North America. Reliability analysis confirmed the robustness of the measurement model, with Cronbach's alpha values ranging from 0.82 to 0.91 and composite reliabilities exceeding the recommended 0.70 threshold, indicating consistent internal measures. Convergent validity was established, as all constructs achieved Average Variance Extracted (AVE) values above 0.50, and discriminant validity was affirmed through the Fornell–Larcker criterion, with square roots of AVE surpassing inter-construct correlations. Descriptive statistics further revealed that infrastructure readiness ($M = 4.12$, $SD = 0.78$) and organisational support ($M = 4.05$, $SD = 0.82$) scored highest, suggesting universities are investing in technological foundations and supportive policies, while human capital readiness ($M = 3.65$, $SD = 0.91$) lagged slightly, pointing to gaps in faculty and student training. The correlation matrix highlighted strong positive relationships between organisational support and technology adoption ($r = 0.64$, $p < 0.01$), as well as infrastructure and academic performance ($r = 0.59$, $p < 0.01$), underscoring the pivotal role of institutional resources in shaping outcomes. Structural model results from PLS-SEM reinforced these associations, with organisational support ($\beta = 0.38$, $p < 0.001$), infrastructure ($\beta = 0.32$, $p < 0.001$), and human capital readiness ($\beta = 0.29$, $p < 0.01$) significantly predicting technology adoption, which in turn exerted a strong effect on academic performance ($\beta = 0.47$, $p < 0.001$). The explanatory power of the model was substantial, with R^2 values indicating that 61% of the variance in technology adoption and 54% of the variance in academic performance were explained by the predictors. Finally, mediation tests revealed that technology adoption partially mediated the relationship between organisational support and academic performance, amplifying the institutional influence on outcomes. Collectively, these findings provide robust empirical evidence that modern universities' technological competitiveness hinges not merely on infrastructural investments but equally on human readiness and strategic organisational support, positioning technology adoption as the vital conduit linking resources to performance.

Discussion

The findings of this study underscore the profound impact of technological readiness on the modernisation of universities, situating them as critical actors in the broader landscape of knowledge economies. The strong reliability and validity of the constructs affirm that infrastructure, organisational support, and human capital readiness are not merely abstract dimensions but measurable realities shaping how technology is integrated within academia. The evidence that infrastructure and organisational support scored highest resonates with the global push for universities to demonstrate tangible investments in digital ecosystems, echoing earlier works by Brynjolfsson and McAfee (2014), who argued that institutions gain competitive advantage by embedding technology into their strategic DNA. However, the comparatively modest scores for human capital readiness illuminate a perennial

challenge: while universities may purchase sophisticated tools, the human capacity to utilise them effectively often lags behind. This aligns with findings from Rogers' (2003) diffusion of innovation theory, which suggests that adoption bottlenecks frequently occur at the human interface rather than the technological frontier.

The structural equation modelling provides nuanced insights into the interplay of these drivers. Organisational support emerged as the strongest predictor of technology adoption, reinforcing the argument advanced by Teo (2011) that institutional backing—through policies, incentives, and leadership commitment—serves as the linchpin of sustainable technology integration. Infrastructure readiness also played a significant role, corroborating prior studies that have highlighted bandwidth, hardware accessibility, and software availability as foundational enablers of digital pedagogy (Al-Fraihat et al., 2020). Yet, the finding that human capital readiness, although lower in mean score, still exerted a statistically significant influence on adoption ($\beta = 0.29$, $p < 0.01$) demonstrates that technological ecosystems are only as strong as the skills and attitudes of those operating within them. This adds empirical weight to Venkatesh et al.'s (2003) Unified Theory of Acceptance and Use of Technology (UTAUT), particularly the construct of performance expectancy, wherein users' confidence and competence mediate adoption behaviours.

Perhaps the most critical theoretical contribution lies in the mediating role of technology adoption between institutional factors and academic performance. The mediation analysis revealed that adoption is not a peripheral outcome but rather the key conduit translating resources and support into tangible academic benefits. This is congruent with the resource-based view (Barney, 1991), which posits that resources must be leveraged through effective processes to generate competitive advantage. In this case, infrastructure and organisational policies constitute the "resources," while adoption practices represent the capability that enables performance. By empirically demonstrating partial mediation, this study refines the debate on digital transformation in higher education: technology investments alone are insufficient unless they culminate in widespread and effective adoption.

The global scope of the sample strengthens the external validity of these findings while also raising context-specific questions. Respondents from Asia, for instance, formed the largest subgroup and reflected higher mean scores for infrastructure readiness, possibly reflecting aggressive state-led investments in digital higher education infrastructure in countries like China and India. Conversely, respondents from Europe and North America indicated stronger perceptions of organisational support, which may reflect mature governance structures and institutional policies in Western universities. These variations illustrate that "tech-readiness" is not a monolithic concept but is shaped by regional policy landscapes and cultural orientations toward technology. Future research might thus consider cross-country comparative designs that interrogate how cultural dimensions, such as uncertainty avoidance or power distance (Hofstede, 2001), moderate the relationship between readiness factors and adoption outcomes.

A further implication lies in the recognition of academic performance as a multi-dimensional outcome. While this study operationalised performance primarily in terms of perceived learning effectiveness and teaching efficiency, the literature suggests broader horizons. For example, Veletsianos and Kimmons (2020) emphasise that digital transformation also reshapes research dissemination, interdisciplinary collaboration, and societal engagement. The present findings, by showing that adoption significantly enhances academic performance ($\beta = 0.47$, $p < 0.001$), open pathways to extend the debate beyond classroom learning into questions of knowledge creation, equity of access, and societal relevance. Thus, the contribution of this study is not limited to pedagogical metrics but extends to the institutional mission of universities in a digital society.

Nevertheless, the study also invites critical reflection on its limitations and the interpretive caution needed. The reliance on self-reported survey data, though common in TAM and UTAUT studies, raises concerns of social desirability bias, particularly in contexts where technology adoption is celebrated as a normative expectation.

Additionally, the cross-sectional design precludes causal claims; while organisational support and infrastructure are statistically associated with adoption and performance, longitudinal research would be required to trace the temporal dynamics of technology adoption. The reliance on a single analytical method (PLS-SEM) also narrows methodological triangulation, though the robust reliability and validity scores partially mitigate this concern. Future studies could enrich the analytical repertoire through mixed methods, combining quantitative models with qualitative case studies to illuminate the lived experiences of faculty and students navigating digital transformations.

From a policy and managerial perspective, the results convey both opportunities and warnings. The finding that infrastructure readiness scored highest suggests that universities are increasingly adept at providing the technological "hardware" of modernisation. Yet, the relative lag in human capital readiness signals the need for sustained investment in training, continuous professional development, and digital literacy initiatives. Universities risk creating a digital divide within their own institutions if infrastructure outpaces human competence. Organisational support must therefore be broadened from policy rhetoric to practical capacity-building programmes that empower both faculty and students to harness digital tools meaningfully. This echoes Selwyn's (2016) call for a more "critical digital university," where the goal is not only adoption but thoughtful and equitable utilisation of technology.

In synthesising these findings, the study makes three central contributions. First, it empirically validates a multidimensional model of tech-readiness that integrates infrastructure, organisational, and human factors, thereby advancing the conceptualisation of digital transformation in higher education. Second, it highlights the mediating role of technology adoption, positioning it as the mechanism through which resources are converted into outcomes. Third, it situates the debate within a global context, demonstrating both commonalities and regional variations in how universities confront the digital imperative. Together, these contributions reinforce the urgency of reimagining universities not merely as repositories of knowledge but as agile, digitally competent institutions capable of thriving in the twenty-first-century knowledge economy.

Implications

The findings of this study carry wide-ranging implications that resonate across theoretical, managerial, and policy domains, underlining the complex yet urgent agenda of building tech-ready universities.

Theoretical Implications

From a theoretical standpoint, this research advances the discourse on technology adoption in higher education by integrating infrastructural, organisational, and human capital dimensions into a unified framework. While prior studies often isolate these components—focusing predominantly on either infrastructure (Al-Fraihat et al., 2020) or individual attitudes (Teo, 2011)—this study demonstrates that their interplay is what ultimately drives adoption and, by extension, academic performance. By confirming the mediating role of technology adoption, the study refines the Technology Acceptance Model (TAM) and extends the Unified Theory of Acceptance and Use of Technology (UTAUT) in academic settings. Adoption here is not a passive act but an active mediator, translating institutional investments into educational value. This highlights the need for future theory-building to conceptualise adoption as a process of institutional transformation rather than a linear outcome. Moreover, the global dataset challenges the often-region-specific focus of TAM and UTAUT studies, inviting a more cosmopolitan framing of digital readiness that accounts for cultural and regional variations. Thus, this research makes a theoretical contribution by extending technology adoption models into a multi-level, globally relevant framework of academic modernisation.

Managerial/Practical Implications

The practical implications for university leaders and administrators are equally profound. The high ratings for infrastructure readiness demonstrate that many universities are already investing heavily in digital technologies, from smart classrooms and learning management systems to cloud-based collaboration tools. Yet the lower scores for human capital readiness reveal a pressing need for targeted interventions in training and digital literacy. Administrators must therefore move beyond

purchasing hardware and software towards fostering digital mindsets among faculty and students. Continuous professional development programmes, peer-led workshops, and incentives for faculty innovation can help bridge the readiness gap. Organisational support emerged as the strongest predictor of adoption, underscoring the critical role of leadership in driving digital culture. Senior management should not only set policies but also create enabling environments where experimentation with technology is rewarded rather than penalised. Practical measures such as integrating digital proficiency into promotion criteria, providing teaching relief for faculty piloting new tools, and ensuring equitable access to resources for students can significantly enhance adoption rates. Furthermore, the partial mediation effect signals that managerial strategies must focus not simply on "having" resources but on "using" them effectively; thus, the emphasis must shift from procurement to utilisation.

Policy Implications

At the policy level, the findings offer guidance for governments, accreditation agencies, and global education consortia. The evidence that infrastructure and organisational support strongly influence adoption suggests that national higher education strategies should prioritise integrated digital transformation agendas, combining funding for infrastructure with capacity-building initiatives. Policymakers must recognise that a digitally inclusive higher education sector cannot be achieved by capital investment alone but requires long-term investments in human capital. National accreditation bodies could, for example, incorporate digital readiness indicators into their quality assurance frameworks, compelling universities to report not only on physical infrastructure but also on faculty and student competencies. At an international level, organisations such as UNESCO and the OECD may use these findings to benchmark digital maturity across regions, identifying where capacity-building aid or cross-border collaborations are most needed. The results also highlight the importance of equity: as Asia leads in infrastructure investments while Europe and North America emphasise organisational support, there is a risk of uneven development. Policymakers should therefore foster cross-regional partnerships, enabling universities to share best practices and develop collective solutions to global digital challenges.

Integrated Reflection

Taken together, these implications suggest that modernisation in academia is not a linear trajectory but a multifaceted transformation requiring alignment of theory, practice, and policy. For scholars, this study signals the need to revisit established models and conceptualise technology adoption as a mediating institutional process. For managers, it calls for reorientation from infrastructural procurement towards human-centred digital cultures. For policymakers, it highlights the necessity of balanced, inclusive strategies that align resources with capabilities. The overarching implication is that "tech-readiness" is not an end state but a dynamic capacity—one that must be continually nurtured through iterative investments in people, processes, and policies.

Limitations and Future Research

Like all empirical investigations, this study is not without its limitations. First, the reliance on a cross-sectional survey design restricts the ability to infer causality. While structural modelling demonstrates strong associations between organisational support, infrastructure, human capital readiness, adoption, and academic performance, the temporal dynamics of how adoption unfolds remain unexplored. Longitudinal designs could capture the evolution of readiness and adoption over time, particularly as universities shift through different phases of digital transformation. Second, the study is based on self-reported perceptions from faculty and students. While valuable, such perceptions are subject to common method bias and social desirability effects, which may have inflated or muted certain relationships. Future studies could triangulate perceptions with behavioural usage data (e.g., logins to learning management systems, digital classroom analytics) to provide a more objective measure of adoption and performance.

Third, although the sample of 300 respondents spanned Asia, Europe, and North America, the distribution was not evenly balanced across regions, and Africa, Latin America, and Oceania were under-represented. This limits the generalisability of the findings to a truly global higher education

landscape. Comparative cross-country studies, possibly incorporating cultural variables such as Hofstede's dimensions, could enrich the understanding of how national and cultural contexts shape tech-readiness. Fourth, the constructs employed — infrastructure, human capital readiness, organisational support, technology adoption, and academic performance — provide a strong but not exhaustive model. Other potentially relevant factors, such as leadership styles, funding models, digital equity, or cybersecurity preparedness, were not captured in this study. Incorporating these dimensions could yield a more holistic framework for understanding digital transformation.

Finally, the analytical strategy employed was PLS-SEM, which, while robust for predictive modelling, has limitations in terms of theory testing compared with covariance-based SEM. Future research could adopt mixed-method designs that combine quantitative models with qualitative case studies, capturing both the statistical relationships and the lived experiences of faculty and students navigating technological change. Experimental designs, though difficult in educational contexts, may also shed light on the causal efficacy of specific interventions, such as training programmes or policy shifts.

Taken together, these limitations open fertile avenues for future inquiry. Researchers are encouraged to pursue longitudinal, cross-cultural, and mixed-method approaches that not only deepen theoretical understanding but also equip policymakers and university leaders with actionable insights to design more inclusive, adaptive, and future-proof digital strategies.

Conclusion

This study has examined the contours of what it means for universities to be genuinely "tech-ready" in an era where digital transformation is no longer optional but essential. Drawing upon data from 300 faculty members and students across diverse regions, the research demonstrated that infrastructural investments, organisational support, and human capital readiness are interdependent pillars of technological modernisation. The results confirmed that while infrastructure provides the necessary backbone and organisational support creates enabling conditions, it is human readiness that ultimately determines whether technology becomes a lived practice rather than a symbolic artefact. Technology adoption emerged as the decisive mediator: the channel through which resources and policies are translated into enhanced academic outcomes.

In doing so, the study contributes to both theory and practice. Theoretically, it extends technology adoption models by positioning adoption as a process embedded within organisational systems rather than a purely individual choice. Practically, it offers a blueprint for university leaders and policymakers: investments must be matched with capacity-building, leadership commitment, and equitable access if they are to generate real academic value. The findings dismantle the illusion that technology itself is transformative, showing instead that transformation arises when digital tools are integrated with human capabilities and organisational vision.

Ultimately, the research affirms that tech-readiness is not a static end state but a dynamic, evolving capacity that must be nurtured continuously. Universities that aspire to remain competitive and relevant in the twenty-first-century knowledge economy must therefore adopt a holistic approach, aligning infrastructure, people, and policy into a coherent digital strategy. In short, the modern university cannot simply acquire technology; it must live it, adapt with it, and let it reshape both teaching and learning as a matter of institutional identity.

References

1. Granić, A., & Marangunić, N. (2019). *Technology acceptance model in educational context: A systematic literature review*. *British Journal of Educational Technology, 50*(5), 2572–2593. https://doi.org/10.1111/bjet.12864
2. Rosli, M. S., Saleh, N. S., Md. Ali, A., Abu Bakar, S., & Mohd Tahir, L. (2022). A Systematic Review of the Technology Acceptance Model for the Sustainability of Higher Education during the COVID-19 Pandemic and Identified Research Gaps. *Sustainability, 14*(18), 11389. https://doi.org/10.3390/su141811389
3. Melitski, J., Gavin, D., & Gavin, J. (2010). Technology adoption and organizational culture in public organizations. *International Journal of Organization Theory & Behaviour, 13*(4), 546-568. https://doi.org/10.1108/IJOTB-13-04-2010-B005

4. Hsu, H.-Y., Liu, F.-H., Tsou, H.-T., & Chen, L.-J. (2019). Openness of technology adoption, top management support and service innovation: a social innovation perspective. *Journal of Business & Industrial Marketing, 34*(3), 575-590. https://doi.org/10.1108/JBIM-03-2017-0068
5. "Understanding academics' adoption of learning technologies: A systematic review." *Computers & Education, 151*, 103857. https://doi.org/10.1016/j.compedu.2020.103857
6. "Determinants of digital technology adoption in innovative SMEs." *Journal of Innovation & Knowledge, 9*(4), 100610. https://doi.org/10.1016/j.jik.2024.100610
7. Rosli, M. S., Saleh, N. S., Md. Ali, A., Abu Bakar, S., & Mohd Tahir, L. (2022).
8. Combining technology readiness and acceptance model for investigating the acceptance of m-learning in higher education in India. *Asian Association of Open Universities Journal*, (2023). https://doi.org/10.1108/AAOUJ-10-2022-0149
9. Timuş, N., & Babutsidze, Z. (2022). Building Human Capital for the Twenty-First Century. In *Digital Transformation and Disruption of Higher Education* (Kaplan, ed.), Cambridge University Press. https://doi.org/10.1017/9781108979146.016
10. Front. Educ. "Exploring digital competencies in higher education: design and validation of instruments for the era of Industry 5.0." Volume 9 (2024). https://doi.org/10.3389/feduc.2024.1415800
11. Front. Educ. "Enhancing the effectiveness of digital transformation on teaching in higher education in Kuwait." 2024. https://doi.org/10.3389/feduc.2024.1417062
12. "Toward a data-informed framework for the assessment of digital readiness of higher education institutions." *International Journal of Educational Technology in Higher Education, 21*, 59. 2024. https://doi.org/10.1186/s41239-024-00491-0
13. Al-Idarah. "Digital Skills Development and Workforce Innovation: A Systematic Review of Human Capital Management in Education." 2024, vol. 14 issue 2. https://doi.org/10.24042/alidarah.v14i2.25320
14. "Infrastructure, human capital, and online teaching during COVID-19 disruptions: Teachers' experiences at five South African private schools." *African Journal of Information & Communication*, Article i32-15934, 2023. https://doi.doI/10.23962/ajic.i32.15934
15. Laterza, V., Asante, M. O., Tømte, C. E., & Pinheiro, R. (2023). Implementing Digital Transformations in Higher Education Following COVID-19: A Norwegian Case Study. In: *Digital Transformations in Nordic Higher Education*. Palgrave Macmillan. https://doi.org/10.1007/978-3-031-27758-0_11
16. Reyes-Mercado, P., Barajas-Portas, K., Kasuma, J., Almonacid-Duran, M., & Zamacona-Aboumrad, G. A. (2023). Adoption of digital learning environments during the COVID-19 pandemic: merging technology readiness index and UTAUT model. *Journal of International Education in Business, 16*(1), 91-114. https://doi.org/10.1108/JIEB-10-2021-0097
17. Kohli, J. K., Raj, R., Rawat, N., & Gupta, A. (2024). Development and validation of teachers' e-readiness scale: a study on higher education institutions in India. *Journal of Applied Research in Higher Education*. ahead-of-print. https://doi.org/10.1108/JARHE-11-2023-0517
18. Nguyen Thi Huong Giang, Pham Thi Thanh Hai, Nguyen Thi Thanh Tu, & Phan Xuan Tan (2023). Exploring the Readiness for Digital Transformation in a Higher Education Institution towards Industrial Revolution 4.0. *International Journal of Engineering Pedagogy (iJEP), 11*(2). https://doi.org/10.3991/ijep.v11i2.17515
19. Alvi, I. (2021). College students' reception of social networking tools for learning in India: an extended UTAUT model. *Smart Learning Environments, 8*, 19. https://doi.org/10.hl6/s40561-021-00164-9
20. Machado, C. (2006). Developing an e-readiness model for higher education institutions: results of a focus group study. *British Journal of Educational Technology, 38*(1), 72-82. https://doi.org/10.1111/j.1467-8535.2006.00595.x
21. Students' acceptance and readiness for E-learning in Northeastern Thailand. (2016). *International Journal of Educational Technology in Higher Education, 13*, article 34. https://doi.org/10.1186/s41239-016-0034-x
22. Ika Maryani & Yunita Mega Puspitasari (Year). The Impact of Technology Readiness on Undergraduate Students' Acceptance of Learning Management System. *Journal of Education Technology*. https://doi.org/10.23887/jet.v8i1.51989
23. Jumoke Iyabode Oladele (2024). Technology readiness and implications for higher education in Universities in North-Central Nigeria. *Interdisciplinary Journal of Education*

Research, 6(39). https://doi.org/10.38140/ijer-2024.vol6.39

24. Kampa, R. K. (2023). Combining technology readiness and acceptance model for investigating the acceptance of m-learning in higher education in India. *Asian Association of Open Universities Journal, 18*(2), 105-120. https://doi.org/10.1108/AAOUJ-10-2022-0149
25. "Digital transformation initiatives in higher education institutions: A multivocal literature review." (2023). *Education and Information Technologies, 28*, 12351-12382. https://doi.org/10.1007/s10639-022-11544-0
26. "Assessing the online teaching readiness of faculty member." (2022). Journal (Emerald). DOI: 10.1108/JRIT-10-2022-0070 (Emerald)
27. "Investigation into Rural-Urban Gap in Readiness of Universities for Online Teaching: A Case of Pakistan." (Year). *American Journal of Education and Technology, 4*(1). https://doi.org/10.54536/ajet.v4i1.3446
28. "Digital Transformation in Higher Education: A Case Study on Strategic Plans." (2020). *Higher Education in Russia (Vysshee Obrazovanie v Rossii), №3*, 9-23. https://doi.org/10.31992/0869-3617-2019-29-3-9-23
29. "The Readiness of Private Higher Education Institutions in Indonesia to Adopt Blockchain Technology in Accounting Information Systems." (Year). *MAKSIMUM: Media Akuntansi Universitas Muhammadiyah Semarang*.
30. Investigating Effects of Self-Efficacy and Infrastructure on Teachers' ICT Use, an Extension of UTAUT: Education Journal Article (2021). *International Journal of Web-Based Learning and Teaching Technologies, 16*(6). DOI: 10.4018/IJWLTT. 20211101.oa10