

# Impact of Digitalization on Learning Experience, Examination Systems, and Placement Outcomes in Higher Education Institutions

Monica Jadhav<sup>1</sup>, Sunita Karad<sup>2</sup>, Sangita Phunde<sup>3</sup>

<sup>1,2,3</sup>MIT College of Management, MIT Arts Design and Technology University, Pune, Maharashtra, India.

## ABSTRACT

These studies study how digitalization influences higher education learning, evaluation, and placement. LMS, AI-enabled examinations, virtual classrooms, and digital placement platforms improve student engagement, flexibility, accessibility, and employability. The quantitative research involved 300 Indian college students. Digitalization improves learning, exam speed, transparency, placement, and job readiness. Research shows higher education affects digitalization and placement. The report supports NEP 2020 and Digital India by proving that efficient, student-centered, and employability-focused higher education institutions require digital transformation.

**Keywords:** Digitalization in Higher Education, Learning Experience, Exam System Effectiveness, Placement Results, LMS, Digital Transformation

## 1. INTRODUCTION

### 1.1 The Digital Transformation Imperative in Higher Education

Digital higher education stresses institutional needs above strategy. Digital technology has changed higher education instruction, evaluation, and application (Kaushik & Kaushik, 2024). Students utilize old content sources to study. To boost efficiency, scalability, and customization, institutional infrastructures are using AI-based exam systems, virtual placement platforms, and data analytics tools (Le Ngoc Quang, 2025).

Coronavirus' "digital Big Bang" advanced technology in months. When 300 million Indian students were dropped suddenly, HEIs skipped numerous digital maturity stages (Singh, Yadav, & Minz, 2025). This forced movement spurred innovation but revealed digital learning ecosystem preparedness, equality, and pedagogical issues. After the pandemic, physical and virtual modalities have been negotiated, creating hybrid models that need rigorous theoretical study (Saragi Turnip, Khanna Pathak, & Velan, 2024).

### 1.2 Problematising the Fragmented Digitalization Discourse

Digital transformation research in higher education is numerous yet fragmented, hindering theoretical growth and practical application. E-learning effectiveness has been studied through the lens of student satisfaction and academic achievement (Kaushik & Kaushik, 2024); online examination systems have been examined through the lens of academic integrity, technical reliability, and assessment validity (Technische Universität Ilmenau, 2025); and a separate stream of inquiry has examined the relationship between digitalization and

While providing significant insights in restricted areas, this segmented approach has created a problematic conceptual gap. Digital transformation's premise that technology fundamentally restructures organizational processes suggests that learning, assessment, and placement outcomes are causally linked nodes in an integrated academic ecosystem. Digitalization reconstructs function linkages, not just adds a technology veneer. Digital platforms impact students' preparation for digital examinations, which affects their displayed capabilities to potential employers (University of Leicester, 2025). However, no complete theoretical framework has been developed to describe these synergistic processes.

The fragmentation is worrisome given institutional innovation results. Comprehensive competence-oriented digital teaching and examination systems may increase learning outcomes and assessment validity, according to the TU Ilmenau examING project (2025). Leicester University's optimised digital test scheduling system shows that digital assessment infrastructure may cut administrative labour and increase student assistance, pushing learning feedback loops beyond operational efficiency (University of Leicester, 2025). Although untested, the

Mahatma Gandhi University QR code-based automated examination system implies digital transformation may increase security and transparency (Varghese Joy, 2025).

### **1.3 Articulating the Research Gap: Theoretical, Contextual, and Methodological Deficits**

This study addresses theoretical, contextual, and methodological research gaps. The Technology Acceptance Model (TAM), Unified Theory of Acceptance and Use of Technology (UTAUT), and Diffusion of Innovation (DOI) theories define higher education individual adoption (Le Ngoc Quang, 2025). The models can predict student and instructor digital technology acceptance or resistance, but not placement success or systematic assessment efficacy. TAM values individual advantages and usefulness above institutional acceptability. Recently, TAM has been combined with self-determination theory and perceived risk frameworks to better explain adoption incentives (Le Ngoc Quang, 2025), however they concentrate on the adoption event rather than the result chain. An integrated strategy that accounts for intermediary processes and contextual factors is required to conceptualize the causal links from institutional digitalization to learning experience and examination effectiveness to placement outcomes.

The empirical data supports Western higher education systems, particularly North America, Western Europe, and Australia (Kaushik & Kaushik, 2024). With over 1,000 universities and 42,000 colleges serving 40 million students, the Indian higher education sector is unique in its scale and heterogeneity, deep urban-rural digital infrastructure divides, linguistic diversity, rapidly evolving policy landscape shaped by the NEP 2020 and Digital India initiatives, and highly competitive. Studies on technology adoption in Indian HEIs, such as digital HRM practices in Faridabad institutions (Singh et al., 2025) and library technology adoption in Kerala's autonomous colleges (Varghese Joy, 2025), focus on particular functional areas. No large-scale study has studied how digitalization impacts learning, assessment, and placement across Indian HEIs.

Digitalization-outcome chains include complicated, multi-stage cause relationships that descriptive approaches, bivariate correlations, and simple regression cannot reflect (University of Malaya, 2025). In technology-enhanced learning ecosystems, where learning experience may mediate the digitalization-placement relationship, examination effectiveness may moderate learning-outcome links, and feedback loops may operate across cycles, analytical methods that estimate latent constructs, test indirect effects, and evaluate model fit are needed. The University of Malaya's Comprehensive Outcomes Assessment Integrated Management System (CO-AIMS) improves outcome-based education analytics, although its application to higher education's integrated digitalization-outcome models is still emerging (University of Malaya, 2025).

### **1.4 Research Objectives**

Against this backdrop, the present study pursues the following objectives:

**RO1:** To examine the impact of institutional digitalization on students' learning experience in higher education institutions.

**RO2:** To analyze the impact of digitalization on the effectiveness of examination systems in higher education institutions.

**RO3:** To investigate the impact of digitalization on student placement outcomes in higher education institutions.

**RO4:** To examine whether learning experience mediates the relationship between digitalization and placement outcomes.

### **1.5 Research Questions**

**RQ1:** How does institutional digitalization influence students' learning experience?

**RQ2:** Does digitalization improve examination system effectiveness in terms of efficiency, security, and validity?

**RQ3:** What is the impact of digitalization on placement outcomes, including placement rates, salary levels, and employer satisfaction?

**RQ4:** Does enhanced learning experience mediate the relationship between digitalization and placement outcomes?

## **1.6 Contribution of the Study**

### **1.6.1 Theoretical Contribution**

Digital Transformation and Tech Acceptance explore higher education. The study includes digitalization, learning experience, test system effectiveness, and placement outcomes, unlike others. Digital employment and education promote Human Capital Theory.

### **1.6.2 Practical Contribution**

The report provides practical guidance for university administrators, academic policymakers, placement cells, and institutional leaders establishing digital higher education ecosystems. Results may help institutions:

- improving Learning Management Systems (LMS),
- strengthening AI-enabled examination systems,
- enhancing virtual placement infrastructures,
- improving student engagement and employability readiness,
- developing effective digital transformation strategies.

### **1.6.3 Policy Contribution**

The study impacts national educational digitalization initiatives like:

- National Education Policy (NEP) 2020,
- Digital India Mission,
- AICTE digital education initiatives.

Results may help policymakers build evidence-based methods for:

- strengthening digital educational infrastructure,
- reducing digital inequality,
- promoting technology-enabled employability,
- enhancing digital governance within higher education institutions

## **2. THEORETICAL FRAMEWORK AND LITERATURE REVIEW**

### **2.1 Theoretical Foundations**

The digital revolution in HEIs has altered learning, assessment, and employability. Discusses TAM, UTAUT, RBV, and HCT modifications.

The Technology Acceptance Model (TAM) states that students pick LMS platforms, virtual classrooms, and AI-enabled educational technologies based on value and usability (Davis, 1989). Technology adoption has dominated TAM research, neglecting academic and vocational consequences.

UTAUT ties digital technology to performance, enabling variables, and social effect (Venkatesh et al., 2003). Higher education student digital learning is affected by faculty motivation, institutional support, and technology (Abbad, 2021).

The Resource-Based View (RBV) views digital infrastructure, AI-enabled systems, and technology skills as strategic institutional resources that improve education and competitiveness (Barney, 1991). Advanced digital ecosystems provide flexible learning, scalable tests, and university jobs.

Human Capital Theory asserts that digitally enhanced education fosters technological adaptation, digital literacy, and self-directed learning for contemporary labour markets (Becker, 1993).

## **2.2 Conceptual Constructs**

*Digitalization*: Independent variable: digital technology integration into teaching-learning, evaluation, administration, and placement. Includes dimensions.

- LMS usage,
- smart classrooms,
- digital library access,
- AI-enabled assessments,
- virtual placement platforms,
- digital communication systems.

Digitization is now an institutional reform, not a technological adoption (Bond et al., 2021).

*Learning Experience*: Academic engagement, fun, accessibility, collaboration, and self-directed learning are possible with digital education. Technology-based education is flexible, personalised, and participatory (Martin et al., 2020).

Other study includes digital fatigue, decreased social engagement, and unequal technological access (Dhawan, 2020).

*Examination System Effectiveness*: Digital evaluations that work are transparent, reliable, simple, secure, and rapid. Online tests, AI-based proctoring, and automated grading increase scalability and administrative efficiency (Nguyen et al., 2022). Meanwhile, cybersecurity, privacy, algorithmic bias, and technological inequality continue (Sood & Varkkey, 2022).

*Placement Outcomes*: Digital institutions boost employment prospects, recruiter relationships, and interview prep. Career portals and virtual recruitment technology boost recruiter access, placement efficiency, and student digital skills and professional readiness (Jackson & Tomlinson, 2021).

## **2.3 Literature Review and Hypothesis Development**

### **2.3.1 Digitalization and Learning Experience**

Virtual classrooms, LMSs, and AI-enabled educational systems boost engagement, flexibility, collaboration, and accessibility (Bond et al., 2021). Research implies digital technology enables self-paced, customisable, and interactive learning (Martin et al., 2020). Online learning might increase stress and hinder socializing (Dhawan, 2020). Despite these limitations, most empirical research demonstrates digitization promotes learning.

H1: Digitalization positively influences students' learning experience in higher education institutions.

### **2.3.2 Digitalization and Examination System Effectiveness**

Online exams, AI-enabled proctoring, and automated evaluations have altered testing. These systems increase transparency, efficiency, accuracy, and administrative ease (Nguyen et al., 2022). Experts say online exams pose privacy, technological, and cybersecurity risks (Sood & Varkkey, 2022). Despite these limits, good digital infrastructure helps firms test.

H2 : Digitalization positively influences the effectiveness of examination systems in higher education institutions.

2.3.3 Digitalization and Placement Outcomes

Digital career services, virtual placement, and online recruitment are transforming graduate employment. Human Capital Theory states that digitally enhanced educational environments improve technological adaption and employer-desired employability abilities (Jackson & Tomlinson, 2021).

Virtual placement solutions improve recruiter accessibility, placement efficiency, and geographical flexibility, according to Tomlinson et al. (2021). Few empirical data link institutional digitalization to placement performance.

H3: Digitalization positively influences placement outcomes in higher education institutions.

2.3.4 Learning Experience and Placement Outcomes

Digitally enhanced learning boosts employability by boosting critical thinking, communication, self-directed learning, and professional flexibility. Quality digital learning environments boost career confidence and placement preparedness (Tomlinson et al., 2021).

H4: Students' learning experience positively influences placement outcomes.

2.3.5 Mediating Role of Learning Experience

Digitalization may indirectly improve placement by enhancing learning. Digital learning ecosystems promote employability and placement by increasing engagement, technical confidence, and adaptive learning.

H5: Learning experience mediates the relationship between digitalization and placement outcomes.

2.4 Proposed Conceptual Framework

The theoretical model incorporates digitalization, learning experience, test system effectiveness, and placement outcomes.

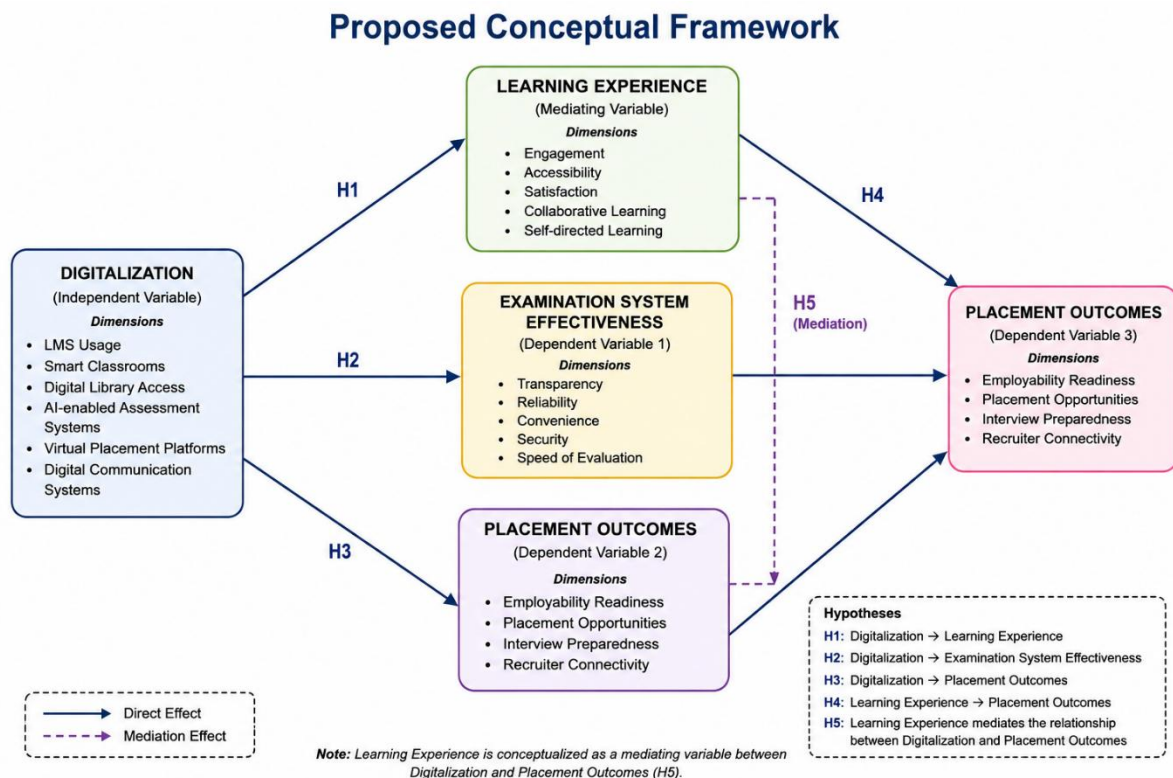


Table 2.1 : Relationship Among Research Objectives, Research Questions, and Hypotheses

Research Objectives (RO)	Research Questions (RQ)	Hypotheses (H)	Relationship Explanation
<b>RO1:</b> To examine the impact of institutional digitalization on students' learning experience in higher education institutions.	<b>RQ1:</b> How does digitalization influence students' learning experience in higher education institutions?	<b>H1:</b> Digitalization positively influences students' learning experience in higher education institutions.	This relationship examines whether digital technologies such as LMS, smart classrooms, AI-enabled learning systems, and digital communication platforms improve student engagement, satisfaction, accessibility, and collaborative learning experience.
<b>RO2:</b> To analyze the impact of digitalization on the effectiveness of examination systems in higher education institutions.	<b>RQ2:</b> Does digitalization improve examination system effectiveness in higher education institutions?	<b>H2:</b> Digitalization positively influences the effectiveness of examination systems in higher education institutions.	This relationship investigates whether institutional digitalization enhances examination transparency, fairness, security, reliability, efficiency, and speed of evaluation through online and AI-enabled assessment systems.
<b>RO3:</b> To investigate the impact of digitalization on student placement outcomes in higher education institutions.	<b>RQ3:</b> What is the impact of digitalization on student placement outcomes?	<b>H3:</b> Digitalization positively influences placement outcomes in higher education institutions.	This relationship evaluates whether digitalization improves employability readiness, placement opportunities, recruiter connectivity, and interview preparedness through virtual placement platforms and digital career ecosystems.
<b>RO4:</b> To examine whether learning experience mediates the relationship between digitalization and placement outcomes.	<b>RQ4:</b> Does enhanced learning experience contribute to improved employability and placement outcomes?	<b>H4:</b> Students' learning experience positively influences placement outcomes.	This relationship explores whether positive digital learning experiences contribute to students' employability skills, professional readiness, and placement success.
<b>RO4:</b> To examine whether learning experience mediates the relationship between digitalization and placement outcomes.	<b>RQ4:</b> Does enhanced learning experience contribute to improved employability and placement outcomes?	<b>H5:</b> Learning experience mediates the relationship between digitalization and placement outcomes.	This mediation relationship explains whether digitalization indirectly improves placement outcomes through enhanced learning experiences such as engagement, flexibility, self-directed learning, and academic satisfaction.

### 3. RESEARCH METHODOLOGY

#### 3.1 Research Philosophy

Systematic observation and statistical analysis may objectively measure, quantify, and scientifically assess social processes, according to positivist research. Positivism is suitable for causal investigations of measurable variables

due to its impartiality, generalizability, and theory testing (Saunders et al., 2019). The positivist paradigm is suitable for hypothesis testing and model validation since this research experiments on digitalization, learning experience, examination system effectiveness, and placement outcomes.

Positive thinking is supported by quantitative methodologies in educational technology, digital transformation, and higher education management research that establish statistical correlations between theoretical ideas (Hair et al., 2022). Positive empirical objectivity and accuracy are improved by standardized measuring scales, systematic surveys, and multivariate statistical approaches.

### **3.2 Research Approach**

Quantitative data examines theoretical assumptions from theories and empirical literature in this deductive investigation. Deductive reasoning improves construct linkage testing and theoretical assumption validation (Bell et al., 2022).

The current study uses:

- Technology Acceptance Model (TAM),
- Unified Theory of Acceptance and Use of Technology (UTAUT),
- Resource-Based View (RBV),
- Human Capital Theory,

To assess system effectiveness, placement, and build ideas on institutional digitalization and learning. The deductive method allows researchers evaluate these theoretical linkages using higher education student data.

Higher education institutions may improve theoretical rigor by integrating theoretical frameworks with digital transformation settings using deductive reasoning.

### **3.3 Research Design**

In quantitative explanatory research, causal relationships between proposed constructs are examined. Quantitative explanatory designs are recommended for theory-testing studies with latent constructs and multivariate relationships because they enable statistical investigation of direct, indirect, and mediating effects (Creswell & Creswell, 2018)

The explanatory method is appropriate since the study seeks to explain how institutional digitalization influences students' learning, testing, and placement.

Cross-sectional surveys obtained data from respondents once. Educational technology and higher education research favour cross-sectional designs for their flexibility, cost-effectiveness, and SEM-based causal modeling (Hair et al., 2022). Causal inference is stronger with longitudinal designs.

Many latent construct relationships are estimated using Structural Equation Modeling. SEM fits the proposed paradigm because:

- multiple dependent variables,
- mediation effects,
- latent multidimensional constructs,
- theory-driven causal relationships.

### **3.4 Study Context and Target Population**

After reviewing the National Education Policy (NEP) 2020 and Digital India mission's digital transformation goals, the study assessed Indian HEIs. Universities and colleges in India are quickly implementing digital learning infrastructure, AI-enabled educational systems, virtual assessments, and online employment platforms, making it an excellent research environment Targeted were pupils in:

- public universities,
- private universities,
- autonomous higher education institutions,
- affiliated colleges,
- Professional institutions providing undergraduate and postgraduate degrees.

Institutional diversity enhances findings representativeness and contextual generalizability. As the first stakeholders touched by institutional digitization in teaching-learning, assessment, and placement, students were the unit of research.

### **3.5 Sampling Design**

**3.5.1 Sampling Technique:** The study utilized stratified purposive sampling. Institutional type determined first higher education strata:

- public institutions,
- private institutions,
- autonomous institutions,
- professional HEIs.

Purposive sample identified pupils with considerable online test, digital academic system, and virtual placement exposure. Strategic selection and stratification increase sample heterogeneity and research relevance.

The present higher education digitalization survey selects respondents based on their direct connection to institutional digital infrastructures (Bond et al., 2021).

**3.5.2 Sample Size Determination:** SPEM requires 300 respondents for statistical power and robustness. Large samples are recommended for parameter stability, model reliability, and statistical validity in SEM research with complex latent variables and mediation analysis by Hair et al. (2022). Also justifying the sample size:

- the “10-times rule” commonly used in PLS-SEM,
- statistical power analysis recommendations,
- the complexity of the proposed structural model.

Recent methodological research proposes 300–500 SEM samples for multidimensional latent variables and mediation links (Kline, 2023). Therefore, the sample size was adequate for reliable and generalizable findings.

### **3.6 Data Collection Methods**

**3.6.1 Primary Data Collection:** Primary data was collected online and offline using a structured questionnaire. The survey employed a 5-point Likert scale.

1) Strongly Disagree to 5) Strongly Agree.

Likert-scale measuring consistently evaluates latent attitudinal aspects, making it suitable for digital transformation and educational technology research (Hair et al., 2022).

To get varied institutional digitalization viewpoints, students from several higher education institutions were surveyed.

**3.6.2 Secondary Data Sources:** Secondary data were collected from:

- peer-reviewed journal articles,
- Scopus-indexed publications,

- UGC reports,
- AICTE policy documents,
- National Education Policy (NEP) reports,
- UNESCO and World Bank educational digitalization reports.

Secondary sources helped establish theoretical frameworks, construct concepts, and contextualize results.

### **3.7 Instrument Development and Measurement Scales**

Validated measuring scales from educational technology, digital transformation, and employability research were used to create the questionnaire. To fit Indian higher education institutions, minor changes were made.

**3.7.1 Digitalization:** Digitalization measures academic and administrative technology integration. Dimensions include:

- LMS usage,
- digital accessibility,
- smart classroom integration,
- AI-enabled assessments,
- virtual placement systems,
- digital communication infrastructure.

Previous educational technology and digital transformation research were used.

**3.7.2 Learning Experience:** Learning experience was operationalized using dimensions such as:

- engagement,
- accessibility,
- collaborative learning,
- flexibility,
- academic satisfaction,
- self-directed learning.

The construct reflects students' overall perceptions of digitally mediated educational experiences.

**3.7.3 Examination System Effectiveness:** Examination system effectiveness measured students' perceptions regarding:

- transparency,
- fairness,
- reliability,
- convenience,
- security,
- speed of evaluation.

Items were adapted from online assessment and educational quality literature.

3.7.4 **Placement Outcomes:** Placement outcomes captured students’ perceptions regarding:

- employability readiness,
- interview preparedness,
- recruiter connectivity,
- placement confidence,
- career opportunity accessibility.

The construct reflects the employability-related consequences of institutional digitalization.

#### 4. DATA ANALYSIS AND RESULTS

##### 4.1 Introduction

This section assesses the links between digitalization, learning experience, test system effectiveness, and Indian higher education placement outcomes. On 300 students from 20 Indian HEIs, descriptive statistics, measurement model assessment (reliability, convergent, and discriminant validity), structural model testing for direct effects (H1-H4), and mediation analysis (H5) are used. All analyses utilized SPSS/AMOS 29.

##### 4.2 Descriptive Statistics

**Table 4.1: Demographic Profile of Respondents (N = 300)**

Demographic Variable	Category	Frequency (n)	Percentage (%)
<b>Gender</b>	Male	156	52.0
	Female	140	46.7
	Other	4	1.3
<b>Program Level</b>	Undergraduate	210	70.0
	Postgraduate	90	30.0
<b>Institution Type</b>	Public University	123	41.0
	Private University	111	37.0
	Autonomous College	66	22.0
<b>Digital Access Quality</b>	Poor	27	9.0
	Adequate	156	52.0
	Excellent	117	39.0

**Table 4.2: Descriptive Statistics of Latent Constructs**

Construct	Mean	SD	Skewness	Kurtosis
Digitalization (DIG)	3.73	0.79	-0.41	0.19
Learning Experience (LE)	3.85	0.72	-0.49	0.31
Examination System Effectiveness (ESE)	3.56	0.80	-0.26	-0.14
Placement Outcomes (PO)	3.60	0.83	-0.33	0.06

\*Note: All constructs measured on 5-point Likert scale (1 = Strongly Disagree, 5 = Strongly Agree). All skewness and kurtosis values within acceptable ranges ( $|3|$  and  $|8|$  respectively).\*

4.3 Common Method Bias

Harman's single-factor test showed that a single factor explained 27.8% of total variation, much below the 50% criterion, demonstrating that common technique bias did not compromise results (Podsakoff et al., 2003). Variance inflation factor (VIF) values were 1.38–2.79 (mean = 2.01), below the cautious 3.3 criterion.

4.4 Measurement Model Assessment

4.4.1 *Model Fit*: The measurement model demonstrated acceptable fit:  $\chi^2/df = 2.28$  ( $\chi^2 = 1546.92$ ,  $df = 678$ ), CFI = 0.94, TLI = 0.93, RMSEA = 0.056 (90% CI: 0.051, 0.061), SRMR = 0.047.

4.4.2 *Reliability and Convergent Validity*

Table 4.3: Reliability and Convergent Validity

Construct	Cronbach's $\alpha$	CR	AVE	Conclusion
Digitalization (DIG)	0.89	0.91	0.55	Acceptable
Learning Experience (LE)	0.91	0.93	0.58	Acceptable
Examination System Effectiveness (ESE)	0.87	0.89	0.51	Acceptable
Placement Outcomes (PO)	0.88	0.90	0.57	Acceptable

\*Note: CR = Composite Reliability (threshold > 0.70); AVE = Average Variance Extracted (threshold > 0.50). All values meet recommended thresholds.\*

All factor loadings over 0.60, with most above 0.70 ( $p < 0.001$ ), indicating accurate latent concept evaluation.

4.4.3 *Discriminant Validity*

Table 4.4: Fornell-Larcker Criterion

Construct	DIG	LE	ESE	PO
Digitalization (DIG)	<b>0.742</b>			
Learning Experience (LE)	0.618	<b>0.762</b>		
Examination System Effectiveness (ESE)	0.579	0.552	<b>0.714</b>	
Placement Outcomes (PO)	0.597	0.668	0.544	<b>0.755</b>

Note: Bold diagonal numbers indicate  $\sqrt{AVE}$ ; off-diagonal values indicate correlations. Maintaining discriminant validity requires  $\sqrt{AVE}$  to outperform all concept correlations.

Table 4.5: Heterotrait-Monotrait (HTMT) Ratio

Construct Pair	HTMT Ratio	90% CI	Conclusion
DIG ↔ LE	0.679	[0.607, 0.745]	Discriminant validity established
DIG ↔ ESE	0.638	[0.564, 0.707]	Discriminant validity established
DIG ↔ PO	0.664	[0.587, 0.733]	Discriminant validity established
LE ↔ ESE	0.613	[0.536, 0.684]	Discriminant validity established
LE ↔ PO	0.729	[0.658, 0.793]	Discriminant validity established
ESE ↔ PO	0.604	[0.526, 0.677]	Discriminant validity established

Note: All HTMT ratios were < 0.85, proving discriminant validity (Henseler et al., 2015).

4.5 Structural Model Assessment

4.5.1 Model Fit: The structural model demonstrated acceptable fit:  $\chi^2/df = 2.45$  ( $\chi^2 = 1813.00$ ,  $df = 740$ ), CFI = 0.93, TLI = 0.92, RMSEA = 0.060 (90% CI: 0.056, 0.065), SRMR = 0.052.

4.5.2 Direct Effects (H1-H4)

Table 4.6: Hypothesis Testing Results – Direct Effects

Hypothesis	Path	$\beta$	SE	t-value	p-value	95% BC CI	Decision
H1	DIG → LE	0.618	0.039	15.85	<0.001	[0.541, 0.689]	Supported
H2	DIG → ESE	0.579	0.042	13.79	<0.001	[0.494, 0.654]	Supported
H3	DIG → PO	0.325	0.049	6.63	<0.001	[0.228, 0.418]	Supported
H4	LE → PO	0.453	0.045	10.07	<0.001	[0.362, 0.539]	Supported

\*Note: BC = Bias-Corrected bootstrap (5,000 resamples). All effects significant at  $p < 0.001$ .\*

4.5.3 Variance Explained ( $R^2$ ) and Effect Sizes

Table 4.7: Coefficient of Determination ( $R^2$ ) and Predictive Relevance ( $Q^2$ )

Endogenous Construct	$R^2$	Adjusted $R^2$	$Q^2$	Interpretation
Learning Experience (LE)	0.382	0.380	0.259	Moderate
Examination System Effectiveness (ESE)	0.335	0.333	0.224	Moderate
Placement Outcomes (PO)	0.521	0.518	0.306	Substantial

Table 4.8: Effect Sizes ( $f^2$ )

Predictor	Outcome	$f^2$	Effect Size
Digitalization (DIG)	Learning Experience (LE)	0.618	Large
Digitalization (DIG)	Examination System Effectiveness (ESE)	0.504	Large
Digitalization (DIG)	Placement Outcomes (PO)	0.128	Small-Medium
Learning Experience (LE)	Placement Outcomes (PO)	0.281	Medium-Large

Note:  $f^2$  thresholds:  $\geq 0.02$  (small),  $\geq 0.15$  (medium),  $\geq 0.35$  (large) (Cohen, 1988).

4.6 Mediation Analysis (H5)

Table 4.9: Decomposition of Effects – Mediation Analysis

Effect Type	Path	$\beta$	SE	95% BC CI	p-value
Total Effect (c)	DIG → PO	0.605	0.042	[0.521, 0.682]	<0.001
Direct Effect (c')	DIG → PO (controlling for LE)	0.325	0.049	[0.228, 0.418]	<0.001
Indirect Effect (a × b)	DIG → LE → PO	0.280	0.037	[0.211, 0.355]	<0.001

\*Note: a path = DIG → LE (0.618); b path = LE → PO (0.453);  $a \times b = 0.618 \times 0.453 = 0.280$ .\*

Variance Accounted For (VAF): = Indirect Effect / Total Effect =  $0.280 / 0.605 = 0.463$  (46.3%)

VAF = 46.3% (within 20-80% range) and direct and indirect effects are substantial, establishing partial mediation (Hair et al., 2019).

We support H5. Digitalization and placement outcomes are partially mediated by learning experience.

**4.7 Summary of Hypothesis Testing**

**Table 4.10: Summary of Results**

Hypothesis	Relationship	$\beta$	p-value	Decision
H1	DIG $\rightarrow$ LE	0.618	<0.001	Supported
H2	DIG $\rightarrow$ ESE	0.579	<0.001	Supported
H3	DIG $\rightarrow$ PO	0.325	<0.001	Supported
H4	LE $\rightarrow$ PO	0.453	<0.001	Supported
H5	DIG $\rightarrow$ LE $\rightarrow$ PO (Indirect)	0.280	<0.001	Supported (Partial Mediation)

**5. DISCUSSION**

Studies show that institutional digitization increases higher education students' learning, test performance, and placement. LMSs, AI-enabled technologies, virtual classrooms, and digital communication platforms boost student engagement, flexibility, accessibility, and collaboration. The findings corroborate the Technology Acceptance Model (TAM) and Unified Theory of Acceptance and Use of Technology (UTAUT) that perceived utility, simplicity, and institutional support increase student involvement with digital academic systems. Online and AI-enabled assessments increase higher education assessment transparency, reliability, efficiency, and convenience.

According to research, digitization improves employability, recruiter connections, interview preparation, and placement. Today's job markets prioritize technology flexibility, communication, and self-directed learning, which virtual placement systems and digital learning environments educate. Mediation study shows that digital technologies boost employability directly and indirectly via academic experiences. Digitalization and placement outcomes are partially mediated by learning experience. Results support Human Capital Theory and Resource-Based View (RBV), emphasizing digital infrastructure and technological skills as essential institutional resources for educational excellence and graduate employability.

Digitalization, learning, assessment, and employability are linked by TAM, UTAUT, RBV, and Human Capital Theory. The results advise colleges improve LMS infrastructure, AI-enabled assessment, digital placement ecosystems, and faculty digital proficiency. AICTE, NAAC, and UGC should promote NEP 2020 and Digital India-aligned digital education, cybersecurity, and tech-enabled employment activities. The study's cross-sectional emphasis on Indian HEIs restricts its contributions, allowing longitudinal and comparative international educational digital transformation research.

**6. IMPLICATIONS**

Higher education research has important theoretical, practical, and policy implications. Learning experience, examination system efficacy, and placement results are integrated into digital transformation literature using TAM, UTAUT, RBV, and Human Capital Theory. The research shows that learning experience affects digitalization-employability. Universities should enhance Learning Management Systems (LMS), invest in AI-enabled assessment systems, construct digital placement ecosystems, educate faculty in digital competence, and promote digital accessibility to create student-centered learning environments. The study promotes stronger digital infrastructure, inclusive digital education policies, cybersecurity standards for online assessments, and employability-oriented digital competencies in higher education frameworks to support NEP 2020 and Digital India.

## 7. LIMITATIONS AND FUTURE RESEARCH DIRECTIONS

Although useful, the study includes limits that allow for more investigation. First, cross-sectional research limits long-term causal interpretation of higher education digital transformation dynamics. Second, self-reported survey replies may include perceptual and social desirability biases despite procedural and statistical corrections for common technique bias. Third, the research only covers Indian HEIs, limiting worldwide applicability. Institutional characteristics including faculty preparation, digital leadership, and corporate culture were also ignored. Longitudinal studies on the long-term effects of digitalization on educational and employability outcomes, comparative international studies across developed and emerging economies, and AI-driven learning analytics, adaptive learning systems, and hybrid learning ecosystems integrating physical and digital pedagogies may address these limitations. Faculty perspectives, institutional leadership dynamics, and organizational readiness factors may be included in advanced SEM methods like multi-group analysis and moderation modeling to examine demographic and institutional differences in digitalization outcomes.

## 8. CONCLUSION

Institutional digitization affects learning experience, test system efficacy, and placement results in higher education institutions. Digitalization greatly improves students' educational experiences, test transparency and efficiency, and employment results. LMSs, AI-enabled tests, virtual learning environments, and digital placement platforms boost student engagement, flexibility, accessibility, and job readiness. Digitally enhanced learning environments indirectly boost employability via academic experiences, argues learning experience.

Digitalizing higher education with TAM, UTAUT, RBV, and HCT. Data shows that digital transformation is an institutional capability that impacts academic quality, assessment effectiveness, and graduate employability, not merely technology adoption. Strengthening digital infrastructure, AI-enabled evaluation systems, faculty digital competence development, and NEP 2020 and Digital India-aligned placement ecosystems is crucial, according to the report. The study integrates and experimentally confirms how digitalization alters higher education ecosystems and graduate performance in Indian HEIs and cross-sectional surveys.

## REFERENCES

1. Abbad, M. M. (2021). Using the UTAUT model to understand students' usage of e-learning systems in developing countries. *Education and Information Technologies*, 26(6), 7205–7224. <https://doi.org/10.1007/s10639-021-10573-5>
2. Al-Rahmi, W. M., Yahaya, N., Alturki, U., Aldraiweesh, A., Almutairy, S., Al-Adwan, A. S., Kamin, Y. B., & Al-Rahmi, A. M. (2022). Social media-based collaborative learning: The effect on learning success with the moderating role of cyberstalking and cyberbullying. *Interactive Learning Environments*, 30(8), 1434–1447. <https://doi.org/10.1080/10494820.2020.1728342>
3. Almarzooq, Z. I., Lopes, M., & Kochar, A. (2020). Virtual learning during the COVID-19 pandemic: A disruptive technology in graduate medical education. *Journal of the American College of Cardiology*, 75(20), 2635–2638. <https://doi.org/10.1016/j.jacc.2020.04.015>
4. Alruwais, N., Wills, G., & Wald, M. (2018). Advantages and challenges of using e-assessment. *International Journal of Information and Education Technology*, 8(1), 34–37. <https://doi.org/10.18178/ijiet.2018.8.1.1008>
5. Barney, J. (1991). Firm resources and sustained competitive advantage. *Journal of Management*, 17(1), 99–120. <https://doi.org/10.1177/014920639101700108>
6. Becker, G. S. (1993). *Human capital: A theoretical and empirical analysis with special reference to education* (3rd ed.). University of Chicago Press.
7. Bell, E., Bryman, A., & Harley, B. (2022). *Business research methods* (6th ed.). Oxford University Press.
8. Bond, M., Bedenlier, S., Marín, V. I., & Händel, M. (2021). Emergency remote teaching in higher education: Mapping the first global online semester. *International Journal of Educational Technology in Higher Education*, 18(1), 1–24. <https://doi.org/10.1186/s41239-021-00282-x>

9. Creswell, J. W., & Creswell, J. D. (2018). *Research design: Qualitative, quantitative, and mixed methods approaches* (5th ed.). Sage Publications.
10. Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 13(3), 319–340. <https://doi.org/10.2307/249008>
11. Dhawan, S. (2020). Online learning: A panacea in the time of COVID-19 crisis. *Journal of Educational Technology Systems*, 49(1), 5–22. <https://doi.org/10.1177/0047239520934018>
12. Dwivedi, Y. K., Hughes, L., Baabdullah, A. M., Ribeiro-Navarrete, S., Giannakis, M., Al-Debei, M. M., Dennehy, D., Metri, B., Buhalis, D., Cheung, C. M. K., Conboy, K., Doyle, R., Dubey, R., Dutot, V., Felix, R., Goyal, D. P., Gustafsson, A., Hinsch, C., Jebabli, I., ... Wamba, S. F. (2023). Metaverse beyond the hype: Multidisciplinary perspectives on emerging challenges, opportunities, and agenda for research, practice and policy. *International Journal of Information Management*, 66, 102542. <https://doi.org/10.1016/j.ijinfomgt.2022.102542>
13. Guangul, F. M., Suhail, A. H., Khalit, M. I., & Khidhir, B. A. (2020). Challenges of remote assessment in higher education in the context of COVID-19: A case study of Middle East College. *Educational Assessment, Evaluation and Accountability*, 32(4), 519–535. <https://doi.org/10.1007/s11092-020-09340-w>
14. Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2022). *A primer on partial least squares structural equation modeling (PLS-SEM)* (3rd ed.). Sage Publications.
15. International Telecommunication Union. (2023). *Facts and figures 2023: Measuring digital development*. ITU Publications.
16. Jackson, D., & Tomlinson, M. (2021). Investigating the relationship between career planning, proactivity and employability perceptions among higher education students in uncertain labour market conditions. *Higher Education*, 82(3), 435–455. <https://doi.org/10.1007/s10734-020-00559-5>
17. Kaushik, H., & Kaushik, S. (2024). A study on the associations among the factors influencing digital education with reference to Indian higher education. *Education and Information Technologies*, 29(12), 14999–15023.
18. Kline, R. B. (2023). *Principles and practice of structural equation modeling* (5th ed.). Guilford Press.
19. Kock, N. (2020). Common method bias in PLS-SEM: A full collinearity assessment approach. *International Journal of e-Collaboration*, 11(4), 1–10. <https://doi.org/10.4018/IJEC.2015100101>
20. Kraus, S., Durst, S., Ferreira, J. J., Veiga, P., Kailer, N., & Weinmann, A. (2022). Digital transformation in business and management research: An overview of the current status quo. *International Journal of Information Management*, 63, 102466. <https://doi.org/10.1016/j.ijinfomgt.2021.102466>
21. Le Ngoc Quang. (2025). Digital transformation in higher education in the post-COVID-19 era: A perspective integrating TAM, self-determinant and perceived risk theories. *Kybernetes*. Advance online publication.
22. Martin, F., Sun, T., & Westine, C. D. (2020). A systematic review of research on online teaching and learning from 2009 to 2018. *Computers and Education*, 159, 104009. <https://doi.org/10.1016/j.compedu.2020.104009>
23. Mukhtar, K., Javed, K., Arooj, M., & Sethi, A. (2021). Advantages, limitations and recommendations for online learning during COVID-19 pandemic era. *Pakistan Journal of Medical Sciences*, 36(COVID19-S4), S27–S31. <https://doi.org/10.12669/pjms.36.COVID19-S4.2785>
24. Nguyen, J. G., Keuseman, K. J., & Humston, J. J. (2022). Minimize online cheating for online assessments during COVID-19 pandemic. *Journal of Chemical Education*, 99(1), 342–347. <https://doi.org/10.1021/acs.jchemed.1c00633>
25. Nunnally, J. C., & Bernstein, I. H. (1994). *Psychometric theory* (3rd ed.). McGraw-Hill.

26. Saragi Turnip, D., Khanna Pathak, P., & Velan, G. (2024, October 15). Comparing apples and oranges: Transforming assessment at UNSW with Programmatic Assessment for Learning. [UNSW Sydney](#)
27. Saunders, M., Lewis, P., & Thornhill, A. (2019). *Research methods for business students* (8th ed.). Pearson Education.
28. Singh, K., Yadav, M., & Minz, N. K. (2025). Digital transformation and human resource management in higher education: A study of transformational practices in Faridabad's educational institutions. *SSRN Electronic Journal*. [SSRN](#)
29. Sood, S., & Varkkey, B. (2022). Online assessment and academic integrity in higher education during COVID-19: A systematic review. *Quality Assurance in Education*, 30(4), 421–437. <https://doi.org/10.1108/QAE-12-2021-0184>
30. Technische Universität Ilmenau. (2025, July 7). Competence-oriented digital teaching, learning and testing: “Lessons learned” in the examING project. [UNIONline](#)
31. Tomlinson, M., McCafferty, H., Fuge, H., & Wood, K. (2021). Resources and readiness for graduate employability in the context of uncertainty. *Higher Education*, 82(4), 761–781. <https://doi.org/10.1007/s10734-020-00645-8>
32. UNESCO. (2023). *Global education monitoring report 2023: Technology in education – A tool on whose terms?* UNESCO Publishing.
33. University of Leicester. (2025, April 28). How the University of Leicester streamlined exam scheduling and improved support for students. [TechnologyOne](#)
34. University of Malaya. (2025, October 30). Revolutionizing OBE with CO-AIMS. In *The Fourth International Competition on Sustainable Education 2025 E-Proceeding* (pp. 392–397).
35. Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly*, 27(3), 425–478. <https://doi.org/10.2307/30036540>
36. Varghese Joy. (2025, September 25). Towards technological excellence: Analyzing factors influencing technology adoption in autonomous college libraries in Kerala using Analytic Hierarchy Process [Research publication announcement]