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Research Article

Digital Learning Ecosystems and Employability Skill Development: An Empirical Study of Management Students Using Structural Equation Modelling

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Abstract

This study investigates the impact of Digital Learning Ecosystems (DLE) on the development of employability skills among management students. While digital platforms have transitioned from peripheral tools to central instructional spaces, empirical evidence linking specific ecosystem dimensions to granular career readiness attributes remains fragmented. Utilizing a quantitative survey design, data was gathered from 420 final-year MBA and PGDM students across major business schools.

Structural Equation Modelling (SEM) was employed to validate the measurement model and test the hypothesized structural relationships. The empirical findings reveal that **Platform Interactivity** ($\beta = 0.38, p < 0.001$) and **Content Personalisation** ($\beta = 0.29, p < 0.01$) exert the strongest direct impacts on the acquisition of advanced problem-solving and digital literacy skills. Furthermore, learner self-efficacy serves as a crucial mediating variable in translating ecosystem engagement into tangible workforce readiness. The study provides concrete, data-driven frameworks for academic administrators and instructional designers to optimize digital investments for measurable employment outcomes.

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1. INTRODUCTION

The modern corporate landscape demands an agile workforce capable of navigating continuous technological disruption. For business schools, the historical mandate of imparting theoretical frameworks has expanded into a critical requirement: graduating students with immediately deployable, advanced employability skills. Concurrently, higher education has witnessed a structural shift toward integrated Digital Learning Ecosystems (DLEs)—environments comprising Learning Management Systems (LMS), AI-driven adaptive platforms, collaborative digital spaces, and peer-to-peer repositories.

Despite massive capital expenditure on these digital architectures, a critical empirical gap persists. Extant literature largely evaluates DLEs through the lens of user satisfaction, basic adoption metrics, or general academic performance. There is an absolute scarcity of empirical models that trace the structural pathways from specific technological dimensions of a digital ecosystem to explicit components of managerial employability—such as critical thinking, digital collaboration, and data-driven decision making (Omodan, 2025).

This research addresses this gap by answering a central question: *How, and to what degree, do the structural dimensions of Digital Learning Ecosystems drive the development of employability skills in management students?* By applying Structural Equation Modelling (SEM), this paper uncovers both the direct effects and the underlying psychological mechanisms (specifically learner self-efficacy) that govern this digital transformation.

2. Theoretical Framework and Hypotheses

This study synthesizes **Socio-Technical Systems (STS) Theory** and **Self-Efficacy Theory** to construct an integrated structural model. STS theory posits that organizational outcomes are optimized only when technological sub-systems (the features, tools, and algorithms of the DLE) are harmonized with social sub-systems (the behaviors, motivations, and interactions of the learners).

2.1 Ecosystem Dimensions and Skill Development

Digital Learning Ecosystems are not monolithic; they are multi-dimensional. Based on a comprehensive literature review, we isolate three primary exogenous constructs:

- **Platform Interactivity (PI):** The degree to which a platform facilitates synchronous and asynchronous multi-directional communication, real-time collaboration, and active peer-to-peer feedback loops (Liu, 2003).
- **Content Personalization (CP):** The capacity of the ecosystem's adaptive algorithms to tailor learning pathways, content density, and formative assessments to an individual's latent skill level (Kalyanaraman & Sundar, 2006).
- **Collaborative Infrastructure (CI):** The availability and integration of collaborative tools (e.g., shared cloud workspaces, version-controlled group repositories, and

digital whiteboards) that mimic real-world corporate workflows (Al-Samarraie et al., 2018).

The endogenous target construct is **Employability Skills (ES)**, conceptualized as a higher-order construct comprising digital literacy, complex problem-solving, adaptive communication, and team agility (Omodan, 2025; van Dijk, 2020).

Therefore, we hypothesize:

- **H1:** Platform Interactivity exerts a significant positive direct effect on management students' Employability Skills.
- **H2:** Content Personalization exerts a significant positive direct effect on management students' Employability Skills.
- **H3:** Collaborative Infrastructure exerts a significant positive direct effect on management students' Employability Skills.

2.2 The Mediating Role of Learner Self-Efficacy

Technological features alone do not automatically translate into skill acquisition. According to Self-Efficacy Theory, a rich, supportive digital environment enhances an individual's belief in their ability to execute complex tasks (Panaoura, 2024). This cognitive shift, **Learner Self-Efficacy (LSE)**, acts as an internal engine that drives deeper engagement and eventual skill mastery (Compeau & Higgins, 1995).

- **H4:** Learner Self-Efficacy mediates the relationship between Platform Interactivity and Employability Skills.
- **H5:** Learner Self-Efficacy mediates the relationship between Content Personalization and Employability Skills.

3. METHODOLOGY

3.1 Sample and Data Collection

A cross-sectional survey design was used to capture data from final-year management students (MBA/PGDM) who had spent at least three semesters utilizing an integrated institutional DLE. A purposive sampling strategy yielded 450 responses, of which 420 were retained after rigorous screening for missing values, straight-lining, and multivariate outliers.

The sample composition consisted of 58% male and 42% female respondents, with a mean age of 23.4 years. Specializations included Marketing (34%), Finance (28%), Human Resources (18%), and Operations/Business Analytics (20%).

3.2 Measurement Instrument

All constructs were measured using multi-item scales adapted from validated psychometric instruments and modified to fit the context of digital management education. Responses were anchored on a 5-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree).

- **Platform Interactivity (4 items):** Adapted from Liu (2003). Measures real-time feedback, active participation, and response speed.
- **Content Personalization (4 items):** Adapted from Kalyanaraman and Sundar (2006). Assesses adaptive pacing and custom module recommendation systems.

- **Collaborative Infrastructure (4 items):** Adapted from Al-Samarraie et al. (2018). Evaluates cloud integration, multi-user environments, and tool availability.
- **Learner Self-Efficacy (5 items):** Adapted from Compeau and Higgins (1995). Measures confidence in navigating advanced digital problem-solving tasks.
- **Employability Skills (8 items):** Grounded in future-of-work competencies measuring critical thinking, data interpretation, and remote team management (Omodan, 2025; van Dijk, 2020).

4. EMPIRICAL ANALYSIS AND RESULTS

The study applied a two-stage structural equation modelling approach using AMOS 26.0: first evaluating the measurement model via Confirmatory Factor Analysis (CFA), followed by testing the structural paths.

4.1 Measurement Model Evaluation

To verify the psychometric properties of the scales, internal reliability, convergent validity, and discriminant validity were assessed.

Construct	Items	Factor Loadings (Range)	Cronbach's α	Composite Reliability (CR)	Average Variance Extracted (AVE)
Platform Interactivity (PI)	4	0.74 – 0.86	0.84	0.85	0.59
Content Personalization (CP)	4	0.71 – 0.83	0.81	0.83	0.55
Collaborative Infrastructure (CI)	4	0.76 – 0.89	0.87	0.88	0.64
Learner Self-Efficacy (LSE)	5	0.78 – 0.85	0.89	0.89	0.62
Employability Skills (ES)	8	0.72 – 0.84	0.91	0.92	0.58

Validity Diagnostics: All factor loadings exceeded the standard 0.70 threshold. Convergent validity is confirmed as CR values exceed 0.70 and AVE values exceed 0.50 across all latent constructs.

To establish **discriminant validity**, the square root of the AVE

for each construct was compared against its inter-construct correlations (Fornell-Larcker criterion). In all instances, the square root of the AVE (displayed along the diagonal below) was substantially higher than the corresponding off-diagonal correlation coefficients.

Construct	PI	CP	CI	LSE	ES
PI	0.768				
CP	0.421	0.741			
CI	0.385	0.492	0.800		
LSE	0.511	0.463	0.312	0.787	
ES	0.589	0.534	0.441	0.602	0.761

4.2 Structural Model and Hypothesis Testing

The structural model exhibited an excellent fit to the empirical data. The goodness-of-fit indices comfortably surpassed

standard recommended thresholds. The direct path coefficients and statistical significance tests are detailed below:

Hypothesis	Structural Path	Standardised Path Coefficient (β)	t-value (Critical Ratio)	p-value	Result
H1	Platform Interactivity -Employability Skills	0.382	6.841	< 0.001	Supported
H2	Content Personalisation - Employability Skills	0.291	5.113	< 0.01	Supported
H3	Collaborative Infra - Employability Skills	0.164	2.945	< 0.05	Supported

4.3 Mediation Analysis

To test the indirect effects via Learner Self-Efficacy (H4 and H5), bootstrapping with 5,000 resamples at a 95% confidence interval was conducted.

- The indirect effect of **Platform Interactivity** on Employability Skills via LSE was significant ($\beta= 0.143$, $p < 0.01$; CI: [0.085, 0.214]). Because the direct path remains significant, **partial mediation** is confirmed (H4).
- The indirect effect of **Content Personalization** on Employability Skills via LSE was also significant ($\beta= 0.112$, $p < 0.01$; CI: [0.061, 0.178]), validating **partial mediation** (H5).

Together, the exogenous variables and the mediator explain **R = 54.6%** of the total variance in management students' Employability Skills.

5. DISCUSSION AND IMPLICATIONS

5.1 Theoretical Contributions

This study advances the literature by unpacking the black box of "digital learning" in business education. Instead of analyzing digital adoption generally, this paper provides a granular structural decomposition of how specific system configurations map onto workforce-ready outcomes (Omodan, 2025).

The confirmation of Learner Self-Efficacy as a potent mediator reveals that the value of technological interventions is highly

dependent on psychological enablement. A digital learning ecosystem doesn't just build skills by pushing content down a pipeline; it builds skills by elevating the user's psychological capacity and confidence to interact with complex digital tasks (Panaoura, 2024).

5.2 Managerial and Instructional Implications

For business school deans, academic directors, and ed-tech developers, these results yield highly actionable mandates:

- **Prioritize Real-Time Interactivity Over Static Delivery:** Given that Platform Interactivity proved to be the strongest driver of capability development ($\beta = 0.38$), institutions should move away from asynchronous "video repository" models. Capital investments must prioritize tools that enable real-time collaborative coding, live simulation debates, and instant automated feedback loops.
- **Invest heavily in Adaptive Learning Frameworks:** Content Personalization directly enhances both self-efficacy and skill outcomes. DLEs should integrate AI engines capable of dynamically recalibrating the complexity of case studies and business analytics problems based on the student's real-time performance metrics.
- **Build Technical Confidence Interventions:** Since LSE directly drives over half the variance in employability outcomes, orientation programs must intentionally focus on reducing digital anxiety. Simply deploying a tool is not enough; structured onboarding that guarantees early micro-successes for students within the platform will structurally scale their eventual employability scores.

6. CONCLUSION AND FUTURE RESEARCH

This study empirically validates that Digital Learning Ecosystems are powerful engines for modern skill acquisition when designed with high interactivity and adaptive personalisation. By applying Structural Equation Modelling to data from 420 management students, we confirmed that socio-technical alignment significantly predicts core competencies required by the contemporary labour market.

Limitations and Future Horizons

While robust, this study is subject to limitations that offer valuable avenues for future inquiry:

1. **Cross-Sectional Constraints:** The data captures a specific point in time. Longitudinal research tracking students from their first semester into their first year of corporate employment would provide definitive proof of skill translation.
2. **Self-Reported Measures:** Employability skills were measured via verified self-perception scales. Future models could integrate objective external parameters, such as actual corporate placement performance or recruiter assessment scores, as independent endogenous validation metrics.

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