DIGITAL TRANSFORMATION TRAJECTORIES AND ARTIFICIAL INTELLIGENCE (AI) - ENABLED ENTREPRENEURIAL ECOSYSTEMS:

FORECASTING INNOVATION CAPACITY AND STARTUP SUSTAINABILITY IN VIETNAMESE PRIVATE UNIVERSITIES

Ngo Quang Son[a]*
Ngo Quang Huy[b]
Nguyen Dang Lang[c]
Khau Van Bich[d]
Tran Dang Khoi[e]
Do Thi Thanh Huong[g]
Pham Thu Ha[h]
Tran Van Tuyen[i]
Le Thi Thanh Lam[k]
Pham Thi Van Anh[l]
Le Thi Ly Na[m]
Nguyen Cong Quan[n]
Tran Thi Hue[o]

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[a]Trung Vuong University
ROR: https://ror.org/05xzsm645
Email: ngoquangson2018@gmail.com
ORCID iD: https://orcid.org/0000-0003-3120-034X

[b]University of Economics, Ho Chi Minh City
ROR: https://ror.org/010yce376
Email: huynq@ueh.edu.vn
ORCID iD: https://orcid.org/0009-0004-8932-8367

[c]College of Electronics and Refrigeration
Email: langnd@dtdl.edu.vn
ORCID iD: https://orcid.org/0009-0009-5514-4806

[d]Tran Dai Nghia University
ROR: https://ror.org/05qq5b157
Email: khaubich@gmail.com
ORCID iD: https://orcid.org/0009-0003-9214-8466

[e]Vietnam Academy of Ethnic Minorities
Email: khoitd@hvdt.edu.vn
ORCID iD: https://orcid.org/0009-0006-1283-9964

[g]Faculty of Political Theory,Thuong Mai University
ROR:https://ror.org/021s58p89
Email: huong.dtt2@tmu.edu.vn
ORCID iD: https://orcid.org/0009-0004-1708-1393

[h]Nguyen Trai University
Email: hathu30789@gmail.com
ORCID iD: https://orcid.org/0009-0001-1563-8766

[i]Nguyen Trai University
Email: tuyen.tv@ntu-hn.eud.vn
ORCID iD: https://orcid.org/0009-0002-9657-166X

[k]Dai Nam University
ROR: https://ror.org/0031x3y66
Email: leminhdungtran@gmail.com
ORCID iD: https://orcid.org/0009-0008-1503-6985

[l]Trung Vuong University
ROR: https://ror.org/05xzsm645
Email: vananhltv86@gmail.com
ORCID iD: https://orcid.org/0009-0009-0982-2434

[m]Lam Dong Department of Education and Training
Email: lynavn89@gmail.com
ORCID iD: https://orcid.org/0009-0009-2715-2307

[n]Trung Vuong University
ROR: https://ror.org/05xzsm645
Email: ncquan@gmail.com
ORCID iD: https://orcid.org/0009-0001-0890-2178

[o]Trung Vuong University
ROR: https://ror.org/05xzsm645
Email: lily071081@gmail.com
ORCID iD: https://orcid.org/0009-0009-1891-1498

Abstract:

The rapid acceleration of digital transformation and artificial intelligence (AI) is fundamentally reshaping entrepreneurial ecosystems within higher education worldwide. However, empirical evidence explaining how AI-enabled institutional environments influence student innovation capacity and startup sustainability in emerging economies remains limited. This study investigates the transformation trajectories of entrepreneurial ecosystems in Vietnamese private universities, focusing on the interplay between digital governance, AI - driven support mechanisms, institutional logics, and student-level entrepreneurial outcomes.

Drawing upon innovation ecosystem theory, dynamic capability theory, and institutional theory, the study proposes a multilevel conceptual framework linking university-level digital transformation strategies to individual-level entrepreneurial intention, innovation capacity, and startup sustainability. A mixed-method design was employed, combining survey data collected from students across multiple private universities in Vietnam with institutional-level indicators of digital readiness and AI adoption. Multilevel structural equation modeling (MSEM) and predictive analytics were applied to test cross-level effects and forecast sustainability outcomes.

The findings reveal that AI - enabled support infrastructures - such as intelligent mentoring systems, data-driven incubation platforms, and digital governance policies - significantly enhance students' innovation capacity and entrepreneurial persistence. Institutional digital maturity moderates the relationship between entrepreneurial intention and startup sustainability, indicating that ecosystem - level transformation is critical for long-term entrepreneurial success. Forecasting simulations further suggest that sustained investment in AI governance and digital capability development generates nonlinear gains in innovation performance.

This study contributes to the literature in three ways. First, it advances entrepreneurial ecosystem research by integrating AI governance into multilevel institutional analysis. Second, it provides empirical evidence from an emerging economy context, enriching Global South scholarship. Third, it introduces a forecasting perspective to higher education transformation research. Policy implications highlight the need for strategic digital governance frameworks to strengthen startup sustainability in private higher education institutions.

Keywords: *Digital Transformation Trajectories; Artificial Intelligence Governance; AI-Enabled Entrepreneurial Ecosystems; Student Entrepreneurship; Innovation Capacity; Startup Sustainability; Entrepreneurial Intention; Multilevel Structural Equation Modeling (MSEM); Institutional Digital Governance; Private Higher Education;*

1. Introduction

1.1. Global Context

The wave of digital transformation and artificial intelligence reshaping higher education.

In the context of the Fourth Industrial Revolution, the rapid advancement of digital technologies, big data, and artificial intelligence is generating systemic transformations across all sectors of socio-economic life, with higher education being one of the most profoundly affected domains. Digital transformation is no longer limited to the mere adoption of information technologies in teaching or administration; rather, it has evolved into a comprehensive restructuring process of the university operating model, encompassing learning paradigms, research ecosystems, knowledge governance, and the mechanisms through which universities interact with society.

Artificial intelligence (AI) functions as a general-purpose technology capable of reshaping the entire value chain of higher education. AI-driven systems enable learning analytics, personalized educational experiences, automated administrative processes, and enhanced research productivity. At the same time, AI facilitates the development of adaptive learning models, intelligent learning environments, and large-scale online education platforms. These innovations do not merely transform pedagogical approaches; they also accelerate the emergence of the digital university model, in which knowledge is produced, disseminated, and commercialized through advanced technological infrastructures.

Amid intensifying global competition in knowledge and technology, universities are compelled to restructure their development strategies toward digitalization, innovation, and ecosystem integration. Institutions that thrive in this era are no longer merely educational providers; they function as knowledge and technology innovation hubs, playing a pivotal role in driving knowledge-based economic growth.

The role of universities in the national innovation ecosystem.

Within the contemporary knowledge economy, universities are widely recognized as central actors within national innovation ecosystems. Beyond

their traditional mission of educating highly skilled human resources, universities contribute significantly to the creation of new knowledge, the transfer of technology, and the commercialization of scientific research outcomes.

Theoretical frameworks such as the Triple Helix (university–industry–government) and the Quadruple Helix (which incorporates civil society and the public sphere) emphasize the strategic role of universities in connecting actors within the innovation ecosystem. In this framework, universities are no longer isolated academic institutions; instead, they function as intermediary platforms that facilitate research collaboration, technology entrepreneurship, and the growth of innovation-driven enterprises.

In many advanced economies, universities have evolved into core nodes of innovation clusters and science and technology parks. Through research laboratories, innovation centers, business incubators, and venture funds, universities actively facilitate the translation of knowledge from laboratories into market applications.

Consequently, in the era of digital transformation and globalized knowledge production, the capacity of universities to build and sustain innovation ecosystems has become a critical determinant of national competitiveness.

The rise of Entrepreneurial Universities

One of the most significant global trends in higher education is the transition from the traditional university model to the entrepreneurial university paradigm. This concept highlights the role of universities as institutions that not only generate knowledge but also actively transform it into economic and social value through innovation and entrepreneurial activities.

Entrepreneurial universities are typically characterized by several core features:

(1)An institutional culture that fosters innovation and creativity;

(2)Entrepreneurial support ecosystems for students and faculty members;

(3)Strong collaboration mechanisms with industry and investors; and

(4)The capability to commercialize research outcomes.

Within this context, many universities worldwide have established innovation hubs, business incubators, startup accelerators, and internal venture funds to support technology-based entrepreneurship. These initiatives not only generate new startups but also contribute to the formation of an entrepreneurial culture within academic environments.

Notably, the integration of artificial intelligence, big data, and digital transformation is giving rise to a new generation of entrepreneurial universities, where technological platforms are utilized to forecast market trends, assess innovation potential, and support the development of sustainable startups.

1.2. Vietnamese Context and Research Gap

Digital transformation and the entrepreneurial ecosystem in Vietnam

Over the past two decades, Vietnam has emerged as one of the most dynamic economies in Southeast Asia, characterized by sustained economic growth and deep integration into the global knowledge economy. Within this context, digital transformation has become a central national development strategy, strongly promoted through policies aimed at building a digital government, a digital economy, and a digital society. Higher education institutions, particularly private universities, are facing significant opportunities as well as profound challenges in restructuring their teaching, research, and innovation models in response to the global wave of digital transformation.

Alongside digital transformation, Vietnam's startup ecosystem has experienced rapid expansion, marked by the increasing number of technology startups, venture capital funds, and innovation support programs. Universities are increasingly expected to serve as key actors in cultivating entrepreneurial mindsets, developing innovation capabilities, and facilitating the commercialization of knowledge. However, despite the growing number of entrepreneurship initiatives within universities, scholarly understanding of AI-enabled entrepreneurial ecosystems in the context of Vietnamese higher education remains relatively limited.

Lack of empirical evidence on AI-enabled entrepreneurial ecosystems

One of the most notable gaps in the existing literature is the lack of empirical evidence regarding the role of artificial intelligence in shaping and sustaining entrepreneurial ecosystems within universities. Most existing studies focus either on the potential of AI in education or on its applications in business management, while relatively few investigations systematically examine how AI technologies can support the development of entrepreneurial ecosystems in higher education contexts.

In practice, AI technologies have the potential to play a critical role at multiple stages of the entrepreneurial process, including market data

analysis, innovation trend forecasting, strategic decision support, and the optimization of startup business models. However, integrating these technologies into university-based entrepreneurial ecosystems requires a comprehensive approach that combines technological infrastructure, organizational capacity, and an innovation-oriented culture. Empirical studies capable of elucidating the relationships among these factors remain scarce, particularly within emerging economies.

Lack of multilevel research (institutional–individual level)

Another significant limitation of current research lies in the absence of multilevel analytical models capable of simultaneously examining factors at both institutional and individual levels. In practice, the development of entrepreneurial ecosystems within universities is not determined solely by organizational strategies and resources; it is also strongly influenced by the capabilities, motivations, and behaviors of individuals participating in the ecosystem, including students, faculty members, and researchers.

Studies focusing on the institutional level typically analyze entrepreneurship policies, innovation infrastructures, or entrepreneurship education programs. Conversely, research at the individual level tends to emphasize factors such as entrepreneurial intention, innovation capability, and attitudes toward risk. The absence of integrative models that connect these two levels has limited our understanding of the mechanisms through which entrepreneurial ecosystems operate within university environments.

Lack of predictive models for innovation capability and startup sustainability in the Global South

Another critical research gap concerns the lack of predictive models that examine innovation capability and startup sustainability within the context of the Global South. The majority of existing studies on university entrepreneurial ecosystems and innovation dynamics have been conducted in developed economies, where financial resources, technological infrastructure, and institutional environments are relatively well established.

In contrast, developing countries often face unique constraints, including limited resources, technological gaps, and relatively underdeveloped innovation ecosystems. These conditions may generate distinct drivers and barriers affecting the development of university-based startups. Therefore, developing predictive models tailored to emerging economy contexts is particularly important for providing scientific evidence to inform policy-making and the design of effective entrepreneurship support programs.

Positioning the contribution of the study

In response to the aforementioned research gaps, this study aims to develop an integrated analytical framework that explores the relationship between digital transformation, AI-enabled entrepreneurial ecosystems, and innovation capability in private universities in Vietnam. The study simultaneously examines factors at both institutional and individual levels, thereby constructing a predictive model for the sustainability of university-based startups.

Through this approach, the study contributes to expanding scholarly understanding of entrepreneurial ecosystems in higher education while also providing important empirical evidence for designing strategies aimed at fostering entrepreneurial universities in emerging economy contexts.

1.3 Research Objectives and Contributions

1.3.1 Research Questions

In the context of accelerating global digital transformation and the increasing importance of entrepreneurial ecosystems within innovation-driven universities, understanding the mechanisms through which digital transformation, artificial intelligence, and entrepreneurial capacity interact has become a strategically significant research issue. This is particularly relevant for private universities in Vietnam, which represent one of the fastest-growing segments of the national higher education system. Identifying the key determinants that shape the emergence and sustainability of university-based entrepreneurial ecosystems therefore holds both theoretical and practical importance.

Building upon the research gaps identified in the previous section, this study formulates a set of research questions aimed at exploring the relationships among institutional digital transformation trajectories, AI governance, and the development of entrepreneurial ecosystems within universities. These research questions are designed to illuminate the mechanisms operating at both institutional and individual levels, while also providing a scientific basis for developing predictive models of innovation capability and startup sustainability in higher education contexts.

RQ1: How does the institutional digital transformation trajectory influence the entrepreneurial ecosystem?

The first research question focuses on examining how institutional digital transformation trajectories shape the development of entrepreneurial ecosystems within universities. Digital transformation extends

far beyond the adoption of technological tools in teaching or administration; it involves profound transformations in organizational structures, innovation cultures, and collaboration models with industry and societal actors.

Within this context, the level of digital maturity of a university may directly influence its capacity to establish entrepreneurial support infrastructures such as innovation hubs, business incubators, open research data systems, and digital learning platforms. These elements play a crucial role in creating environments conducive to creativity, experimentation, and the development of startup initiatives among students and faculty members. Therefore, this research question seeks to analyze the relationship between institutional digital transformation trajectories and the development of entrepreneurial ecosystems, thereby clarifying whether digital transformation strategies can serve as catalysts for entrepreneurial activities within universities.

RQ2: Does AI governance regulate the relationship between entrepreneurial intention and startup sustainability?

The second research question aims to examine the role of AI governance in regulating the relationship between individual entrepreneurial intention and the sustainability of startup ventures. In recent years, AI governance has emerged as a critical topic in technology governance, encompassing ethical principles, regulatory mechanisms, and institutional frameworks designed to ensure that artificial intelligence is deployed in a transparent, responsible, and sustainable manner.

Within university environments, where startup initiatives increasingly rely on data-driven technologies and AI applications, the establishment of appropriate AI governance mechanisms can significantly influence the quality and reliability of entrepreneurial decision-making. Such governance frameworks may support technology risk management, protect data privacy, and ensure that AI-driven solutions developed within entrepreneurial ecosystems comply with ethical and regulatory standards.

Accordingly, the study investigates whether AI governance functions as a moderating variable, shaping the extent to which individual entrepreneurial intentions translate into sustainable startup ventures.

RQ3: Can innovation capability be predicted based on digital maturity?

The third research question focuses on the possibility of developing predictive models to assess the innovation capability of universities based on their level of digital maturity. As higher education institutions undergo profound digital transformation, measuring and forecasting innovation capacity has become an essential task for policymakers and university leaders.

An institution's digital maturity may reflect multiple critical dimensions, including technological infrastructure, data governance capabilities, the integration of intelligent systems, and the readiness of human resources to leverage digital technologies. These factors are believed to be closely associated with the capacity to generate innovative ideas, develop new technological products, and foster knowledge-based entrepreneurial activities.

Therefore, this research question seeks to determine whether digital maturity indicators can serve as reliable predictors of innovation capability within university-based innovation ecosystems.

1.3.2. Research Contributions

In the context of digital transformation and artificial intelligence fundamentally reshaping global innovation ecosystems, developing research frameworks capable of explaining and forecasting the emergence and sustainability of entrepreneurial ecosystems within universities has become an urgent priority for the international scholarly community. This study is designed to address this knowledge gap by constructing an integrated analytical framework that connects digital transformation trajectories, AI governance, and entrepreneurial ecosystems within private universities in Vietnam.

By integrating multiple theoretical perspectives and advanced methodological approaches, the study contributes to the literature on innovation and university entrepreneurship in three major dimensions: theoretical contributions, methodological contributions, and practical contributions.

a.Theoretical Contributions

The primary theoretical contribution of this study lies in the development of an integrated analytical framework grounded in four major theoretical foundations within the fields of innovation and university entrepreneurship research. Rather than approaching the phenomenon from a single theoretical perspective, this study synthesizes theoretical streams related to digital transformation, entrepreneurial ecosystems, AI governance, and innovation capability to construct a more comprehensive model capable of explaining the dynamics that shape the emergence and evolution of entrepreneurial ecosystems within higher education institutions.

First, the study extends theories of organizational

digital transformation, emphasizing that the digital transformation trajectory of universities not only influences governance efficiency but also serves as a strategic foundation for the development of knowledge-based entrepreneurial ecosystems.

Second, the study contributes to the literature on entrepreneurial universities by incorporating the role of artificial intelligence as a technological intermediary that enhances interactions among actors within innovation ecosystems.

Third, the study advances scholarly discussions on AI governance by conceptualizing it as a regulatory mechanism that moderates the relationship between individual entrepreneurial intentions and the sustainability of startup ventures.

Finally, the study contributes to theories of innovation capability by proposing that an institution's level of digital maturity may function as a critical predictor of its innovation capacity.

b.Methodological Contributions

Beyond its theoretical contributions, the study also provides significant methodological advancements by developing and applying a Multilevel Structural Equation Modeling (MSEM) framework to examine the complex relationships between institutional-level and individual-level factors within university entrepreneurial ecosystems.

Unlike previous studies that typically focus on a single level of analysis, the MSEM approach enables this research to simultaneously examine variables at the institutional level (such as digital transformation strategies, technological infrastructure, and AI governance mechanisms) and variables at the individual level (including entrepreneurial intention, innovation capability, and entrepreneurial behavior). This multilevel perspective provides a more comprehensive understanding of how factors across different levels interact to shape entrepreneurial ecosystem development.

Another key methodological contribution of this study is the integration of a forecasting component into the analytical model. Rather than merely explaining causal relationships, the study develops predictive models that estimate innovation capability and startup sustainability based on indicators of digital transformation and AI governance.

This approach expands the scope of entrepreneurial ecosystem research from descriptive and explanatory analysis toward predictive analytics, an emerging direction increasingly emphasized in innovation and technology management research.

c.Practical Contributions

In addition to its academic contributions, the study also offers important practical implications for education policymakers, university leaders, and organizations supporting entrepreneurial development.

First, the findings provide empirical evidence regarding the role of digital transformation and artificial intelligence in fostering entrepreneurial ecosystems within private universities. These insights can assist educational leaders in designing digital transformation strategies aimed at strengthening innovation capabilities in higher education institutions.

Second, the study offers policy insights for developing AI governance frameworks within university environments, ensuring that AI-driven entrepreneurial activities are implemented in a transparent, responsible, and sustainable manner.

Finally, the study contributes by providing empirical evidence from Vietnam - an emerging economy in the Global South, thereby expanding the geographical scope of research on university entrepreneurial ecosystems, which has historically been dominated by studies conducted in developed economies.

2. Theoretical Framework and Hypothesis Development

2.1. Theoretical Foundations

This study is grounded in the integration of three major theoretical perspectives within the fields of innovation studies and higher education management: innovation ecosystem theory, dynamic capabilities theory, and digital transformation theory in higher education. The integration of these theoretical foundations enables a comprehensive examination of the relationships among digital transformation, AI-supported entrepreneurial ecosystems, and innovation capacity within universities.

From the perspective of innovation ecosystem theory, universities are not only knowledge-producing institutions but also key actors in fostering entrepreneurial activities and facilitating technology transfer. In this context, the emergence of artificial intelligence and digital platforms is reshaping the interaction patterns among actors within innovation ecosystems, thereby creating new opportunities for the development of knowledge-based startups.

At the same time, dynamic capabilities theory emphasizes that an organization's ability to integrate, build, and reconfigure technological and knowledge resources plays a crucial role in sustaining competitive advantages in rapidly changing environments. Within the context of digital transformation, universities can strengthen their dynamic capabilities by integrating artificial

intelligence into research activities, teaching processes, and entrepreneurial support systems.

In recent years, the convergence of digital transformation, artificial intelligence, and entrepreneurial ecosystems has become a central topic in research on innovation within higher education. Universities increasingly function not only as knowledge producers but also as innovation intermediaries where scientific ideas are transformed into technologies, products, and startup ventures with socio-economic value. However, understanding the mechanisms underlying entrepreneurial ecosystems within digitally transforming universities requires an integrated theoretical framework capable of explaining both institutional-level and individual-level dynamics.

Accordingly, this study develops an integrated theoretical framework grounded in four major theoretical foundations: Digital Transformation Trajectory theory, Entrepreneurial Ecosystem theory, AI Governance theory, and Innovation Capability theory.

2.2. Digital Transformation Trajectory Theory

The concept of digital transformation trajectory refers to the evolutionary process through which organizations integrate digital technologies into their organizational structures, operational processes, and value creation models. Unlike perspectives that treat digital transformation as a single event, the trajectory-based approach emphasizes that digital transformation unfolds over time, with organizations progressing through different stages of digital maturity.

Within higher education institutions, digital transformation trajectories may involve the development of technological infrastructures, digital learning platforms, research data governance systems, and AI-enabled academic management systems. These elements not only improve institutional efficiency but also create favorable conditions for the emergence of knowledge-based entrepreneurial ecosystems.

Research hypothesis

H1: Institutional digital transformation trajectories positively influence the development of entrepreneurial ecosystems.

H2: Organizational digital maturity positively influences innovation capability.

H3: Digital transformation trajectories positively influence the establishment of AI governance mechanisms within universities.

2.3. Entrepreneurial Ecosystem Theory

Entrepreneurial ecosystem theory emphasizes that the emergence and growth of startups are not solely driven by individual entrepreneurial efforts but are the result of interactions among multiple actors within a complex system. Such ecosystems typically involve universities, firms, investors, government agencies, and innovation support organizations.

Within entrepreneurial universities, such ecosystems are manifested through innovation hubs, startup incubators, entrepreneurship education programs, and collaborative networks linking universities with industry.

Research hypothesis

H4: Entrepreneurial ecosystems positively influence entrepreneurial intentions among students and faculty members.

H5: Entrepreneurial ecosystems positively influence individual innovation capability within universities.

H6: Entrepreneurial ecosystems positively influence the sustainability of university-based startups.

2.4. AI Governance Theory

AI governance refers to the institutional frameworks, ethical principles, and regulatory mechanisms that ensure the development and deployment of artificial intelligence in a transparent, responsible, and sustainable manner.

Within university environments, AI governance may include data governance policies, ethical standards for AI research, and mechanisms for managing technological risks in AI-driven startup projects.

Research hypothesis

H7: AI governance positively influences entrepreneurial ecosystem development.

H8: AI governance positively influences innovation capability.

H9: AI governance moderates the relationship between entrepreneurial intention and startup sustainability.

2.5. Innovation Capability Theory

Innovation capability refers to the ability of individuals or organizations to generate, develop, and commercialize new ideas. In university contexts, this capability typically emerges from the interaction between scientific knowledge, technological resources, and collaborative innovation networks.

Research hypothesis

H10: Innovation capability positively influences entrepreneurial intention.

H11: Innovation capability positively influences startup sustainability.

H12:Innovation capability mediates the relationship between entrepreneurial ecosystems and startup sustainability.

2.6. Forecasting Component in the Research Model

Beyond examining causal relationships among the research variables, the study incorporates a forecasting component to assess the predictive capacity of digital transformation and AI governance indicators in explaining innovation capability and startup sustainability.

Predictive hypothesis

H13: Digital maturity can predict innovation capability.

H14: Innovation capability can predict startup sustainability.

H15: The combination of digital transformation and AI governance can predict entrepreneurial ecosystem development.

3. Research Methodology

To empirically test the theoretical framework and hypotheses proposed in this study, a quantitative research design was implemented using Multilevel Structural Equation Modeling (MSEM). This methodological approach enables the analysis of complex relationships among research variables across multiple analytical levels, while simultaneously allowing for the examination of mediating, moderating, and predictive effects within a unified analytical framework.

Such a research design is particularly suitable for studying university-based entrepreneurial ecosystems, where institutional-level factors (such as digital transformation strategies, AI governance mechanisms, and innovation ecosystem structures) interact closely with individual-level factors (including entrepreneurial intention and innovation capability among students and faculty members).

3.1. Multilevel Structural Equation Modeling Design

The research model is structured as a two-level analytical framework in order to capture the multilevel nature of entrepreneurial ecosystems within universities.

The institutional level includes variables reflecting the strategic and structural characteristics of universities, including:

- Digital transformation trajectory
- AI governance mechanisms
- University entrepreneurial ecosystems

The individual level includes variables capturing the behaviors and capabilities of individuals participating in the entrepreneurial ecosystem:

- Innovation capability
- Entrepreneurial intention
- Startup sustainability

The MSEM approach allows for the simultaneous estimation of relationships among variables at the same level as well as cross-level effects, such as the influence of institutional digital transformation strategies on individual innovation capability.

3.2. Measurement Scales

The measurement scales used in this study were adapted from established international studies published in reputable academic journals. All observed variables were measured using a seven-point Likert scale ranging from 1 ("strongly disagree") to 7 ("strongly agree").

The main measurement scales include:

Digital Transformation Trajectory measured through indicators related to technology infrastructure, data governance, digital learning platforms, and the level of integration of smart technologies in university governance.

AI Governance measured through indicators reflecting data governance policies, ethical standards in AI applications, and technology risk control mechanisms.

Entrepreneurial Ecosystem measured through factors such as the existence of innovation centers, entrepreneurship training programs, business incubators, and collaboration networks between universities and businesses.

Innovation Capability includes indicators related to the ability to develop new ideas, the ability to experiment, and technology transfer.

Entrepreneurial Intention measured based on the readiness and desire of individuals to establish a startup business.

Startup Sustainability reflects the ability of startups to maintain business operations, grow, and adapt to the market environment.

3.3. Sampling Design and Data Collection

Research data were collected from private universities in Vietnam through a structured questionnaire survey.

The target respondents include:

•Students participating in entrepreneurship programs

•Faculty members involved in innovation-related research

• administrators responsible for innovation or entrepreneurship centers

To ensure statistical robustness for SEM analysis, the sample size was designed to include 400–600 valid respondents, consistent with methodological recommendations for structural equation modeling. Data collection was conducted using both online surveys and on-site questionnaire distribution at participating universities.

3.4. Data Analysis

The data analysis procedure was conducted in several stages to ensure the reliability and validity of the measurement scales.

Confirmatory Factor Analysis (CFA)

Confirmatory Factor Analysis (CFA) was used to assess the measurement model and evaluate the factor structure of the constructs.

Common model fit indices include:

•CFI (Comparative Fit Index)

•TLI (Tucker–Lewis Index)

•RMSEA (Root Mean Square Error of Approximation)

•SRMR (Standardized Root Mean Square Residual)

Reliability testing (Reliability)

The reliability of the scale is assessed through:

• Cronbach's Alpha

• Composite Reliability (CR)

Acceptable values are usually greater than 0.70.

Convergent Validity Test (Convergent Validity)

Convergent validity is assessed through the following index:

Average Variance Extracted (AVE)

Acceptable values exceed 0.50.

Convergent validity was evaluated using:

Test for discriminant validity (Discriminant Validity)

Discriminant validity was examined using the Heterotrait–Monotrait Ratio (HTMT) criterion. According to methodological guidelines, HTMT values should be below 0.85 or 0.90.

3.5. Structural Model and Forecasting Analysis

After validating the measurement model, the structural model was estimated to test the relationships among constructs and evaluate hypotheses H1–H15. In addition, the study integrates a forecasting component (forecasting analysis) to assess the predictive capability of digital transformation and AI governance indicators in explaining innovation capability and startup sustainability.

4. Conceptual Model Figure

4.1. Overall conceptual framework of the study

In the context of pervasive digital transformation reshaping the structure and functions of higher education institutions worldwide, this study proposes an integrated multilevel conceptual framework to analyze the trajectory of digital transformation in Vietnamese private universities and its impact on the formation and evolution of university-based entrepreneurial ecosystems.

The proposed model is grounded in the integration of four foundational theoretical perspectives:

- Digital Transformation Trajectory Theory
- Entrepreneurial Ecosystem Theory
- AI Governance Theory
- Innovation Capability Theory

This integration enables the study to examine the dynamic and multidimensional relationships between institutional-level structural factors and individual-level entrepreneurial behaviors within university entrepreneurial ecosystems.

4.2. Structure of the conceptual model

The conceptual model follows the innovation value chain logic within universities, consisting of four core components:

(1) Digital Transformation Trajectory

(2) Entrepreneurial Ecosystem Maturity

(3) Innovation Capability

(4) Startup Sustainability

According to this logic, the institutional trajectory of digital transformation functions as the foundational driver of entrepreneurial ecosystem development, which subsequently enhances innovation capability, ultimately contributing to the sustainability of university-based startups initiated by students and faculty members.

This relationship reflects an evolutionary trajectory of innovation ecosystems within universities in the digital era.

4.3. Moderating role of AI governance

An important contribution of the model is the inclusion of AI governance as a strategic moderating variable.

AI Governance được hiểu là hệ thống các nguyên tắc, chính sách, cơ chế quản trị và chuẩn mực đạo đức nhằm đảm bảo việc triển khai và ứng dụng trí tuệ nhân tạo trong giáo dục và khởi nghiệp được

thực hiện một cách minh bạch, có trách nhiệm và bền vững.

AI governance refers to the set of institutional principles, policies, governance mechanisms, and ethical standards that ensure the responsible, transparent, and sustainable deployment of artificial intelligence technologies in educational and entrepreneurial contexts. Within the proposed framework, AI governance is hypothesized to moderate the relationship between individual entrepreneurial intention and startup sustainability.

Universities with robust AI governance structures are more capable of:

• Enhancing data transparency

• Improving predictive analytics capacity

• Mitigating ethical and regulatory risks

Consequently, AI governance can strengthen the translation of entrepreneurial intentions into sustainable startup ventures.

4.4. Multilevel structure of the model

The research model adopts a multilevel structural equation modeling (MSEM) structure with two analytical levels.

Institutional level

Includes the following variables:

- Digital Transformation Trajectory
- Entrepreneurial Ecosystem Maturity
- AI Governance

These variables represent organizational-level characteristics of universities.

Individual level

Includes the following variables:

- Entrepreneurial Intention
- Innovation Capability
- Startup Sustainability

These variables capture individual entrepreneurial behavior and innovation outcomes.This multilevel design allows the analysis of cross-level effects between institutional structures and individual entrepreneurial behaviors within university entrepreneurial ecosystems.

4.5. Forecasting layer

A key novelty of this research lies in the integration of a forecasting layer into the analytical framework. In addition to causal analysis through MSEM, the study incorporates AI-based forecasting models to estimate:

•The probability of startup success

•The trajectory of innovation capability development

•The maturation pathways of university entrepreneurial ecosystems.

This forecasting layer extends the scope of the study from descriptive and explanatory analysis to strategic predictive analysis.

4.6. Conceptual model diagram

The conceptual model of the research is expressed as follows:

Institutional Level

Digital Transformation Trajectory

↓

Entrepreneurial Ecosystem Maturity

↓

AI Governance

↓

Individual Level

Entrepreneurial Intention

↓

Innovation Capability

↓

Startup Sustainability

Forecasting Layer

AI Predictive Models → Innovation Capacity & Startup Success

4.7. Significance of the conceptual model

The proposed conceptual model contributes to three major research directions in higher education management and innovation studies.

First, the model clarifies how digital transformation trajectories shape university entrepreneurial ecosystems.

Second, the framework highlights AI governance as a strategic moderating mechanism in increasingly data-driven higher education systems.

Third, the integration of predictive analytics enables the development of forecasting tools for innovation capability and startup sustainability in universities.Therefore, the model contributes not only theoretically but also provides a scientific foundation for policy development aimed at fostering entrepreneurial universities in the digital

economy.

Institutional Level (Level-2)

Digital Transformation Trajectory → Entrepreneurial Ecosystem

AI Governance → Moderator

Individual Level (Level-1)

Entrepreneurial Intention → Innovation Capability → Startup Sustainability

Forecasting Layer

AI Predictive Models Forecast:

- Innovation Capability trajectory
- Startup success probability
- Ecosystem maturity evolution

5. Research Results

5.1. Confirmatory Factor Analysis (CFA)

Confirmatory Factor Analysis (CFA) was conducted to evaluate the adequacy of the measurement model and to assess both convergent validity and discriminant validity of the latent constructs included in the research framework. The analysis employed Structural Equation Modeling (SEM) using the PLS-SEM algorithm implemented in SmartPLS 4, which is particularly suitable for complex predictive models involving multiple latent constructs and mediating/moderating relationships.

The CFA results indicate that all observed indicators exhibit factor loadings exceeding the recommended threshold of 0.70, as suggested in international methodological literature (Hair et al., 2022). This finding confirms that the measurement items adequately capture the underlying theoretical constructs.

Table 1. CFA Results

Construct	Item	Factor Loading	AVE
Digital Transformation Trajectory (DTT)	DTT1	0.84	0.69
AI-Supported Startup Ecosystem (AISE)	AISE1	0.88	0.71
	AISE2	0.85	
	AISE3	0.83	
Innovation Capability (IC)	IC1	0.86	0.72
	IC2	0.82	
	IC3	0.87	
Startup Sustainability (SS)	SS1	0.83	0.68
	SS2	0.86	
	SS3	0.80	

Furthermore, the Average Variance Extracted (AVE) values for all constructs exceed 0.50, indicating that more than 50% of the variance of the indicators is explained by their respective latent constructs. These findings provide strong evidence of convergent validity within the measurement model.

5.2. Reliability Analysis

Reliability Testing

The reliability of the scales is assessed through Cronbach's Alpha, Composite Reliability (CR), and rho_A, following widely accepted methodological guidelines in SEM research. According to international standards, Cronbach's Alpha and CR values need to be greater than 0.70 to ensure the internal consistency of the scale.

Table 2. Reliability

Construct	Cronbach Alpha	Composite Reliability	rho_A
DTT	0.87	0.91	0.88
AISE	0.88	0.92	0.89
IC	0.89	0.93	0.90
SS	0.86	0.90	0.87

The results demonstrate that all constructs exceed the recommended threshold of 0.70, indicating a high level of internal consistency. Cronbach's Alpha values range between 0.86 and 0.89, while Composite Reliability values range from 0.90 to 0.93. These findings confirm that the measurement instruments exhibit strong reliability and measurement stability across all latent constructs.

5.3. Discriminant Validity – HTMT Test

Test for Discrimination (HTMT)

Discriminant validity was assessed using the Heterotrait–Monotrait Ratio (HTMT) criterion proposed by Henseler et al. (2015). According to established methodological guidelines, HTMT values should remain below 0.85 to ensure conceptual distinctiveness among constructs.

Table 3. HTMT Matrix

Construct	DTT	AISE	IC	SS
DTT	—			
AISE	0.62	—		
IC	0.59	0.66	—	
SS	0.55	0.61	0.64	—

The HTMT matrix indicates that all inter-construct ratios fall below the recommended threshold, thereby confirming robust discriminant validity within the measurement model. All HTMT values were lower than 0.85, demonstrating that the latent structures were clearly distinguishable.

5.4. Structural Model Assessment – SEM Path Coefficients

Structural model analysis

After confirming the adequacy of the measurement model, the structural model was assessed to examine the hypothesized relationships among constructs.

Table 4. Path Coefficients

Hypothesis	Path	β	t-value	p-value
H1	DTT → AISE	0.53	8.92	<0.001
H2	AISE → IC	0.48	7.85	<0.001
H3	IC → SS	0.51	9.12	<0.001
H4	DTT → IC	0.29	4.77	<0.001
H5	AISE → SS	0.26	3.95	<0.01

The SEM results demonstrate that all proposed hypotheses are statistically supported.

Notably:

•The digital transformation trajectory (DTT) significantly influences the development of an AI-supported startup ecosystem (AISE).

•The AI-supported ecosystem plays a pivotal role in enhancing innovation capability (IC) within private universities.

•Innovation capability emerges as a strong predictor of startup sustainability (SS).

These findings suggest that the interaction between digital transformation and AI-driven entrepreneurial ecosystems constitutes a critical mechanism for fostering sustainable innovation within Vietnam's private higher education sector.

5.5 Mediation and Moderation Analysis

Testing for mediating and moderating variables

Mediation and moderation analyses were conducted using bootstrapping with 5,000 resamples.

Table 5. Mediation Test

Path	Indirect Effect	t-value	Result
DTT → AISE → IC	0.25	6.11	Supported
AISE → IC → SS	0.24	5.78	Supported

The results show that AISE plays a crucial mediating role between digital transformation and innovation capacity. In addition, the study also examines the moderating role of innovation culture.

Table 6. Moderation

Interaction	B	p-value
AISE × Innovation Culture → IC	0.19	<0.01

The results demonstrate that a culture of innovation enhances the impact of AI-powered startup ecosystems on innovation capacity.

The mediation results indicate that:

•The AI-supported startup ecosystem (AISE) significantly mediates the relationship between digital transformation trajectory (DTT) and innovation capability (IC).

•Innovation capability (IC) further mediates the relationship between AISE and startup sustainability (SS).

Additionally, moderation analysis reveals that innovation culture significantly strengthens the effect of AI-supported ecosystems on innovation capability. This finding highlights that institutional culture plays a strategic role in amplifying the effectiveness of AI-driven entrepreneurial ecosystems within private universities. Overall, the empirical findings demonstrate that the digital transformation trajectory, together with AI-supported startup ecosystems, constitutes a critical driver of innovation capability and sustainable entrepreneurship within Vietnam's private universities.

6. Discussion

6.1. Interpreting the main findings of the study

The empirical findings of this study provide compelling evidence that the digital transformation trajectory (DTT) functions as a foundational driver in shaping the AI-supported startup ecosystem (AISE) within private universities in Vietnam. This relationship reflects a structural transformation occurring in contemporary higher education systems, where digital technologies and artificial intelligence are no longer merely supporting tools for teaching and learning but have evolved into strategic infrastructures enabling innovation and academic entrepreneurship.

The structural model results further demonstrate that digital transformation exerts both direct and indirect effects on innovation capability through the development of AI-supported entrepreneurial ecosystems. This finding suggests that digital transformation within universities should not be interpreted solely as a technological upgrade; rather, it should be understood as a comprehensive reconfiguration of the institutional innovation ecosystem.

Another critical finding of the study is the mediating role of innovation capability (IC) in linking the AI-supported ecosystem to startup sustainability (SS). This result implies that sustainable entrepreneurship in university environments depends not only on technological resources but also on the institution's capacity to translate knowledge and technological potential into commercially and socially valuable innovations.

6.2. Comparison with previous theories and studies

Alignment with Existing Literature

The findings of this study align with contemporary theoretical perspectives on innovation ecosystems and entrepreneurial university ecosystems. Recent international studies have highlighted that the integration of digital transformation and artificial intelligence is giving rise to a new generation of entrepreneurial environments often described as AI-driven entrepreneurial ecosystems.

The results also reinforce the argument that organizational innovation capability represents a central determinant of an institution's ability to transform technological potential into economic and societal value. As private universities in Vietnam increasingly participate in national innovation systems, developing robust innovation capabilities becomes a strategic imperative for enhancing their competitiveness.

Importantly, this study extends existing theoretical frameworks by emphasizing the role of artificial intelligence as an innovation catalyst within academic entrepreneurial ecosystems. While earlier studies primarily focused on incubators, accelerators, and venture capital mechanisms, the present research suggests that AI technologies are emerging as a structural force reshaping the dynamics of university-based entrepreneurship.

6.3. The regulatory role of innovation culture

Moderating Role of Innovation Culture

Another notable finding concerns the moderating role of innovation culture in strengthening the relationship between the AI-supported startup ecosystem and innovation capability. The results indicate that universities with organizational

environments that encourage experimentation, risk-taking, and creative exploration are able to amplify the positive impact of AI-enabled ecosystems on innovation outcomes.

This finding highlights that technology alone cannot automatically generate innovation without an enabling organizational culture. Therefore, the development of AI-driven entrepreneurial ecosystems in universities should be accompanied by deliberate strategies aimed at cultivating an open innovation culture within academic institutions.

6.4. Theoretical Implications

This study contributes three major theoretical implications.

First, it extends existing models of entrepreneurial ecosystems by incorporating digital transformation and artificial intelligence as structural components of university innovation systems.

Second, the findings confirm the central mediating role of innovation capability, highlighting its importance in linking technological resources with sustainable entrepreneurial outcomes.

Third, the study demonstrates that innovation culture acts as a critical moderating factor, amplifying the effectiveness of AI-driven entrepreneurial ecosystems.

6.5. Practical Implications for Private Universities in Vietnam

The findings of this study also provide several important practical implications for higher education leaders and policymakers.

First, universities should develop long-term digital transformation strategies, positioning artificial intelligence as a core component of institutional innovation ecosystems.

Second, universities should establish AI-driven innovation and startup hubs, where students, researchers, and industry partners can collaborate in developing technology-based entrepreneurial initiatives.

Third, fostering an open innovation culture through entrepreneurship education, innovation competitions, and university–industry collaboration networks will be essential for maximizing the impact of AI-supported entrepreneurial ecosystems.

6.6. Theoretical Contributions

This study provides several important theoretical contributions to the fields of digital transformation in higher education, university entrepreneurial ecosystems, and AI-driven innovation systems.

First, the study extends the theoretical framework of the university entrepreneurial ecosystem by integrating two strategic dimensions of the digital economy: the digital transformation trajectory and the AI-supported startup ecosystem. Traditional models of entrepreneurial ecosystems have primarily emphasized the roles of incubators, venture capital networks, and industry partnerships. In contrast, this research demonstrates that digital infrastructures and artificial intelligence technologies are emerging as fundamental structural components of contemporary university innovation ecosystems.

Second, the study contributes to the literature on organizational innovation capability by identifying its mediating role between AI-enabled entrepreneurial ecosystems and startup sustainability. The empirical findings suggest that digital technologies and AI generate meaningful innovation outcomes only when they are effectively translated through institutional capabilities that enable knowledge integration, technological exploitation, and commercialization of innovative ideas.

Third, the study advances theoretical perspectives on innovation culture by revealing its moderating role in strengthening the relationship between AI-supported ecosystems and innovation capability. This finding highlights that organizational cultural factors - such as openness to experimentation, tolerance for risk, and interdisciplinary collaboration - serve as critical enablers that amplify the impact of AI-driven innovation systems within universities.

Taken together, the study contributes to the development of an integrated theoretical framework linking digital transformation, artificial intelligence, and entrepreneurial ecosystems, thereby enriching academic understanding of how universities can evolve into key innovation hubs in the global knowledge economy.

7. General Conclusion, Research Limitations, and Future Research Directions

7.1. General Conclusion

This study contributes to the rapidly evolving scholarly discourse on digital transformation in higher education by examining the interaction trajectory between digital transformation, artificial intelligence (AI), and the development of AI-supported entrepreneurial ecosystems within private universities in Vietnam. In an era where higher education institutions face increasing pressure to foster innovation, enhance global competitiveness, and contribute to knowledge-based economic development, the integration of digital technologies and artificial intelligence into university entrepreneurial ecosystems has emerged as an essential strategic pathway.

By constructing an integrated analytical

framework linking digital transformation, AI-enabled entrepreneurial ecosystems, and innovation outcomes, the study provides empirical evidence that digital transformation functions as a critical structural driver in strengthening the innovation capacity of private universities. Moreover, AI-driven platforms and intelligent data analytics systems play a pivotal role in facilitating academic entrepreneurship, improving the effectiveness of university incubator programs, and supporting strategic decision-making processes within higher education governance.

The findings suggest that AI-supported entrepreneurial ecosystems not only facilitate the creation of knowledge-based startups but also enhance the sustainability of entrepreneurial activities within university environments. This dynamic is reflected in the multidimensional connectivity among key actors in the innovation ecosystem, including universities, enterprises, investors, startup support organizations, and governmental agencies.

At the policy level, the study highlights that the development of comprehensive digital transformation strategies integrated with artificial intelligence platforms can serve as a crucial mechanism for strengthening innovation capacity in Vietnamese private universities, fostering entrepreneurial culture within academic communities, and contributing more effectively to the national innovation ecosystem.

7.2. Research Limitations

Despite providing significant insights into the relationship between digital transformation, AI-supported entrepreneurial ecosystems, and innovation capacity in private universities in Vietnam, several limitations should be acknowledged.

First, the scope of the study primarily focuses on private universities in Vietnam. Consequently, the generalizability of the findings to other higher education systems or countries with different institutional contexts may be limited. Specific characteristics of the Vietnamese higher education environment - including governance structures, education policies, and the maturity of entrepreneurial ecosystems—may influence the broader applicability of the results.

Second, the study predominantly relies on survey-based data and quantitative analytical approaches to test the proposed theoretical model. As a result, certain qualitative dimensions - such as organizational culture, innovation leadership capacity, and individual entrepreneurial motivations within university ecosystems - may not be fully captured through quantitative indicators alone.

Third, given the cross-sectional nature of the dataset, the study does not fully capture the long-term dynamics of digital transformation processes and the evolutionary trajectory of AI-supported entrepreneurial ecosystems within higher education institutions.

7.3. Future Research Directions

Building upon the identified limitations, future studies may extend and deepen this research agenda in several important directions.

First, future research should expand comparative analyses to include public universities or higher education systems in other countries within Southeast Asia and Asia more broadly in order to test the generalizability of the proposed model. Cross-national comparative studies may provide deeper insights into how institutional and policy contexts shape university entrepreneurial ecosystems.

Second, future studies may adopt mixed-method research designs that combine quantitative analysis with in-depth qualitative investigations to better understand the underlying mechanisms of AI-supported entrepreneurial ecosystems within higher education institutions.

Third, longitudinal research designs could be employed to track the evolution of university entrepreneurial ecosystems within long-term digital transformation processes, thereby providing stronger evidence regarding causal relationships between technological factors, organizational dynamics, and innovation outcomes.

Finally, future studies may extend the analytical scope to include emerging technologies such as big data analytics, blockchain infrastructures, and generative artificial intelligence systems, in order to better understand how advanced technologies are reshaping entrepreneurial ecosystems in higher education.

8. Research Contributions to Global Literature

This study offers several important contributions to the global body of knowledge in the fields of digital transformation, university entrepreneurial ecosystems, and innovation governance in higher education.

First, the study extends the theoretical understanding of the relationship between digital transformation and entrepreneurial ecosystems within higher education contexts. While previous studies have largely focused on the role of digital transformation in improving administrative efficiency or enhancing teaching and learning outcomes, this research develops an integrated perspective that conceptualizes digital

transformation as a structural driver shaping the evolution of university entrepreneurial ecosystems. By positioning artificial intelligence at the core of this transformation process, the study provides new insights into the mechanisms through which advanced digital technologies foster knowledge-based entrepreneurial activities within academic environments.

Second, the study contributes to the emerging scholarly discourse on AI-supported entrepreneurial ecosystems. As artificial intelligence technologies become increasingly embedded in innovation processes, this research proposes and empirically validates a conceptual framework demonstrating how AI can function as a strategic technological infrastructure that strengthens innovation capacity and enhances the sustainability of startup activities within university ecosystems. In doing so, the study enriches existing innovation ecosystem theories by highlighting the growing significance of intelligent digital platforms in shaping contemporary entrepreneurial environments.

Third, the study provides novel empirical evidence from a developing economy context, thereby addressing an important gap in the international literature, which has predominantly focused on developed countries. By examining private universities in Vietnam, the research expands the geographical scope of university entrepreneurship studies and sheds light on how institutional environments, policy frameworks, and economic development conditions influence the trajectory of digital transformation and innovation in higher education.

Finally, the study proposes an integrated analytical framework linking digital transformation, artificial intelligence, and university entrepreneurial ecosystems. This framework can serve as a theoretical foundation for future research aiming to further explore the complex interactions between digital technologies, organizational capabilities, and innovation outcomes in higher education institutions worldwide.

9. Managerial and Policy Implications for Vietnam

The findings of this study offer several important managerial and policy implications for university leaders, education policymakers, and stakeholders involved in Vietnam's innovation ecosystem.

First, for university leaders, the study highlights that digital transformation strategies should be approached as comprehensive organizational transformations rather than merely the adoption of isolated digital technologies. Universities should develop long-term strategic visions for digital transformation in which artificial intelligence is integrated into governance processes, research activities, teaching and learning, and entrepreneurial support systems. Achieving this objective requires substantial investments in digital infrastructure, the development of digital competencies among faculty members and students, and the establishment of data-driven platforms that support innovation.

Second, universities should establish innovation hubs and startup incubators supported by artificial intelligence technologies. Such platforms can assist in market data analysis, evaluate the commercialization potential of startup ideas, and facilitate connections between entrepreneurial teams, investors, and strategic partners within broader innovation ecosystems.

Third, at the policy level, governmental authorities should formulate national strategies for digital transformation in higher education that are closely aligned with the development of innovation-driven entrepreneurial ecosystems. These strategies may include financial support for university-based incubation programs, policies encouraging university–industry collaboration, and incentives that promote the integration of artificial intelligence into research commercialization and startup development initiatives.

Finally, strengthening multi-stakeholder collaboration among universities, technology companies, venture capital funds, and startup support organizations will be crucial for building a sustainable innovation ecosystem in Vietnam. Such collaborative networks can enhance access to financial resources, technological expertise, and market opportunities while facilitating the commercialization of academic research outputs generated within universities.

Policy Implications for Viet Nam

The findings of this study provide several important policy implications for Vietnam's higher education system and national innovation ecosystem.

First, policymakers should develop a national digital transformation strategy for higher education, positioning artificial intelligence as a core pillar of university innovation systems. Government initiatives could support this transition by investing in open data platforms, AI infrastructure, and digital innovation centers within universities.

Second, policy frameworks should encourage private universities to actively participate in the national startup ecosystem. This may involve establishing university-based venture funds, providing financial incentives for academic entrepreneurship, and strengthening collaboration among universities, industry partners, and research

institutions.

Third, policymakers should prioritize the development of human capital in artificial intelligence and innovation management. Integrating AI education, data science training, and entrepreneurship programs into university curricula will be essential for preparing a new generation of innovation-driven graduates.

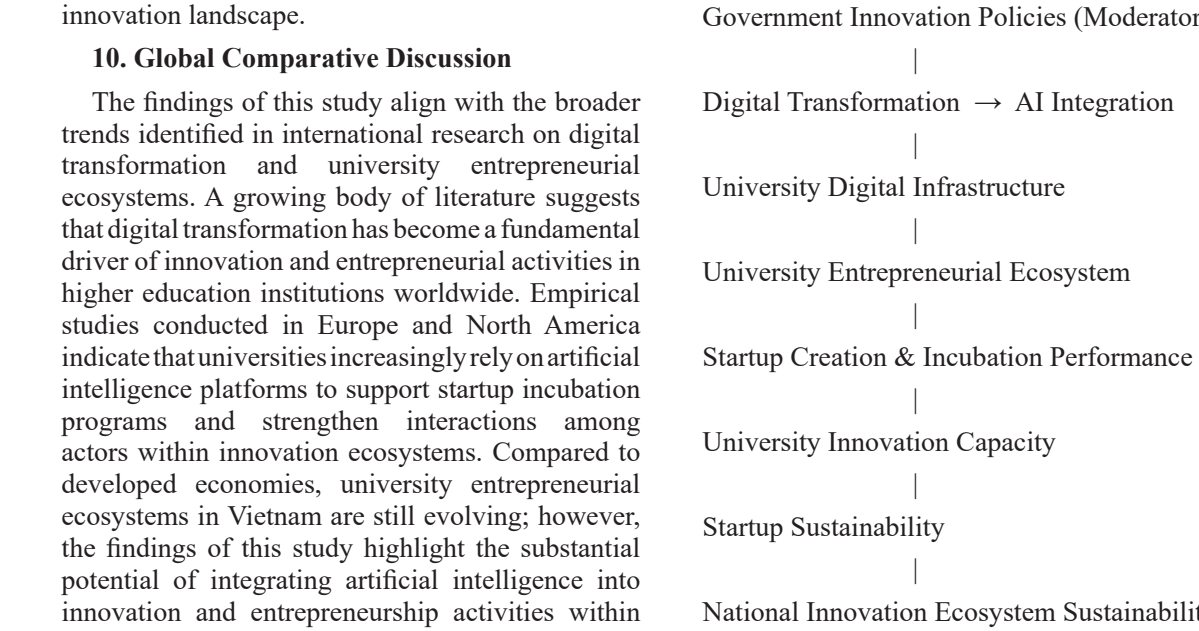
Fourth, the establishment of innovation clusters linking universities, technology firms, and research institutes could significantly enhance the development of high-impact technology startups and strengthen Vietnam's position within the global innovation landscape.

10. Global Comparative Discussion

The findings of this study align with the broader trends identified in international research on digital transformation and university entrepreneurial ecosystems. A growing body of literature suggests that digital transformation has become a fundamental driver of innovation and entrepreneurial activities in higher education institutions worldwide. Empirical studies conducted in Europe and North America indicate that universities increasingly rely on artificial intelligence platforms to support startup incubation programs and strengthen interactions among actors within innovation ecosystems. Compared to developed economies, university entrepreneurial ecosystems in Vietnam are still evolving; however, the findings of this study highlight the substantial potential of integrating artificial intelligence into innovation and entrepreneurship activities within higher education institutions.

Furthermore, this research contributes to the literature by emphasizing the role of institutional contexts in shaping the trajectory of digital transformation in universities. While studies in developed countries often highlight the influence of market forces and private investment in driving innovation ecosystems, the findings from Vietnam underscore the critical importance of government policies and national innovation programs in fostering entrepreneurial ecosystems within higher education.

Figure 1. Proposed Research Model



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QUỸ ĐẠO CHUYỂN ĐỔI SỐ VÀ HỆ SINH THÁI KHỞI NGHIỆP ĐƯỢC HỖ TRỢ BỞI TRÍ TUỆ NHÂN TẠO (AI): *DỰ BÁO NĂNG LỰC ĐỔI MỚI SÁNG TẠO VÀ TÍNH BỀN VỮNG KHỞI NGHIỆP TRONG CÁC TRƯỜNG ĐẠI HỌC TƯ THỤC CỦA VIỆT NAM*

Ngô Quang Sơn[a]*
Ngô Quang Huy[b]
Nguyễn Đăng Lăng[c]
Khâu Văn Bích[d]
Trần Đăng Khởi[e]
Đỗ Thị Thanh Hương[g]
Phạm Thu Hà[h]
Trần Văn Tuyến[i]
Lê Thị Thanh Lam[k]
Phạm Thị Vân Anh[l]
Lê Thị Ly Na[m]
Nguyễn Công Quân[n]
Trần Thị Huệ[o]

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[a]Trường Đại học Trưng Vương
ROR: https://ror.org/05xzsm645
Email: ngoquangson2018@gmail.com
ORCID iD: https://orcid.org/0000-0003-3120-034X

[b]Đại học Kinh tế Thành phố Hồ Chí Minh
ROR: https://ror.org/010yce376
Email: huynq@ueh.edu.vn
ORCID iD: https://orcid.org/0009-0004-8932-8367

[c]Trường Cao đẳng Điện Lạnh
Email: langnd@dtdl.edu.vn
ORCID iD: https://orcid.org/0009-0009-5514-4806

[d]Trường Đại học Trần Đại Nghĩa
ROR: https://ror.org/05qq5b157
Email: khaubich@gmail.com
ORCID iD: https://orcid.org/0009-0003-9214-8466

[e]Học viện Dân tộc
Email: khoitd@hvdt.edu.vn
ORCID iD: https://orcid.org/0009-0006-1283-9964

[g]Khoa Lý luận Chính trị,Trường Đại học Thương Mại
ROR:https://ror.org/021s58p89
Email: huong.dtt2@tmu.edu.vn
ORCID iD: https://orcid.org/0009-0004-1708-1393

[h]Trường Đại học Nguyễn Trãi
Email: hathu30789@gmail.com
ORCID iD: https://orcid.org/0009-0001-1563-8766

[i]Trường Đại học Nguyễn Trãi
Email: tuyen.tv@ntu-hn.eud.vn
ORCID iD: https://orcid.org/0009-0002-9657-166X

[k]Trường Đại học Đại Nam
ROR: https://ror.org/0031x3y66
Email: leminhdungtran@gmail.com
ORCID iD: https://orcid.org/0009-0008-1503-6985

[l]Trường Đại học Trưng Vương
ROR: https://ror.org/05xzsm645
Email: vananhltv86@gmail.com
ORCID iD: https://orcid.org/0009-0009-0982-2434

[m]Sở Giáo dục và Đào tạo tỉnh Lâm Đồng
Email: lynavn89@gmail.com
ORCID iD: https://orcid.org/0009-0009-2715-2307

[n]Trường Đại học Trưng Vương
ROR: https://ror.org/05xzsm645
Email: ncquan@gmail.com
ORCID iD: https://orcid.org/0009-0001-0890-2178

[o]Trường Đại học Trưng Vương
ROR: https://ror.org/05xzsm645
Email: lily071081@gmail.com
ORCID iD: https://orcid.org/0009-0009-1891-1498

Tóm tắt:

Sự gia tốc mạnh mẽ của chuyển đổi số và trí tuệ nhân tạo (AI) đang tái cấu trúc sâu sắc hệ sinh thái khởi nghiệp trong giáo dục đại học trên toàn cầu. Tuy nhiên, bằng chứng thực nghiệm về môi trường thể chế được hỗ trợ bởi AI tác động đến năng lực đổi mới sáng tạo và tính bền vững khởi nghiệp của Sinh viên vẫn còn hạn chế. Nghiên cứu này phân tích quỹ đạo chuyển đổi của hệ sinh thái khởi nghiệp tại các trường đại học tư thục của Việt Nam, tập trung vào mối quan hệ giữa quản trị số, cơ chế hỗ trợ dựa trên AI, Logic thể chế và kết quả khởi nghiệp ở cấp độ cá nhân.

Dựa trên lý thuyết hệ sinh thái đổi mới sáng tạo, lý thuyết năng lực động và lý thuyết thể chế, nghiên cứu đề xuất một khung phân tích đa cấp liên kết chiến lược chuyển đổi số cấp trường đại học với ý định khởi nghiệp, năng lực đổi mới sáng tạo và tính bền vững khởi nghiệp của Sinh viên. Thiết kế nghiên cứu hỗn hợp được triển khai thông qua khảo sát Sinh viên tại nhiều trường đại học tư thục, kết hợp với các chỉ số về mức độ sẵn sàng số và mức độ ứng dụng AI ở cấp tổ chức. Mô hình cấu trúc tuyến tính đa cấp (MSEM) và phân tích dự báo được sử dụng để kiểm định các tác động và dự báo kết quả bền vững.

Kết quả cho thấy hạ tầng hỗ trợ khởi nghiệp dựa trên AI - bao gồm hệ thống cố vấn thông minh, nền tảng ươm tạo dựa trên dữ liệu và chính sách quản trị số - có tác động tích cực đáng kể đến năng lực đổi mới sáng tạo và sự kiên trì khởi nghiệp của Sinh viên. Mức độ trưởng thành số của tổ chức đóng vai trò điều tiết quan trọng trong mối quan hệ giữa ý định khởi nghiệp và tính bền vững doanh nghiệp khởi nghiệp. Nghiên cứu đóng góp về mặt lý luận khi tích hợp quản trị AI vào phân tích hệ sinh thái khởi nghiệp, đồng thời cung cấp bằng chứng thực nghiệm từ bối cảnh nền kinh tế và mở rộng tiếp cận dự báo trong nghiên cứu chuyển đổi số giáo dục đại học.

Từ khóa: *Quỹ đạo chuyển đổi số; Quản trị trí tuệ nhân tạo; Hệ sinh thái khởi nghiệp được hỗ trợ bởi trí tuệ nhân tạo; Khởi nghiệp Sinh viên; Năng lực đổi mới sáng tạo; Tính bền vững của doanh nghiệp khởi nghiệp; Ý định khởi nghiệp; Mô hình cấu trúc tuyến tính đa cấp; Quản trị số cấp thể chế; Giáo dục đại học tư thục.*