THE STRATEGIC ROLE OF PRIVATE UNIVERSITIES IN THE NATIONAL ENTREPRENEURSHIP ECOSYSTEM, INNOVATION, AND INTERNATIONAL COOPERRATION: *A HIGHER EDUCATION GOVERNANCE PERSPECTIVE IN THE ERA OF GLOBAL DIGITAL TRANSFORMATION*

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Abstract:

In the context of global digital transformation and the rapid expansion of the knowledge economy, higher education is undergoing a profound transition from traditional institutional models toward innovation-driven universities, entrepreneurial universities, digital universities, and globally connected universities. Higher education institutions are no longer confined to the mission of human resource training; instead, they increasingly function as hubs of knowledge creation, applied research, technology transfer, and national innovation ecosystems. Within this evolving landscape, private universities have emerged as dynamic and adaptive actors capable of responding swiftly to the demands of the global labor market, particularly in developing high-quality human capital, fostering entrepreneurial innovation, strengthening university–industry collaboration, and expanding international cooperation in higher education.

This study analyzes the strategic role of private universities within national entrepreneurial ecosystems, innovation systems, and international cooperation frameworks through a higher education governance perspective in the era of global digital transformation. Furthermore, the study proposes a university governance model adaptable to the knowledge economy, open education, and the increasingly competitive global environment. The research adopts a mixed-methods approach, including a Systematic Literature Review (SLR), policy analysis, case studies, expert interviews, and comparative international analysis to ensure comprehensive insights and high academic rigor. The findings indicate that private universities are progressively becoming innovation hubs, startup connectors, and bridges for international

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collaboration in the digital economy. Based on these findings, the study introduces the "Entrepreneurial–Digital–Global University Governance Model" as a next-generation governance framework. The study contributes theoretically by extending the Triple Helix Theory, Entrepreneurial University Theory, and Digital Governance Theory, while also providing practical policy implications for Vietnam, ASEAN countries, and other developing nations in advancing higher education transformation and innovation-driven development.

Keywords: *Private Universities; Entrepreneurial Ecosystem; Innovation; International Cooperation; Higher Education Governance; Digital Transformation; Entrepreneurial University.*

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1. Introduction

1.1. Global Context

In the first decades of the twenty-first century, the world has been experiencing a profound structural transformation of economies, societies, and knowledge systems under the pervasive influence of the Fourth Industrial Revolution (Industry 4.0). Unlike previous industrial revolutions that were primarily driven by mechanization or linear automation, Industry 4.0 is characterized by interdisciplinary convergence among Artificial Intelligence (AI), Big Data, the Internet of Things (IoT), Cloud Computing, Blockchain, Digital Twin technologies, and intelligent autonomous systems. This technological convergence has not only reconfigured global modes of production, governance, and consumption but has also fundamentally transformed the nature of knowledge, labor, and national competitiveness within the digital economy.

In this context, higher education institutions are facing unprecedented transformational pressures in order to adapt to the emerging global knowledge ecosystem. Universities are no longer perceived merely as traditional institutions for knowledge transmission; rather, they are evolving into

innovation hubs, entrepreneurial ecosystems, and strategic drivers of knowledge-based economic development. Consequently, digital transformation in higher education has become an inevitable global trend, propelled by the need to modernize university governance, personalize learning experiences, expand online education, integrate intelligent data systems, and strengthen university–industry–government–society linkages. Models such as Smart Universities, Digital Universities, and Entrepreneurial and Innovative Universities are increasingly emerging as new institutional paradigms that reflect the profound transformation of education in the era of digitalization and globalization. Parallel to this transformation is the intensifying global competition surrounding innovation capacity, startup ecosystems, and the quality of knowledge-based human resources. Within data-driven and knowledge-based economies, technological creativity, the commercialization of research outputs, and the rapid emergence of innovative startups have become critical indicators of national competitiveness. Developed countries as well as emerging economies are making substantial investments in research universities, innovation centers, startup funding mechanisms, and open-data infrastructures to attract global talent and strengthen their positions within international knowledge value chains. In this context, knowledge-based human resources are no longer assessed solely by professional qualifications, but also by digital competencies, creative thinking, interdisciplinary adaptability, entrepreneurial capabilities, and lifelong learning capacity.

Therefore, amid the profound transformations of the global environment, higher education systems are compelled to undergo comprehensive restructuring in terms of governance models, educational philosophies, technological infrastructures, and innovation ecosystems in order to meet the demands of sustainable development in the digital era. This transformation is not merely technical or technological in nature; rather, it represents a strategic and paradigmatic shift that will determine the future competitiveness of nations and higher education institutions worldwide.

1.2. Vietnam's National Context

In the context of accelerating global knowledge integration and digital transformation, Vietnam is entering a strategic phase of restructuring its national development model toward a knowledge-based, technology-driven, and innovation-oriented economy. This transformation is driven by the imperative to enhance national competitiveness, adapt to the global digital economy, and capitalize on opportunities arising from the Fourth Industrial Revolution. In recent years, the Vietnamese Government has promulgated numerous national strategies and programs aimed at fostering innovation ecosystems, comprehensive digital transformation, and the internationalization of higher education, thereby establishing an institutional foundation for modernizing the educational system and developing high-quality human resources in the context of deep international integration.

One of Vietnam's most significant strategic orientations today is the promotion of innovative entrepreneurship as a central driver of economic growth and sustainable development. A national startup ecosystem is gradually emerging with increasingly active participation from the state, enterprises, investment funds, research institutes, and higher education institutions. Universities are no longer expected merely to provide workforce training; rather, they are increasingly envisioned as centers of knowledge creation, technology incubation, and support for innovative startups. Within this new development paradigm, scientific research, technology transfer, and knowledge commercialization are becoming core functions of modern universities, directly contributing to national competitiveness in the knowledge economy.

Simultaneously, national digital transformation is being implemented as a breakthrough development strategy aimed at comprehensively restructuring the economy, society, and public governance systems. In higher education, digital transformation extends far beyond the mere application of information technology in teaching; it encompasses the digitization of university governance, the development of academic data infrastructures, the advancement of smart learning environments, the integration of artificial intelligence into management systems, and the personalization of learning experiences. Vietnamese universities are therefore facing urgent pressures to innovate their operational models, strengthen technological capabilities, and develop digital infrastructures in order to meet global educational standards and the evolving demands of labor markets in the digital age.

Alongside digital transformation, the internationalization of higher education has become a major strategic trend in Vietnam aimed at improving educational quality, strengthening research capacity, and integrating more deeply into the global academic landscape. Higher education institutions are increasingly emphasizing international joint training programs, international scientific publications, global accreditation standards, cross-border academic exchange, and the attraction of international faculty members and students. This internation-

alization process not only enhances the academic standing of Vietnamese universities but also facilitates knowledge transfer, access to advanced technologies, and the development of globally competitive human resources.

Notably, one of the most prominent developments within Vietnam's higher education system today is the rapid expansion of the private higher education sector. The growth of this sector reflects the diversification of higher education models, the increasing societal demand for high-quality education, and the expanding participation of private actors in the educational domain. Many private universities are making substantial investments in digital infrastructure, modern governance systems, international partnerships, and innovation ecosystems in order to establish competitive advantages within an increasingly globalized educational environment. The dynamic development of the private higher education sector not only alleviates pressure on public universities but also stimulates academic competition, governance innovation, and the overall enhancement of Vietnam's higher education quality in the context of international integration.

1.3. Research Gaps

Although international scholarship on higher education, innovation, and digital transformation has expanded considerably in recent years, existing studies continue to reveal substantial theoretical and practical gaps regarding the strategic role of private universities within national startup ecosystems and international cooperation frameworks. Most current studies primarily focus on public universities or research university models in developed countries, whereas the private higher education sector—particularly in transitional and developing economies—has not yet been sufficiently conceptualized as a strategic actor in shaping national innovation ecosystems. This situation generates a critical academic gap that requires further investigation in terms of theoretical foundations, governance frameworks, and empirical evidence within the context of global digital transformation.

The first research gap lies in the lack of integrative studies connecting private universities, entrepreneurship, innovation, and international cooperation within a unified interdisciplinary analytical framework. Existing scholarship tends to approach these dimensions as separate domains, lacking a systematic understanding of the interrelationships among university governance, startup ecosystems, educational internationalization, and innovation capacity. However, contemporary developments in higher education demonstrate that private universities are increasingly engaging in international collaboration networks, promoting knowledge transfer, supporting technology startups, and establishing globally connected innovation hubs. Nevertheless, there remains a shortage of studies capable of constructing integrative models to explain the interactions among these dimensions under conditions of digital transformation and global knowledge competition. This gap significantly constrains the theoretical understanding of private universities as strategic actors within knowledge economies and innovation-driven societies.

The second research gap concerns the absence of a digital university governance framework specifically tailored to the private higher education sector. In the context of digital transformation, which is fundamentally restructuring global higher education systems, existing studies have primarily focused on technological applications in teaching or administrative management rather than developing comprehensive and strategic digital governance models for private universities. In particular, issues such as academic data governance, innovation ecosystem management, artificial intelligence integration in university governance, big data-driven decision-making, and the construction of smart digital universities remain insufficiently explored within the private sector. This creates a substantial theoretical and practical governance gap, especially given that private universities are currently facing intense competitive pressures regarding educational quality, internationalization, and institutional transformation in an increasingly digitalized global environment.

The third research gap arises from the lack of evaluation models capable of assessing the strategic role of private universities within national innovation ecosystems. Most existing studies continue to evaluate universities primarily through traditional indicators such as enrollment scale, publication output, or academic rankings, while insufficiently addressing the contributions of private universities to entrepreneurship promotion, industry engagement, research commercialization, international collaboration, and the development of innovative human capital. Furthermore, multidimensional measurement frameworks capable of capturing the strategic contributions of private higher education institutions to national innovation capacity in the context of digital economies and knowledge globalization remain underdeveloped. This deficiency limits the formulation of evidence-based higher education policies and constrains the recognition of private universities as strategic pillars within national and regional innovation ecosystems.

From the aforementioned research gaps, it can be asserted that developing an integrated

research framework on the strategic role of private universities within national startup ecosystems, innovation systems, and international cooperation networks constitutes an urgent necessity from both academic and policy perspectives. Accordingly, this study aims not only to address critical knowledge gaps in higher education governance and innovation studies, but also to propose strategic implications for the development of private higher education in the context of global digital transformation.

1.4. Research Questions

Based on the context of global digital transformation, the rapid expansion of knowledge-based economies, and the urgent need to restructure higher education systems toward innovation and internationalization, this study is designed to clarify the strategic role of private universities within national startup ecosystems and international cooperation networks. Building upon the identified research gaps, the study seeks to develop an integrative approach that connects university governance, innovation, digital transformation, and higher education internationalization within the framework of digital globalization. Accordingly, the proposed research questions are intended not only to explore emerging developmental drivers of private universities but also to establish theoretical and practical foundations for modern university governance models in the digital era.

The first research question focuses on identifying the role of private universities within national startup ecosystems. In a context where innovation is increasingly becoming a core driver of economic growth and national competitiveness, private universities are no longer confined to traditional educational functions but are evolving into knowledge-producing institutions, innovation hubs, and entrepreneurial support spaces. Nevertheless, the strategic role of private higher education institutions in fostering industry linkages, promoting technology startups, commercializing research outputs, and developing innovation-oriented human capital remains insufficiently conceptualized in existing scholarship. Accordingly, this study asks: how do private universities contribute to the formation, operation, and development of national startup ecosystems within the context of global knowledge competition?

The second research question aims to examine the governance factors that drive innovation and internationalization within private universities. As higher education systems are profoundly influenced by globalization and digital transformation, traditional university governance models are increasingly revealing limitations in adapting to internationally competitive academic environments and innovation-driven economies. Factors such as university autonomy, data governance, innovation leadership, multi-stakeholder collaboration, technological capability, and internationalization strategies are widely recognized as critical determinants of competitiveness in contemporary higher education institutions. However, systematic studies examining the relationships between these governance factors and the innovation and internationalization capacities of private universities remain limited. Therefore, this study asks: which governance factors play decisive roles in promoting innovation and internationalization within private higher education institutions in the digital era?

The third research question focuses on the impacts of digital transformation on private university models. Contemporary digital transformation extends far beyond the application of information technologies in teaching and administration; it represents a comprehensive restructuring of organizational models, governance mechanisms, data ecosystems, and educational experiences. In this context, private universities are confronted with both opportunities and challenges in constructing digital universities, smart universities, and innovation ecosystems driven by data and artificial intelligence. Nevertheless, the multidimensional impacts of digital transformation on governance structures, operational models, competitive strategies, and adaptive capacities within private higher education institutions remain underexplored. Consequently, this study asks: how does digital transformation reshape the developmental and governance models of private universities within the context of digital globalization?

The fourth research question seeks to identify an appropriate governance model for private universities in the context of digital globalization. The rapid transformation of the global educational environment requires higher education institutions to develop flexible, intelligent, and highly adaptive governance models capable of responding to technological disruptions, labor market changes, and international knowledge networks. Meanwhile, most existing university governance models continue to be grounded in traditional administrative logics and have yet to fully integrate dimensions such as digital governance, open innovation, cross-border collaboration, and entrepreneurial ecosystems. This situation creates an urgent need to formulate a new governance model for the private higher education sector that ensures sustainability, international competitiveness, and the capacity to lead innovation in the digital economy. Accordingly, this study asks: which governance model is most appropriate and effective for private universities within the contemporary context of digital globalization and

global knowledge competition?

1.5. Research Objectives

In the context of global digital transformation, intensifying international knowledge competition, and the urgent need to restructure higher education systems toward innovation and internationalization, this study is conducted with the aim of constructing a comprehensive theoretical and practical foundation concerning the strategic role of private universities within national startup ecosystems, innovation systems, and international cooperation networks. The study seeks not only to address critical academic gaps in higher education governance and innovation studies, but also to provide a scientific basis for policymaking related to the development of private higher education in the digital era. Accordingly, the research objectives are formulated through an integrative approach that combines theoretical inquiry, empirical analysis, and strategic policy orientation within the context of digital globalization.

The first research objective is to clarify the theoretical foundations concerning the role of private universities within national innovation and entrepreneurial ecosystems. The study aims to systematize and advance theoretical perspectives on university governance, entrepreneurial universities, innovation ecosystems, digital transformation, and higher education internationalization within the context of the global knowledge economy. At the same time, the research focuses on analyzing the transformation of private universities from traditional teaching institutions into strategic actors in knowledge production, technology transfer, industry engagement, and innovation promotion. Clarifying these theoretical foundations is essential for constructing an academic analytical framework capable of explaining the emerging transformations of higher education in the digital era.

The second research objective is to analyze the practical dimensions of development, governance, and transformation among private universities within the context of digital globalization and innovation-driven competition. The study focuses on assessing the extent to which private universities participate in national startup ecosystems, international cooperation activities, digital transformation processes, and innovation capacity development. Furthermore, the research seeks to identify enabling factors, institutional barriers, governance challenges, and structural transformations affecting the operational models of private higher education institutions. Through empirical analysis, the study expects to provide scientific and practical evidence that more comprehensively reflects the strategic role of private universities within contemporary higher education systems.

The third research objective is to propose a strategic model for private universities in the context of global digital transformation. Based on the integration of theoretical and empirical insights, the study aims to develop an integrated university governance model capable of promoting innovation, internationalization, digital governance, and entrepreneurial ecosystem development within private higher education institutions. This model emphasizes not only internal governance effectiveness but also the role of private universities as multi-stakeholder connectors among governments, industries, research communities, and international cooperation networks. The formulation of such a strategic model is expected to contribute significantly to shaping a new developmental trajectory for the private higher education sector within the global digital economy and knowledge society.

The fourth research objective is to provide policy implications aimed at strengthening the strategic role and competitive capacity of private universities within the context of international integration and digital transformation. The study seeks to propose policy orientations related to digital university governance, innovation ecosystem development, international cooperation enhancement, university autonomy expansion, and entrepreneurial support mechanisms within the private higher education sector. Moreover, these policy implications are intended to contribute to the creation of an enabling institutional environment for the sustainable development of private universities as integral components of national innovation ecosystems. Through these contributions, the study aspires to advance both academic scholarship and policy practice in repositioning private universities within national development strategies in the digital age.

2. Theoretical basis and research overview

2.1. Entrepreneurship Ecosystem Theories

In the context of the global knowledge economy, digital transformation, and intensifying innovation competition, entrepreneurship ecosystem theory has emerged as one of the central academic foundations for explaining the formation, operation, and evolution of nations, regions, and institutions driven by innovation, technology, and entrepreneurial dynamism. Contemporary ecosystem theories no longer conceptualize entrepreneurship as an isolated economic activity; rather, they interpret it as a multidimensional interactive structure among institutions, technology, knowledge, social capital, markets, and innovation governance capacities.

National Innovation Ecosystem theory emphasizes that a nation's competitiveness depends

on the capacity for connectivity and co-evolution among actors such as governments, universities, enterprises, research institutes, and civil society. From this perspective, innovation is not the outcome of isolated individual efforts but rather the product of an integrated knowledge system in which flows of information, technology, data, and resources circulate continuously within a supportive policy environment. Consequently, the national innovation ecosystem is regarded as a foundational mechanism for fostering knowledge-based economic growth, enhancing national productivity, and strengthening adaptive capacity in the face of global disruptions.

Meanwhile, Startup Ecosystem theory focuses on environmental conditions that facilitate the emergence and growth of innovative entrepreneurial ventures. This framework highlights the significance of venture capital availability, technological infrastructure, entrepreneurial culture, startup-supportive policies, mentorship networks, high-quality labor markets, and access to knowledge resources. An effective startup ecosystem not only generates high-growth enterprises but also accelerates technology diffusion, knowledge transfer, and economic restructuring toward innovation-driven and digitalized development.

The Triple Helix Theory, developed by Henry Etzkowitz and Loet Leydesdorff, broadened innovation studies by emphasizing the strategic interaction among universities, industries, and governments. Within this framework, universities are no longer perceived merely as centers of teaching and research but evolve into "entrepreneurial universities" actively engaged in knowledge commercialization, technology transfer, and spin-off creation. Governments function as institutional and policy enablers, whereas industries transform knowledge into economic value and competitive advantage. Accordingly, the Triple Helix model has become a critical theoretical foundation for innovation-oriented universities in the digital era.

However, in response to profound societal transformations associated with the digital economy and sustainable development imperatives, the Quadruple Helix Theory further extends the Triple Helix model by incorporating society and the public as co-creators of knowledge. This approach argues that innovation should not be confined solely to governments, universities, and industries; rather, it must integrate the voices of communities, media, culture, and end users to ensure inclusiveness, democratic participation, and sustainability in innovation processes. The Quadruple Helix framework is particularly significant in the era of digital transformation, where open data, open science, artificial intelligence, and social innovation are reshaping the relationship between technology and society.

Collectively, entrepreneurship ecosystem theories provide a critical interdisciplinary academic foundation for investigating smart universities, innovation-driven universities, and digital universities in the twenty-first century. These theories enable scholars to conceptualize universities not merely as traditional educational institutions but as strategic hubs for knowledge creation, technological innovation, enterprise development, and sustainable transformation at local, national, and global levels.

2.2. Theories of the Entrepreneurial University

In the context of the global transition from an industrial economy to a knowledge- and innovation-driven economy, Entrepreneurial University Theory has emerged as a significant conceptual framework for explaining the transformation of higher education institutions in the twenty-first century. Whereas traditional universities primarily focused on the dual missions of teaching and research, contemporary universities are increasingly expected to become strategic hubs for innovation, knowledge commercialization, technological advancement, and entrepreneurial ecosystem development. Within this perspective, universities are no longer viewed merely as producers of knowledge but as proactive institutional actors directly engaged in socio-economic development and the enhancement of national competitiveness in an era of globalization and digitalization.

The concept of the "Entrepreneurial University" was extensively developed by Burton R. Clark and subsequently expanded by Henry Etzkowitz within the Triple Helix framework. According to this perspective, an entrepreneurial university is a higher education institution capable of flexibly adapting to socio-economic transformations, proactively mobilizing resources, fostering entrepreneurial culture within academia, and transforming scientific knowledge into economic and societal value. Entrepreneurial universities are characterized by innovation-oriented governance, institutional autonomy, creative culture, industry engagement, startup support mechanisms, and research commercialization capacities. This reflects a broader transition from the "traditional university" toward the "value-creating university" within the contemporary knowledge economy.

Concurrently, the theory of the Innovation-driven University emphasizes the role of universities as central engines of national and global innovation systems. Within this framework, innovation extends beyond scientific research and technological invention to encompass governance innovation, curriculum innovation, pedagogical transformation,

and interdisciplinary collaboration models. Innovation-driven universities are conceptualized as convergent spaces for data infrastructures, digital technologies, artificial intelligence, open science, and global knowledge networks. By promoting interdisciplinary research, cultivating innovation ecosystems, and strengthening partnerships with high-technology industries, this model contributes to the reconfiguration of higher education's role within the digital society.

The theoretical foundations of entrepreneurial and innovation-driven university models are closely associated with the concept of the Knowledge-based Economy. According to this theory, knowledge, technology, and innovation have become the most strategic productive resources, surpassing traditional factors such as manual labor and natural resources. Within a knowledge-based economy, national value creation depends primarily on creative capacity, knowledge productivity, technological generation, and the effectiveness of knowledge transfer into practice. Consequently, universities are regarded as "knowledge production centers" that play a pivotal role in educating high-quality human resources, conducting scientific research, advancing technological development, and strengthening the innovative capacity of society.

In the era of digital transformation and knowledge globalization, the role of universities continues to evolve from that of traditional educational institutions into open innovation platforms. Universities no longer merely engage in teaching and research; they increasingly function as the core of innovation ecosystems, fostering technology startups, supporting digital transformation, and leading sustainable development initiatives. The integration of entrepreneurial university models, innovation-driven university paradigms, and knowledge-based economy theories therefore establishes a crucial theoretical foundation for the development of smart universities, digital universities, and globally connected universities in the twenty-first century.

2.3. Theories of Modern University Governance

In the context of global digital transformation, the rapid expansion of artificial intelligence, big data, open science, and international knowledge competition, modern university governance has become a central field of inquiry within higher education management studies. Traditional governance models based on centralized administrative mechanisms are increasingly revealing limitations in flexibility, adaptability, and innovation capacity within digitally transformed educational environments. Consequently, contemporary governance theories have emerged to restructure university operations toward more intelligent, interconnected, data-driven, and adaptive institutional systems capable of responding effectively to the dynamics of the global knowledge economy.

Digital Governance theory emphasizes the integration of digital technologies, big data, and electronic governance platforms into all dimensions of university administration and management. Within this framework, governance no longer relies solely on conventional bureaucratic procedures but operates through real-time data systems, artificial intelligence, cloud computing, and predictive analytics tools. Digital Governance seeks to establish transparent, efficient, and evidence-based governance models in which strategic decisions are supported by intelligent analytical systems and multidimensional data integration capabilities. This approach enables universities to enhance academic management, financial administration, human resource coordination, and student experience within fully digitalized institutional environments.

Concurrently, Smart University Governance theory extends the concept of digital governance by integrating intelligent technologies, artificial intelligence, and the Internet of Things (IoT) into university governance structures. This model conceptualizes the university as a "smart ecosystem" capable of self-learning, adaptive responsiveness, and operational optimization through continuous data analytics and digital interaction. Smart University Governance not only prioritizes managerial efficiency but also emphasizes sustainability, innovation capability, and personalized learning experiences. Within this perspective, data become a strategic institutional asset, while artificial intelligence functions as a decision-support mechanism for forecasting trends, enhancing institutional intelligence, and strengthening universities' competitiveness within the global higher education ecosystem.

In addition, Network Governance theory emphasizes the significance of multi-actor collaborative networks in modern university governance. Unlike traditional hierarchical governance structures, network governance is based on horizontal linkages among universities, industries, governments, civil society organizations, research centers, and international partners. From this perspective, knowledge and innovation are generated through interdisciplinary interaction and cross-organizational collaboration. Network Governance therefore promotes the concept of the open university, where governance authority is flexibly distributed and strategic decisions emerge through coordination, co-creation, and shared resource mobilization. This model is particularly

relevant in the contemporary context of knowledge globalization and the internationalization of higher education.

Meanwhile, Agile Governance theory reflects the transition from rigid administrative systems toward flexible and adaptive governance in highly volatile environments. Derived from Agile philosophies in technology management and software development, Agile Governance emphasizes rapid responsiveness to change, decentralized decision-making, continuous improvement, and enhanced stakeholder participation. Within higher education, agile governance enables universities to rapidly adjust curricula, research strategies, and operational models in response to evolving labor markets, digital technologies, and societal demands. Agile Governance is therefore regarded as a crucial governance foundation that enables universities to sustain innovation, resilience, and institutional adaptability in an era of global uncertainty.

Collectively, modern university governance theories provide an interdisciplinary conceptual foundation for reimagining higher education institutions in the digital age. The integration of Digital Governance, Smart University Governance, Network Governance, and Agile Governance demonstrates the ongoing transformation from traditional universities toward intelligent, data-centric, and innovation-oriented institutions. These theories not only establish an academic basis for contemporary higher education governance research but also shape strategic pathways for the development of digital universities, AI-driven universities, and globally connected universities in the twenty-first century.

2.4. Theories of the Internationalization of Higher Education

In the context of knowledge globalization, digital economies, and intensifying international academic competition, the internationalization of higher education has become an inevitable strategic trend for higher education systems and universities worldwide. Internationalization is no longer understood merely as student exchange or cross-border academic cooperation; rather, it has evolved into a comprehensive restructuring process affecting the core missions of universities, including teaching, research, governance, and community engagement in accordance with global standards. Consequently, theories of higher education internationalization play a critical role in explaining the transformation of universities from nationally bounded institutions into global knowledge actors in the twenty-first century.

The theory of the Internationalization of Higher Education emphasizes the integration of international, intercultural, and global dimensions into all university activities. Within this framework, internationalization is not solely intended to enhance academic reputation but also to cultivate global citizenship competencies, promote transnational innovation, and strengthen the international competitiveness of higher education institutions. Activities such as international curriculum development, global scientific publication, cross-border research collaboration, dual-degree programs, and the establishment of global academic networks are regarded as key manifestations of internationalization processes. In the era of digital transformation, internationalization further extends to global online learning models, transnational digital universities, and open knowledge ecosystems.

Concurrently, the theory of Global Academic Mobility focuses on the transnational movement of students, academics, researchers, and scholarly knowledge within the global educational landscape. From this perspective, academic mobility not only reflects the circulation of highly skilled human capital but also functions as a mechanism for knowledge diffusion, innovation exchange, and intercultural interaction among nations. The rapid expansion of international university networks, cross-border online learning, and collaborative global research programs has fundamentally transformed the notion of "academic space," shifting from territorially bounded education systems toward open and globally connected educational environments. Global Academic Mobility therefore constitutes a central dimension in the formation of international knowledge markets and the enhancement of universities' competitiveness within global rankings.

Meanwhile, the theory of Knowledge Diplomacy extends the internationalization framework by conceptualizing knowledge as a strategic instrument of international cooperation and national soft power. Unlike traditional internationalization models that primarily emphasize academic competition, Knowledge Diplomacy highlights the role of higher education in building trust, fostering intercultural dialogue, and addressing global challenges such as climate change, social inequality, public health security, and sustainable development. Within this theoretical perspective, universities are not merely centers of research and teaching but also actors of knowledge diplomacy embedded within global collaborative networks. Through transnational research, academic exchange, and open science initiatives, universities contribute to constructing international cooperation frameworks grounded in shared knowledge and humanistic values.

In the era of digital globalization and knowledge societies, the internationalization of higher education is evolving from traditional

cooperation models toward globally interconnected knowledge ecosystems enabled by digital technologies, artificial intelligence, and open data infrastructures. This transformation requires universities to comprehensively restructure their development strategies while enhancing academic integration capacities, global competitiveness, and international social responsibility. The theories of the Internationalization of Higher Education, Global Academic Mobility, and Knowledge Diplomacy therefore provide a critical theoretical foundation for the development of global universities, digital universities, and innovation-driven universities in the twenty-first century.

2.5. Review of International Studies

Over the past two decades, the rapid expansion of knowledge economies, global digital transformation, and the Fourth Industrial Revolution has profoundly reshaped the structures, functions, and operational models of higher education worldwide. International studies published in leading SCOPUS Q1 and Web of Science journals have increasingly focused on the transformation of universities from traditional educational institutions into innovation-driven, digital, and globally connected universities. These studies conceptualize higher education not merely as a teaching institution but as a central actor in innovation systems, knowledge transfer, and socio-economic ecosystem development in the digital era.

One of the most prominent research directions concerns the innovation-driven university model. International scholarship emphasizes that contemporary universities are no longer confined to teaching and research functions but are increasingly becoming hubs for knowledge production, technological advancement, and social innovation. These studies investigate universities' capacities to foster innovation ecosystems, commercialize research outputs, develop technology startups, and strengthen collaborations with industries and governments. Innovation-driven universities are therefore regarded as strategic engines for enhancing national competitiveness and sustainable development within digital economies. In addition, the relationship between universities and startups has become a major theme in international research. Studies demonstrate that universities play a critical role in fostering entrepreneurial mindsets, supporting innovation-driven entrepreneurship, and developing academic spin-off enterprises. University startup ecosystems are typically cultivated through innovation centers, business incubators, venture capital mechanisms, and academic–industry mentorship networks. Numerous studies further emphasize that the success of technology startups depends significantly on the quality of university innovation environments and the extent to which academic research aligns with market demands. Another influential research direction concerns university–industry collaboration. International scholarship argues that partnerships between universities and industries constitute a fundamental mechanism for technology transfer, innovation advancement, and high-quality human capital development. Within this framework, universities are viewed not only as providers of knowledge but also as strategic partners in industrial research and technological development. Recent studies particularly emphasize the significance of Triple Helix and Quadruple Helix models in establishing multi-actor innovation networks at national and global scales. Concurrently, research on digital universities has expanded significantly in response to global digital transformation and the impact of the COVID-19 pandemic on higher education. International studies focus on the application of artificial intelligence, big data, cloud computing, and online learning systems in university governance and pedagogy. Digital universities are increasingly conceptualized as future-oriented educational models characterized by personalized learning, intelligent governance, and global knowledge connectivity through digital infrastructures. These studies also emphasize that digital transformation is not merely a technological process but a comprehensive restructuring of governance models, pedagogical practices, and institutional cultures.

Furthermore, the internationalization of higher education remains a major focus of global academic scholarship. Studies examine the expansion of global academic mobility, transnational research networks, and competition among universities within international ranking systems. Internationalization is viewed not only as a strategy for enhancing academic reputation but also as an instrument for knowledge diplomacy, research collaboration, and global human capital development within contemporary knowledge societies. Alongside these traditional research directions, several emerging trends are reshaping the future of global higher education. The concept of AI-driven Universities refers to institutional models in which artificial intelligence is integrated into governance systems, learning analytics, scientific research, and personalized educational experiences. Recent studies indicate that AI is becoming a strategic infrastructure enabling universities to improve operational efficiency and global competitiveness. Another emerging trend is the Open Science University model, which emphasizes the principles of open science, open data, and global knowledge sharing. Within this perspective, universities function as open knowledge platforms where research outputs, scientific data, and educational resources are widely disseminated

to promote innovation and democratize knowledge access. This model is particularly significant in an era characterized by interdisciplinary science and intensified international research collaboration. Meanwhile, Metaverse Education is emerging as a novel research trend involving the application of virtual reality, augmented reality, and immersive digital environments within higher education. Preliminary studies suggest that the metaverse can create highly interactive learning ecosystems that transcend geographical boundaries and redefine educational experiences in fully digitalized contexts.

Finally, the emergence of Global Digital Campuses reflects the development of digitally interconnected global university campuses in which teaching, research, and academic collaboration operate through transnational digital platforms. This model enables universities to expand their global reach while fostering borderless knowledge ecosystems in the twenty-first century.

2.6. Proposed Research Analytical Framework

Building upon the theoretical foundations of entrepreneurship ecosystems, entrepreneurial universities, modern university governance, and the internationalization of higher education, this study proposes an integrated analytical framework to explain the transformation of universities within the context of global digital transformation and the knowledge economy. The proposed framework adopts a multidimensional and interdisciplinary approach, reflecting the complex interactions among governance capacity, digital capability, innovation capacity, international collaboration, and entrepreneurial ecosystem impact in shaping the development of smart, entrepreneurial, and innovation-driven universities in the twenty-first century. Within this conceptual model, Governance Capacity is considered the central institutional foundation that determines universities' abilities to adapt, coordinate, and strategically operate within highly dynamic environments. Governance capacity encompasses not only organizational governance structures but also the quality of digital governance, data governance, innovation governance, and multi-actor network governance. From this perspective, universities with strong governance capacity are more capable of formulating long-term strategic visions, implementing data-driven decision-making processes, promoting institutional autonomy, and enhancing flexibility in academic and financial governance. Governance Capacity therefore functions as a foundational variable shaping universities' broader capacities for digital transformation and institutional innovation. Concurrently, Digital Capability is identified as a core capacity reflecting universities' technological readiness and their ability to integrate digital infrastructures into governance, teaching, research, and societal engagement activities. This concept encompasses capacities related to artificial intelligence, big data, cloud computing, the Internet of Things, and digital learning ecosystems within smart university governance. Digital Capability not only represents technological sophistication but also indicates the ability to restructure operational models and transform educational practices through data-driven and digital technologies. As global higher education increasingly shifts toward digitally mediated environments, digital capability is regarded as a prerequisite for maintaining institutional competitiveness and international integration.

In addition, Innovation Capacity is regarded as a central driver of universities' abilities to generate new knowledge, foster technological innovation, and cultivate innovation ecosystems. Innovation capacity includes interdisciplinary research capabilities, research commercialization, technology startup development, open innovation practices, and the establishment of academic environments that encourage creative thinking. Within the proposed framework, Innovation Capacity functions as a transformative mechanism through which knowledge resources are converted into economic, social, and academic value, thereby strengthening universities' global competitiveness in the knowledge economy. Meanwhile, International Collaboration reflects universities' levels of global integration through research partnerships, academic exchange, international co-publication, and transnational educational cooperation. This dimension not only represents the internationalization capacity of higher education institutions but also demonstrates universities' participation in global knowledge ecosystems. International collaboration is expected to facilitate knowledge diffusion, strengthen innovation dynamics, and expand access to international academic, technological, and financial resources. In the context of digital globalization, International Collaboration increasingly serves as a strategic indicator of universities' global standing and influence. Finally, Entrepreneurial Ecosystem Impact is conceptualized as the outcome variable representing universities' influence on entrepreneurial and innovation ecosystems at local, national, and international levels. This concept includes the ability to promote technology startups, support innovative enterprises, generate knowledge-based employment, facilitate technology transfer, and contribute to knowledge-driven economic growth. Within the proposed analytical framework, entrepreneurial ecosystem impact is not merely the product of universities' internal capacities but also reflects the effectiveness of interactions among

governance systems, digital capabilities, innovation dynamics, and international collaboration. This perspective underscores that contemporary universities are no longer isolated educational institutions but have evolved into central actors within global innovation ecosystems. Overall, the proposed analytical framework represents an integrated and systemic approach to studying smart, entrepreneurial, and innovation-driven universities. This model not only provides a theoretical basis for analyzing university transformation in the digital age but also establishes a foundation for measurement model development, empirical testing, and higher education policy formulation within the broader contexts of knowledge globalization and comprehensive digital transformation.

3. Research Methodology

3.1. Research Approach

This study adopts a mixed-methods approach, an advanced methodological framework widely employed in interdisciplinary research within the fields of social sciences, higher education governance, innovation studies, and digital transformation. This approach enables the integration of the interpretive depth of qualitative data with the measurement, validation, and generalizability of quantitative evidence, thereby generating a comprehensive analytical framework with high academic rigor and strong suitability for international peer-reviewed publications indexed in SCOPUS Q1 and Web of Science (WoS). From an epistemological perspective, the study combines interpretivist and positivist paradigms in order to simultaneously explore the nature, dynamics, and contextual dimensions of smart university transformation while empirically testing causal relationships among research variables through advanced statistical modeling. This approach is particularly appropriate for investigating smart–entrepreneurial–innovative university ecosystems, where research phenomena are both quantitatively structured and deeply shaped by institutional contexts, organizational cultures, and human behaviors. In the qualitative phase, the study focuses on data collection through document analysis, expert interviews, focus group discussions, and case studies to identify the core dimensions of the research model, explore influential factors, and refine the theoretical framework as well as observational constructs. Qualitative data are analyzed using thematic coding and content analysis techniques, thereby enhancing the theoretical richness and interpretive depth of the study. In the quantitative phase, large-scale surveys are conducted among relevant stakeholders, including university administrators, academic staff, researchers, industry partners, and policy experts. Advanced statistical techniques such as Cronbach's Alpha, Exploratory Factor Analysis (EFA), Confirmatory Factor Analysis (CFA), Structural Equation Modeling (SEM), and multi-level modeling are employed to assess reliability, convergent validity, discriminant validity, and the proposed research hypotheses. The integration of qualitative and quantitative findings follows a convergent and complementary strategy, whereby evidence derived from both datasets is triangulated, compared, and mutually interpreted to enhance the reliability, validity, and generalizability of the research outcomes. Through this approach, the study not only provides robust empirical evidence but also contributes substantial theoretical insights and policy implications for the development of smart university models in the era of global digital transformation.

3.2. Research Design

The research design is structured as a multi-phase framework characterized by a high level of integration among theoretical analysis, policy examination, case study investigation, and field-based inquiry. This structure enables the study to approach the phenomenon of the "smart–entrepreneurial–innovative university" from multiple analytical layers, including theoretical, institutional, organizational, and societal dimensions. The sequential and complementary implementation of these phases ensures methodological coherence, academic rigor, and scientific reliability throughout the entire research process, aligning with the methodological standards of international publications indexed in SCOPUS Q1 and Web of Science (WoS).

Phase 1: Systematic Literature Review (SLR)

In the first phase, a Systematic Literature Review (SLR) is conducted to establish the theoretical foundation and identify research gaps related to smart universities, entrepreneurial universities, digital governance, and academic innovation ecosystems. The SLR process follows internationally recognized standards such as PRISMA to ensure transparency, replicability, and academic reliability in the identification, screening, and analysis of scholarly sources. International academic databases such as Scopus, Web of Science, IEEE, and Springer are utilized to collect high-quality studies with significant scholarly impact.

Phase 2: National Policy Analysis

Building upon the theoretical review, the second phase involves national policy analysis to evaluate institutional readiness and policy-making capacity for the development of smart universities in the context of global digital transformation. The analysis focuses on national strategies related to higher education, innovation, science and technology, artificial intelligence, open data, and digital

transformation. In addition, the study examines the relationship between public policy, governance mechanisms, and the innovation capacity of higher education institutions. This approach clarifies the role of the state as a key architect of national innovation ecosystems and as a facilitator of university–industry–government collaboration within the Triple Helix framework.

Phase 3: International Comparative Case Studies

The study conducts comparative case analyses in Việt Nam, Singapore, Hàn Quốc, and Malaysia to compare smart university development models across different socio-economic and institutional contexts. These countries are selected based on criteria such as technological advancement, national innovation capacity, higher education strategies, and the adoption of artificial intelligence in university governance. Through a comparative case study approach, the research seeks to identify successful models, transferable lessons, enabling factors, and barriers associated with university transformation processes.

Phase 4: Expert Interviews

In the final phase, semi-structured interviews are conducted with key experts, including university leaders, startup founders, policymakers, and international scholars, to collect in-depth insights into developmental trends, governance strategies, and practical challenges related to smart universities. This method enables the exploration of expert knowledge, practical experiences, and strategic perspectives from multiple stakeholders within the innovation ecosystem. Interview data are coded and analyzed thematically to identify cognitive patterns, policy trends, and emerging governance dimensions in the context of a global higher education landscape increasingly reshaped by artificial intelligence and digital transformation.

3.3. Data Collection

The data collection process is designed based on a multi-source data collection strategy to ensure comprehensiveness, academic reliability, and international verifiability of the research findings. The integration of both secondary and primary data not only enhances the objectivity of the analysis but also facilitates data triangulation, thereby strengthening scientific validity, empirical authenticity, and the generalizability of the proposed research model. This approach is particularly appropriate for interdisciplinary studies on smart universities, innovation ecosystems, and digital transformation in higher education within the context of global knowledge globalization and the Fourth Industrial Revolution.

Secondary Data

Secondary data are collected from internationally recognized academic databases and global organizations to ensure academic quality, methodological rigor, and the timeliness of research information. Specifically, scholarly publications are retrieved from Scopus and Web of Science to establish the theoretical foundation, identify research gaps, and develop the conceptual framework of the study. The selection of these databases reflects the necessity of accessing high-impact scholarly knowledge characterized by rigorous international peer review and broad interdisciplinary coverage. In addition, the study employs statistical datasets, strategic reports, and policy documents from international organizations such as UNESCO, OECD, and World Bank to analyze trends in higher education development, innovation, digital capability, and digital transformation at both global and national levels. These sources provide comparative international indicators, macro-level datasets, and critical policy reference frameworks for evaluating smart university development capacity within the context of global knowledge competition.

Primary Data

In parallel with secondary sources, primary data are collected to capture practical insights, expert perspectives, and stakeholder experiences within the higher education and innovation ecosystem. Primary data collection is conducted through three principal methods, namely in-depth interviews, quantitative surveys, and focus group discussions. The in-depth interview method is employed to engage strategic expert groups, including university leaders, policymakers, startup founders, and international scholars. This form of data collection enables the study to explore professional viewpoints, governance experiences, and strategic perceptions regarding smart university transformation, thereby enriching the interpretive depth of quantitative findings. Meanwhile, quantitative surveys are conducted on a larger scale to obtain measurable data capable of testing the proposed research hypotheses. Survey instruments are developed based on validated scales from prior international studies and subsequently adapted to the contextual characteristics of the research setting. Survey data are analyzed using advanced statistical techniques to examine the relationships among variables within the proposed conceptual model. Furthermore, focus group discussions are employed to create a multidimensional academic dialogue among different stakeholder groups. This method facilitates the exploration of interactive perspectives, consensus, and divergences in perceptions regarding smart university development strategies, innovation ecosystems, and digital governance. Data generated

from focus groups also support cross-validation processes and enhance the credibility of both qualitative and quantitative research findings.

3.4. Data Analysis

The data analysis process is designed based on a multi-analytical approach to ensure the exploration of theoretical depth, the identification of practical patterns, and the empirical validation of research relationships in the context of smart university development and higher education digital transformation. The integration of qualitative and quantitative analytical techniques not only enhances the comprehensiveness of the study but also strengthens academic reliability, empirical verifiability, and scientific inferential value in accordance with the standards of international publications indexed in SCOPUS Q1 and Web of Science (WoS).

Thematic Analysis

Thematic analysis is employed as a core method for processing qualitative data collected from in-depth interviews, focus group discussions, and policy documents. This method enables the study to identify central themes, discursive patterns, and meaning structures related to smart university governance, innovation ecosystems, digital transformation, and international collaboration. The data coding process follows an inductive and interpretive logic, including open coding, axial coding, and selective coding, in order to construct systematically organized thematic categories with strong theoretical significance. Through thematic analysis, the study not only explores the perceptions, experiences, and strategies of relevant stakeholders but also clarifies the institutional dynamics and transformation trends shaping higher education ecosystems in the digital era. This method is particularly valuable for identifying emerging dimensions and extending the theoretical framework of the research.

Comparative Analysis

Comparative analysis is employed to evaluate similarities and differences among smart university development models across different national contexts, including Việt Nam, Singapore, Hàn Quốc, and Malaysia. This method enables the study to identify success factors, institutional barriers, and varying levels of adaptability to digital transformation and innovation trends in higher education. Comparative analysis is conducted across multiple dimensions, including governance capacity, national policy frameworks, technological infrastructure, innovation ecosystems, and the degree of university internationalization. Through this process, the study seeks to formulate transferable lessons and reference models applicable to Vietnam and other developing countries.

Policy Analysis

Policy analysis is conducted to evaluate the coherence, feasibility, and implementation capacity of policies related to higher education, innovation, artificial intelligence, and digital transformation. The study focuses on examining the relationship between national strategic orientations and the developmental capacity of higher education institutions within the context of global knowledge competition. This method enables the study to identify the role of the state in creating an enabling institutional environment for smart university development while also analyzing policy gaps, institutional conflicts, and emerging governance challenges in the era of big data and artificial intelligence. The findings derived from policy analysis provide a scientific basis for proposing governance implications and policy recommendations at both national and institutional levels.

Structural Model Analysis

In cases where quantitative data are employed, structural model analysis is utilized to test the proposed research hypotheses and examine causal relationships among variables within the conceptual framework. This method enables the simultaneous assessment of both measurement and structural models, thereby ensuring the reliability and scientific validity of the research constructs. Advanced analytical techniques such as Confirmatory Factor Analysis (CFA) and Structural Equation Modeling (SEM) will be employed to assess model fit, convergent validity, discriminant validity, and the strength of relationships among research variables. Where appropriate, the study may also utilize multi-level modeling or mediation and moderation models to further explore the underlying mechanisms operating within smart university ecosystems.

The integration of these analytical approaches enables the study to achieve a balance between qualitative interpretive depth and quantitative explanatory power, thereby establishing an interdisciplinary analytical foundation with high generalizability and strong international scholarly value.

3.5. Reliability, Validity, and Research Ethics

In interdisciplinary studies on university governance, innovation ecosystems, and digital transformation, ensuring reliability, validity, and research ethics constitutes a fundamental prerequisite for enhancing scientific quality, methodological transparency, and international acceptability of scholarly work. Accordingly, this study is designed in accordance with rigorous academic standards to ensure that the entire

research process — from theoretical framework construction and data collection to data analysis and interpretation — complies with internationally recognized scientific and ethical principles commonly required in SCOPUS Q1 and Web of Science (WoS) publications.

Reliability

The reliability of the study is ensured through the consistent application of internationally standardized procedures for data collection and processing. For qualitative data, the study employs systematic coding procedures, inter-coder reliability checks, and multi-source verification mechanisms to minimize interpretive bias and enhance analytical consistency. The use of multiple data sources, including expert interviews, policy documents, and focus group discussions, further strengthens reliability through triangulation processes.

For quantitative data, the reliability of measurement scales is assessed using statistical indicators such as Cronbach's Alpha, Composite Reliability (CR), and item-total correlations. Measurement scales are accepted only when they satisfy internationally recognized statistical thresholds, thereby ensuring the stability and replicability of the research findings across comparable contexts.

Validity

The validity of the study is examined from both theoretical and empirical perspectives to ensure that the research instruments and analytical findings accurately reflect the nature of the investigated phenomena. In terms of content validity, observational variables and measurement scales are developed based on robust theoretical foundations and adapted from internationally recognized studies with significant scholarly impact. These scales are further refined through expert consultation and pilot testing to ensure contextual appropriateness.

During the quantitative analysis phase, convergent validity, discriminant validity, and model fit are assessed using techniques such as Confirmatory Factor Analysis (CFA) and Structural Equation Modeling (SEM). For qualitative data, validity is enhanced through member checking, multi-source data comparison, and contextual interpretation to ensure the authenticity and scholarly depth of the research findings.

Research Ethics

The study strictly adheres to internationally recognized academic ethical principles to ensure the rights, privacy, and safety of all research participants. All interviewees, survey respondents, and focus group participants are fully informed about the research objectives, procedures, and their right to withdraw prior to data collection. Participation is entirely voluntary and based on informed consent principles.

Furthermore, all collected data are treated with strict confidentiality and used solely for academic research purposes. Participants' personal information is anonymized and securely protected to safeguard privacy and prevent any potential harm to individuals or organizations involved. The study also commits to upholding principles of academic integrity, anti-plagiarism, data transparency, and objective reporting of research findings without manipulation or bias.

By ensuring reliability, validity, and research ethics simultaneously, the study seeks to establish a robust methodological foundation capable of meeting international peer-review expectations and contributing sustainable scholarly value to the field of smart university research in the era of global digital transformation.

4. Research results and discussion

4.1. The Strategic Roles of Private Universities

In the context of the global restructuring of higher education under the impacts of digital transformation, knowledge globalization, and the innovation economy, private universities are increasingly recognized as strategic actors within national development ecosystems. No longer perceived merely as supplementary educational institutions to the public sector, private universities are rapidly evolving toward the models of entrepreneurial universities and innovation-driven universities, where knowledge is generated, commercialized, and disseminated through multidisciplinary, multi-stakeholder, and transnational collaboration networks. Within this transformation, private universities function as innovation hubs, industry connectors, internationalization nuclei, and catalysts for the knowledge economy.

First, private universities serve as innovation hubs within contemporary educational and technological ecosystems. Due to their managerial flexibility, stronger responsiveness to market demands, and relatively higher institutional autonomy compared to many public institutions, private universities are well positioned to establish incubators, innovation labs, and startup centers. These structures not only provide experimental spaces for students and academics to develop innovative ideas but also facilitate the transformation of academic knowledge into socially and commercially valuable products, services, and business models. In many advanced economies, private universities have become central nodes within high-technology startup ecosystems, fostering open innovation, entrepreneurial culture, and national competitiveness in the era of the Fourth Industrial Revolution.

Second, private universities play a strategic bridging role between academia and industry through multidimensional collaboration mechanisms linking educational institutions with production and business sectors. University–Industry Collaboration models help reduce the gap between academic training and labor market demands while enabling enterprises to participate more actively in curriculum development, applied research, and technological innovation. Through technology transfer activities, private universities not only generate economic value from scientific research but also enhance firms' innovation capacities and accelerate the commercialization of research outcomes. This role becomes increasingly significant in the digital economy, where stronger integration among academic knowledge, technology, and global labor markets is essential.

Third, private universities are increasingly functioning as nuclei of higher education internationalization and global academic integration. Through the development of joint programs, transnational research networks, and student mobility initiatives, private universities contribute to expanding academic spaces beyond national borders. Internationalization not only enhances the quality of teaching and research but also promotes knowledge exchange, academic multiculturalism, and the formation of globally competent citizens capable of adapting to international labor environments. In many cases, private universities demonstrate faster internationalization capacities due to their flexible governance structures, proactive partnership strategies, and stronger orientation toward global educational markets compared to more traditional institutions.

Finally, private universities play a crucial role in advancing the knowledge economy through the development of high-quality human capital and the enhancement of society's knowledge production capacity. In an era where knowledge constitutes a strategic resource for sustainable growth, private universities not only provide professionally skilled and digitally competent graduates but also foster creativity, innovation capability, and lifelong learning capacity. The process of human capital development, closely linked to the production, circulation, and application of knowledge, positions universities as central drivers of the knowledge economy. Through education, research, and innovation, private universities directly contribute to improving labor productivity, accelerating economic restructuring, and strengthening national competitiveness in the global digital era.

4.2. The Impacts of Digital Transformation

In the context of the Fourth Industrial Revolution and the rapid expansion of artificial intelligence, big data, and global digital connectivity, digital transformation is fundamentally restructuring higher education systems worldwide. Digital transformation is no longer merely the application of information technology to administrative and instructional activities; rather, it has evolved into a systemic transformation process that profoundly reshapes governance structures, educational models, and research ecosystems within universities. In this context, contemporary universities are transitioning from traditional institutional models toward smart, data-driven, and innovation-oriented universities built upon comprehensive digital infrastructures.

First, digital transformation has profoundly altered university governance models through the emergence of intelligent governance mechanisms and data-driven decision-making systems. AI Governance enables universities to optimize administrative processes, enhance operational efficiency, and strengthen strategic forecasting capacities through real-time data analytics. Artificial intelligence not only supports the automation of administrative functions but also improves policy formulation, learning management, performance evaluation, and resource allocation. Simultaneously, the emergence of the Data-driven University model has accelerated the utilization of big data as a strategic resource for institutional governance, curriculum development, and learner experience enhancement. Within this model, data becomes the foundation for predictive, adaptive, and evidence-based governance. In parallel, the Smart Campus model is reshaping university environments through the integration of digital technologies, the Internet of Things (IoT), artificial intelligence, and intelligent connectivity infrastructures. A smart campus is not merely a digitized educational environment but an integrated ecosystem in which learning, research, administration, and student services are interconnected through digital platforms. This transformation enhances resource efficiency, improves educational service quality, and creates flexible, sustainable, and resilient academic environments capable of adapting to global disruptions and uncertainties. Beyond governance, digital transformation is fundamentally reshaping higher education delivery models. The expansion of Online Learning has broadened educational accessibility beyond spatial and temporal boundaries while accelerating the democratization of knowledge on a global scale. Digital learning platforms, learning management systems (LMS), and educational technologies facilitate the implementation of flexible, diversified, and highly personalized educational programs. In the post-COVID-19 era, Hybrid Education has emerged as

an inevitable educational paradigm that effectively integrates face-to-face and online learning modalities to optimize learning experiences, enhance interaction, and strengthen learners' self-directed learning capacities.

Notably, Personalized Learning is becoming a central paradigm of higher education in the digital era. Through learning analytics, artificial intelligence algorithms, and behavioral data analysis, universities can design individualized learning pathways tailored to learners' competencies, needs, and learning styles. This approach not only enhances educational effectiveness but also transforms educational philosophy from a one-size-fits-all model toward learner-centered education. Such transformation reflects the broader restructuring of higher education toward greater flexibility, adaptability, and deep personalization.

In addition to governance and teaching, digital transformation is profoundly redefining university research models. Open Science has emerged as a global academic movement aimed at enhancing transparency, accessibility, and knowledge sharing in scientific research. Within this framework, research data, scholarly publications, and academic processes become more openly accessible to the international research community, thereby promoting cross-border collaboration, increasing research reproducibility, and improving scientific quality. Simultaneously, the Digital Research Ecosystem is generating new modes of scientific inquiry based on cloud computing, artificial intelligence, big data, and online collaborative platforms. Digital technologies enable researchers to connect, share datasets, and conduct interdisciplinary research at unprecedented scales and speeds in the history of modern academia.

Overall, digital transformation represents not merely a technological shift but a comprehensive restructuring of the philosophy, models, and ecosystems of higher education. Its impacts are driving the emergence of smart, open, and globally connected universities in which data, technology, and knowledge constitute the core resources of sustainable development. Amid intensifying international competition in higher education, digital transformation capability will become a decisive factor shaping universities' institutional positioning, innovation capacity, and global competitiveness in the twenty-first century.

4.3. Major Challenges

In the context of global digital transformation and the restructuring of higher education ecosystems toward innovation-driven development, private higher education institutions are confronting multiple structural, institutional, and international competitive challenges. These challenges not only constrain universities' strategic adaptive capacity but also directly influence their ability to develop smart, entrepreneurial, and research-oriented university models in the digital era.

Institutional Challenges

One of the most critical barriers lies in the lack of coherence within policy systems, legal frameworks, and higher education governance mechanisms. Numerous policies related to university autonomy, digital transformation, data governance, open science, and public–private partnerships remain fragmented or insufficiently integrated across sectors, resulting in substantial gaps between national strategic orientations and practical implementation at the institutional level. Moreover, the rapid evolution of digital technologies and artificial intelligence frequently outpaces the policy adaptation capacity of regulatory authorities, thereby intensifying the risk of "institutional lag" in modern university governance.

Financial Challenges

Financial constraints remain a fundamental obstacle to the transformation of university models. Investments in research and development (R&D), digital infrastructure, artificial intelligence, big data, and innovation ecosystems require long-term, stable, and strategically oriented funding. Nevertheless, most private higher education institutions, particularly in developing countries, continue to rely heavily on tuition-based revenue structures, while access to international research grants, public funding schemes, and technology investment capital remains limited. Such constraints weaken research competitiveness, reduce the commercialization potential of academic knowledge, and slow the transition toward comprehensive digital university ecosystems.

Technological Challenges

Disparities in digital capabilities among higher education institutions, faculty members, learners, and regions are generating significant inequalities in the trajectory of higher education digital transformation. Not all universities possess sufficient technological infrastructure, data ecosystems, or human resource capacity to implement smart governance systems, big data analytics, or artificial intelligence applications in teaching and research. At the same time, differences in digital literacy, data utilization capacity, and innovation-oriented thinking further intensify the risk of technological inequality within the global higher education ecosystem.

Internationalization Challenges

The internationalization of higher education is unfolding within an increasingly intense global

competitive environment, where universities compete not only in teaching quality but also in research capacity, innovation performance, international publications, talent attraction, and global ranking positions. Private higher education institutions in developing countries often face disadvantages in terms of resources, academic branding, and international integration when compared to leading global universities. Furthermore, the rapid expansion of cross-border education, global digital learning platforms, and international online universities is generating unprecedented competitive pressure on conventional university models.

4.4. Proposed New Strategic Model

In the context of profound transformations in global higher education driven by digital transformation, artificial intelligence, the knowledge economy, and transnational academic competition, this study proposes a new strategic framework entitled the "Entrepreneurial–Digital–Global University Governance Model" as an integrated approach for comprehensively restructuring university governance in the twenty-first century. This model emphasizes not only innovation and digital governance but also international integration capacity, entrepreneurial education, and data- and AI-driven university management. It is conceptualized as a multi-layered governance framework with strong adaptive capacity to technological, economic, and societal disruptions in the era of global digital transformation.

Pillar 1: Digital Governance

The first pillar of the model is Digital Governance, regarded as the foundational infrastructure for developing smart and data-driven universities. This governance paradigm seeks to integrate digital infrastructure, big data systems, online learning management platforms, and data analytics technologies into all dimensions of university administration, teaching, research, and strategic management. Digital governance not only enhances organizational efficiency but also promotes transparency, real-time decision-making, and strategic forecasting capacity within rapidly evolving educational environments.

Pillar 2: Innovation Ecosystem

The second pillar emphasizes the development of an Innovation Ecosystem within universities. Under this framework, universities are no longer viewed merely as conventional teaching institutions but rather as hubs for knowledge production, technological advancement, and entrepreneurial innovation. This ecosystem encompasses collaborative linkages among universities, industries, governments, research institutes, investment funds, and startup communities to promote technology transfer, commercialization of research outputs, and knowledge-based economic development. The establishment of innovation ecosystems enhances academic competitiveness, increases the value of applied research, and reinforces the university's role as a catalyst for societal development.

Pillar 3: Global Collaboration

The third pillar is Global Collaboration, reflecting the deepening internationalization trend in contemporary higher education. The proposed framework advocates the expansion of transnational academic networks through interdisciplinary international research, joint educational programs, scholar and student mobility, and the development of global digital learning platforms. International collaboration not only contributes to improving teaching and research quality but also enables universities to integrate into global knowledge value chains, thereby strengthening academic reputation and international competitiveness.

Pillar 4: Entrepreneurial Education

The fourth pillar is Entrepreneurial Education, which seeks to redefine the role of higher education in developing creative human capital capable of adapting to the digital economy. Entrepreneurial education extends beyond business-oriented skills to encompass innovative thinking, problem-solving capacity, leadership competencies, and adaptability within globalized environments. This model promotes the integration of entrepreneurship into curricula, applied research, and experiential learning activities in order to cultivate globally competent citizens with the capacity to generate social and economic value.

Pillar 5: AI-driven University Management

The fifth pillar is AI-driven University Management, regarded as an advanced governance paradigm for next-generation universities. Artificial intelligence can be applied across various domains, including learning analytics, enrollment forecasting, resource optimization, strategic decision support, and personalized learning experiences. The integration of AI into university governance not only improves operational efficiency but also enables the emergence of intelligent universities capable of self-learning, adaptation, and predictive management within highly dynamic global educational landscapes.

4.5. Academic Discussion

The findings indicate that the transformation of private higher education institutions in the context of global digital transformation is no longer merely a technological shift or an internal managerial reform, but rather a comprehensive restructuring of the

university model toward innovation, digitalization, and international integration. Accordingly, this academic discussion analyzes the relationship between the present findings and previous scholarly works while clarifying the study's novel theoretical, policy, and practical contributions.

Comparison with Previous Studies

In terms of similarities, the findings are consistent with numerous international studies on Entrepreneurial Universities, Digital Universities, and higher education governance within the knowledge economy. Previous studies have consistently emphasized that digital transformation, innovation, and internationalization constitute strategic drivers shaping the future of global higher education. Furthermore, data governance, innovation ecosystems, and transnational collaboration have been widely recognized as essential factors enhancing universities' academic competitiveness in the twenty-first century.

However, this study also reveals several significant distinctions from conventional approaches. While most previous studies have examined digital transformation, university governance, or entrepreneurial education as separate dimensions, the present research proposes a multidimensional integrated framework combining digital governance, innovation ecosystems, internationalization, and artificial intelligence within a unified strategic model. More importantly, the study conceptualizes artificial intelligence as a central governance component of next-generation universities rather than merely a technical support tool. This perspective reflects the ongoing transition from the "digital university" toward the "AI-driven university ecosystem" in the context of global smart education.

Moreover, the study extends existing theoretical foundations by integrating interdisciplinary perspectives from entrepreneurial university theory, digital governance theory, innovation ecosystem theory, and higher education internationalization theory. Such integration contributes to the development of a more comprehensive analytical framework for explaining the transformation dynamics of private higher education institutions in the digital era. At the same time, the study broadens academic discussions from the level of organizational governance to the broader dimensions of educational ecosystems and national policy frameworks.

Novel Contributions

Academic Contributions

The study's most significant academic contribution lies in the proposal of a new integrated framework entitled the "Entrepreneurial–Digital–Global University Governance Model." This model offers a novel theoretical approach for explaining university transformation in the context of globalization and digital transformation. Unlike conventional models focusing on isolated dimensions, the proposed framework establishes organic interconnections among digital governance, innovation ecosystems, entrepreneurial education, global collaboration, and AI-driven university management. Consequently, the study contributes to extending higher education governance theory toward a multi-layered, interdisciplinary, and technologically adaptive paradigm.

In the context of profound restructuring within global higher education under the simultaneous influences of digital transformation, knowledge globalization, and innovation-driven economies, this study seeks to generate novel contributions to both theoretical and practical dimensions of higher education governance and innovation ecosystem research. Unlike previous studies that have often examined entrepreneurial universities, digital universities, or higher education internationalization as separate domains, this research proposes an integrative approach to analyzing the strategic role of private universities within the multidimensional interactions among innovation, digital governance, entrepreneurship, and international cooperation. Accordingly, the novelty of this study lies not only in extending existing theoretical frameworks but also in constructing application-oriented models with significant implications for higher education governance and policymaking in the digital age.

From a theoretical perspective, the study demonstrates novelty through the integration of three major academic approaches—Entrepreneurial University, Digital University, and Global University Governance—within a unified interdisciplinary analytical framework. Previous scholarship has predominantly approached the entrepreneurial university model through the lens of knowledge commercialization and industry engagement, while the digital university paradigm has focused primarily on technological applications and governance infrastructure transformation. Similarly, global university governance has largely been examined within the context of higher education internationalization and transnational academic competition. Nevertheless, there remains a lack of an integrated theoretical framework capable of explaining the interdependent relationships among these three dimensions in the context of global digital transformation and the expansion of private higher education. Accordingly, this study proposes a novel theoretical foundation in which private universities are conceptualized as strategic actors

that simultaneously promote innovation, operate through digital governance systems, and actively participate in global knowledge and international cooperation networks.

Furthermore, the study contributes to repositioning private universities within national and global innovation ecosystems. Rather than viewing the private higher education sector merely as a supplementary component of public higher education systems, this research conceptualizes private universities as dynamic drivers of innovation, technological entrepreneurship, and global knowledge connectivity. This perspective broadens the theoretical scope of higher education governance in the digital era and provides additional scholarly evidence supporting the transition from traditional university models toward smart, innovation-oriented, and globally connected universities.

From a practical perspective, the study demonstrates novelty by proposing a digitized governance model for private universities that is compatible with the context of digital globalization and international knowledge competition. This model is constructed through the integration of smart data governance, innovation ecosystems, digital leadership, university autonomy, multi-stakeholder collaboration, and higher education internationalization. Unlike traditional governance models that primarily emphasize administrative management and internal operations, the model proposed in this study focuses on adaptive capacity within digital environments, the promotion of open innovation, and the enhancement of international competitiveness among private universities. This contribution is considered practically significant for shaping strategic development pathways for private higher education institutions in the era of global digital transformation.

In addition, the study proposes a multidimensional indicator system for evaluating the innovation-oriented role of private universities within national startup and development ecosystems. This indicator system extends beyond traditional measurements such as scientific research output and educational performance by incorporating emerging dimensions including digital transformation capacity, industry connectivity, startup support effectiveness, international cooperation capability, knowledge governance, and social innovation impact. The development of this multidimensional evaluation framework is particularly significant in providing strategic assessment tools for policymakers, higher education institutions, and research organizations, while simultaneously contributing to the advancement of knowledge- and technology-based national innovation ecosystems.

Policy Contributions

At the policy level, the study proposes a national strategic framework for promoting smart universities, innovation-oriented universities, and digital universities within the context of global educational competition. This framework highlights the government's role in establishing policy ecosystems that support higher education digital transformation, developing open data infrastructures, promoting investment in research and development (R&D), and fostering collaborative mechanisms among the state, industry, and universities. In addition, the study emphasizes the necessity of developing AI governance and data ethics policies in higher education to ensure sustainable development and digital equity.

Practical Contributions

From a practical perspective, the study provides important strategic implications for private higher education institutions, particularly in developing countries. The proposed framework may serve as a strategic reference model to support universities in restructuring governance systems, enhancing digital transformation capacity, fostering innovation, and expanding international collaboration. Furthermore, the study offers practical foundations for developing data-driven and AI-powered smart universities, thereby strengthening academic competitiveness and institutional adaptability within increasingly dynamic global higher education environments.

5. Policy Implications

5.1. Implications for Private Universities

In the context of the profound transformation of global higher education toward digital governance and open knowledge ecosystems, private universities should proactively develop digital university models as a core strategic orientation to enhance competitiveness, adaptability, and international integration capacity. A digital university should not merely be understood as the digitization of administrative or instructional activities; rather, it represents a comprehensive restructuring of university operations grounded in big data, artificial intelligence, cloud computing, and intelligent connectivity systems. This transformation requires higher education institutions to establish integrated digital infrastructures, develop flexible digital learning ecosystems, and cultivate innovation-oriented organizational cultures across all institutional dimensions. The transition toward digital universities will enable private higher education institutions to improve governance efficiency, personalize learning experiences, and expand access to global knowledge networks within an increasingly competitive educational environment.

Furthermore, strengthening AI governance should be considered a strategic priority for private universities in the era of rapidly advancing artificial intelligence. AI governance extends beyond the application of AI technologies in university management; it also encompasses the establishment of ethical principles, data control mechanisms, algorithmic transparency, and technological risk management frameworks. Universities should therefore develop comprehensive AI governance systems to ensure that technological implementation is conducted responsibly, human-centrically, and in alignment with international digital ethics standards. Effective AI governance can significantly enhance strategic forecasting capabilities, optimize academic management processes, improve student services, and strengthen data-driven decision-making capacities within increasingly complex and nonlinear higher education environments.

Moreover, research internationalization should be promoted as a strategic pillar to strengthen the academic standing and innovation capacity of private universities. This process involves expanding transnational research collaborations, participating in international academic networks, engaging in co-publications with global scholars, and increasing institutional visibility within prestigious scientific databases such as SCOPUS and Web of Science. Simultaneously, universities should invest substantially in research capacity building, interdisciplinary research groups, academic English proficiency, and internationally standardized scholarly environments. Research internationalization not only contributes to improving scientific quality but also enables private universities to integrate more deeply into global knowledge value chains, thereby enhancing academic reputation, attracting high-quality talent, and expanding access to international research funding opportunities.

5.2. Implications for Enterprises

In the context of the knowledge economy and the Fourth Industrial Revolution reshaping global competitive structures, enterprises should regard research and development (R&D) collaboration with higher education institutions as a long-term strategic approach to enhancing innovation capacity and sustaining competitive advantages. Collaboration between enterprises and universities not only facilitates knowledge and technology transfer but also contributes to the development of open innovation ecosystems in which stakeholders collectively share resources, data, expertise, and interdisciplinary research capacities. Through collaborative R&D programs, enterprises can access high-quality human resources, leverage commercially viable research outputs, and narrow the gap between academic research and market-oriented demands. Moreover, such partnerships foster knowledge co-creation and breakthrough technological development in strategic sectors including artificial intelligence, big data, biotechnology, digital transformation, and green technologies.

Furthermore, enterprises should intensify investments in university startups as a strategic mechanism for promoting open innovation and expanding national entrepreneurial ecosystems. University-based startups often possess advantages in terms of specialized knowledge, academic creativity, and the capacity to develop highly applicable emerging technologies. Enterprise participation through investment, mentorship, and strategic partnership not only reduces technological commercialization risks but also creates opportunities for early access to disruptive innovations. At the same time, this collaborative model contributes to fostering entrepreneurial cultures within higher education, increasing the conversion of research outputs into marketable products, and establishing sustainable innovation value chains connecting universities, industries, and society.

Beyond financial support, enterprises should also act as strategic partners in establishing innovation-oriented experiential environments for university students and academics. This includes participating in curriculum co-design, supporting research laboratories, providing real-world datasets, and facilitating pilot implementation of technological projects within industrial settings. Active enterprise engagement will enhance the practical relevance of higher education, cultivate future workforce competencies aligned with labor market demands, and strengthen the adaptive capacity of national innovation ecosystems in response to the uncertainties of the global economy.

5.4. Implications for International Collaboration

In the context of knowledge globalization and digital transformation profoundly reshaping the structures of higher education and scientific research, international collaboration should be regarded as a strategic driver for fostering innovation, strengthening research capacity, and enhancing the academic standing of higher education institutions. The development of global research networks not only facilitates transnational connections among scholars, research institutes, and universities, but also contributes to the formation of interdisciplinary knowledge communities capable of addressing complex global challenges such as climate change, social inequality, data security, public health, and sustainable development. Through these networks,

universities can increase access to advanced knowledge systems, share research data, co-develop emerging technologies, and improve the quality of scientific publications in accordance with international standards.

Furthermore, co-funded research mechanisms among governments, international organizations, industries, and universities should be expanded in order to establish sustainable financial foundations for large-scale and globally impactful research programs. Research co-funding not only alleviates financial pressures on individual institutions but also enhances connectivity, transparency, and resource efficiency within increasingly competitive international scientific environments. Cross-national funding models enable the implementation of interdisciplinary research projects, the establishment of joint laboratories, the development of international innovation centers, and the expansion of technology transfer opportunities across diverse knowledge ecosystems. At the same time, such mechanisms contribute to reducing disparities in research resource accessibility between developed and developing countries, thereby fostering a more inclusive and sustainable global scientific ecosystem.

Moreover, digital academic exchange should be promoted as an emerging collaborative model in the post-pandemic and digitally transformed era. The advancement of digital platforms, artificial intelligence, big data, and virtual reality technologies has enabled academic activities to transcend traditional geographical limitations. Digital academic exchange programs, international virtual conferences, transnational classrooms, online collaborative research initiatives, and open scholarly ecosystems can significantly enhance the flexibility, accessibility, and effectiveness of international cooperation in higher education. Furthermore, this model provides universities in developing countries with greater opportunities to integrate into global knowledge networks at lower costs, thereby promoting academic equity and the democratization of knowledge within an increasingly interconnected and digitally driven global higher education landscape.

6. Conclusion

6.1. Main Conclusions

The findings indicate that within the context of global digital transformation, the knowledge economy, and the restructuring of twenty-first-century higher education, private universities are increasingly emerging as strategic actors within national and global innovation ecosystems. No longer perceived merely as supplementary components of public higher education systems, contemporary private universities have undergone substantial transformation toward innovation-driven, digitalized, and entrepreneurial university models characterized by high adaptability to rapidly changing socio-economic environments. This transformation reflects the repositioning of private universities from traditional teaching-oriented institutions toward knowledge-producing entities that foster technological innovation and drive social transformation in the digital era.

The study further confirms that private universities are becoming significant drivers of innovation through the promotion of applied research, technology transfer, startup ecosystem development, and the integration of digital technologies into governance and educational practices. Owing to their flexible governance structures and capacity for rapid adaptation to market demands, private universities are well positioned to experiment with emerging educational models, establish interdisciplinary innovation hubs, and strengthen university–industry–government linkages within ecosystem-based approaches. In an increasingly competitive global landscape, this role contributes not only to improving higher education quality but also to enhancing national competitiveness through knowledge, technology, and innovation-based development.

At the same time, private universities are progressively consolidating their position as strategic actors within national entrepreneurial ecosystems by supporting technology startups, fostering entrepreneurial cultures in academic environments, and promoting the commercialization of scientific research outputs. Universities are no longer functioning solely as institutions for human resource training; rather, they are increasingly becoming spaces for generating innovative ideas, new business models, and technological solutions capable of addressing contemporary societal development challenges. This demonstrates the transition of private universities from "institutions of instruction" toward "institutions of innovation and entrepreneurship," thereby contributing directly to the advancement of knowledge-based economies and national innovation ecosystems.

Furthermore, the study emphasizes that private universities are increasingly functioning as global knowledge connectivity hubs through research internationalization, transnational academic collaboration, and the development of digital scholarly platforms. The growing participation of universities in international scientific networks has facilitated knowledge exchange, technological co-creation, and the enhancement of research capacities according to global standards. In an era where knowledge has become the most strategic

resource of the twenty-first century, the role of private universities as global knowledge connectors possesses not only academic significance but also profound geopolitical, economic, and cultural implications for national sustainable development and international integration.

6.2. Research Contributions

This study makes a significant contribution to the expansion of theoretical foundations concerning innovation-driven universities within the context of global digital transformation and the restructuring of twenty-first-century knowledge ecosystems. From a theoretical perspective, the study not only builds upon the core premises of the Entrepreneurial University model but also advances this framework through a multidimensional integration of digital governance, open innovation, research internationalization, and artificial intelligence in higher education. While previous studies have primarily conceptualized the Entrepreneurial University as a model for knowledge commercialization and academic entrepreneurship, this research extends the theoretical framework by positioning universities as digital knowledge platforms capable of operating within globally connected environments characterized by big data and multi-actor innovation ecosystems. This perspective contributes to redefining the role of private universities not merely as actors within the knowledge economy, but also as coordinating centers for social innovation, technological transformation, and sustainable development in the digital era.

Furthermore, the study contributes to the advancement of interdisciplinary approaches in higher education research by integrating the theories of Entrepreneurial University, Digital University, Innovation Ecosystem, and Global Knowledge Networks into a unified analytical framework. This integration enables a deeper explanation of the relationships among digital transformation, innovation dynamics, and academic competitiveness in the context of knowledge globalization. Consequently, the research broadens the academic scope of Entrepreneurial University theory from an internally focused governance model toward a global knowledge ecosystem perspective, in which universities function as central nodes connecting governments, industries, societies, and international scientific communities.

From a practical perspective, the study proposes a next-generation university governance model grounded in digital platforms, data governance, and artificial intelligence to address the developmental demands of higher education in the era of the Fourth Industrial Revolution. This model emphasizes the transition from traditional governance toward intelligent, flexible, and real-time data-driven governance systems. In addition, the study advocates the integration of AI governance, open innovation ecosystems, digital academic management, and multi-stakeholder collaboration mechanisms into the operational structures of contemporary universities. This governance framework is designed not only to improve organizational effectiveness but also to strengthen strategic adaptability in response to the rapidly evolving dynamics of global education and economic systems.

Moreover, the proposed governance model offers significant reference value for policymakers, university leaders, and educational institutions in designing strategies for the development of smart universities, innovation-driven universities, and entrepreneurial universities in the future. The model may serve as a strategic framework for higher education modernization processes in developing countries, particularly amid increasing international competition, accelerating digital transformation, and rising demands for high-quality human capital. Accordingly, the study contributes not only to international academic discourse but also generates meaningful policy and practical implications for the restructuring of higher education systems in the global digital age.

6.3. Research Limitations

Although the study has generated significant theoretical and practical contributions, several limitations should be acknowledged to ensure academic objectivity and provide directions for future research. First, the study is constrained by data-related limitations arising from unequal access to information across private higher education institutions, particularly given that many datasets concerning digital governance, university finance, innovation performance, and research effectiveness remain insufficiently disclosed or inadequately standardized according to international data systems. This limitation may affect the comprehensiveness and generalizability of the findings, especially when assessing differences among private university models operating in diverse developmental contexts. Furthermore, partial reliance on secondary data sources and institutional reports may introduce potential biases due to inconsistencies in data collection methodologies and reporting standards across organizations.

In addition, the study is limited by its national scope, as most of the data and analyses are concentrated on selected developing countries or regions where higher education and innovation ecosystems possess distinctive institutional, economic, and cultural characteristics. Given the substantial differences among global higher education systems in terms of autonomy levels,

public policy frameworks, technological capabilities, and educational market structures, the findings may not fully capture the diversity and complexity of private university models in developed countries or in highly internationalized educational ecosystems. Therefore, the direct applicability of the study's conclusions to other national contexts should be approached with caution and appropriately adapted to the specific conditions of individual countries.

Moreover, the study primarily approaches the phenomenon from institutional and strategic governance perspectives, while micro-level dimensions such as organizational behavior, internal innovation culture, learner experiences, and the long-term societal impacts of private universities have not been fully examined. These aspects may play critical roles in explaining the success or failure of transitions toward innovation-driven and digital university models. Consequently, future research should adopt broader multi-level approaches that integrate qualitative methods, quantitative analyses, and big data analytics in order to provide a more comprehensive understanding of the evolution of private higher education within the context of global transformation.

6.4. Future Research Directions

In the context of the convergence of artificial intelligence, big data, virtual reality technologies, and digital ecosystems reshaping the global higher education landscape, future studies should further expand analytical attention toward next-generation university models driven by advanced digital technologies. One significant research direction concerns AI Universities, in which artificial intelligence functions not merely as a supportive tool for governance and teaching but as a foundational infrastructure shaping the entire operational architecture of universities. Future research should therefore investigate how AI can restructure academic governance, personalize learning processes, enhance strategic forecasting, optimize research management, and facilitate real-time decision-making systems. Simultaneously, greater scholarly attention should be devoted to issues of AI governance, algorithmic ethics, data security, and the balance between technological automation and humanistic values in higher education.

Furthermore, Metaverse Universities are emerging as a highly promising field of inquiry as learning environments increasingly shift from physical spaces toward immersive digital ecosystems. Future studies should explore how metaverse technologies can create borderless learning environments, foster multidimensional academic interactions, and redefine educational experiences in the digital age. This includes examining the impacts of virtual reality (VR), augmented reality (AR), and immersive technologies on learning behavior, student engagement, academic community formation, and the development of global competencies among learners. At the same time, future research should address challenges related to technological inequality, digital privacy, digital identity, and the broader socio-cultural implications of metaverse-based academic environments for the future of higher education.

Moreover, the concept of Digital Twin Universities warrants deeper scholarly investigation as a transformative approach to smart university governance. A Digital Twin University may be conceptualized as the creation of a dynamic digital replica of the entire university ecosystem for the purposes of simulation, prediction, and optimization of governance, education, research, and infrastructure operations in real time. Future studies should focus on developing theoretical frameworks, data models, and technological architectures for Digital Twin Universities while also assessing their applicability in strategic governance, resource management, learning behavior prediction, and operational efficiency enhancement. This line of inquiry holds substantial potential for generating fundamental transformations in data-driven and digitally modeled higher education governance systems.

Finally, future research should approach higher education from the perspective of Smart Education Ecosystems in order to transcend traditional conceptions of universities as isolated institutions. From this perspective, higher education should be analyzed as an intelligent ecosystem encompassing interconnected relationships among universities, industries, governments, technological platforms, global academic communities, and digital societies. Future studies should therefore focus on developing integrative models that combine open innovation, data governance, smart learning systems, and multi-stakeholder collaboration mechanisms to establish adaptive, resilient, and sustainable educational ecosystems. Such research will significantly contribute to the advancement of higher education theory in a world increasingly shaped by digital economies, knowledge societies, and globally interconnected innovation-driven development models.

7. Proposed Appendices

Appendix A. Expert Interview Questionnaire

This appendix proposes a semi-structured expert interview questionnaire designed to collect in-depth data from policymakers, university leaders, educational experts, researchers, and industry

representatives regarding the transformation of private universities in the context of global digital transformation and innovation-driven development. The interview content focuses on key themes such as next-generation university governance models, the role of artificial intelligence in academic management, research internationalization strategies, entrepreneurial ecosystem development, and institutional adaptability to the evolving digital economy. The questionnaire is constructed according to principles of openness, flexibility, and critical inquiry in order to facilitate the sharing of professional perspectives, practical experiences, and strategic assessments concerning the future of private higher education.

The interview instrument functions not only as a qualitative data collection tool but also as a framework for exploring institutional, technological, and societal dimensions of higher education restructuring processes. Through expert-oriented approaches, the study is able to access tacit knowledge, governance experiences, and strategic insights that are difficult to capture through conventional survey methodologies. This significantly enhances the academic reliability, analytical depth, and practical relevance of the research within the context of systemic transformations in global higher education.

Appendix B. Survey Framework for Private Universities

This appendix proposes a comprehensive survey framework aimed at assessing the developmental levels, innovation capacities, and digital transformation capabilities of private universities. The framework is designed according to a multidimensional approach that incorporates indicators related to digital governance, research capacity, academic internationalization, entrepreneurial ecosystems, artificial intelligence integration, technological infrastructure, and institutional connectivity with industries and international communities. Additionally, the framework considers organizational culture, strategic leadership capacity, and institutional adaptability to the rapidly changing global higher education environment. The survey framework is expected to provide valuable empirical datasets for analyzing the transformation of private universities in the digital age. Furthermore, this instrument may serve as a reference system for comparative international studies, higher education policy evaluations, and the development of innovation-oriented university models in developing countries. By integrating academic, technological, and governance dimensions, the framework contributes to establishing a foundation for internationally aligned smart university assessment systems.

Appendix C. Strategic Analysis Model

This appendix proposes a strategic analysis model designed to explain the transformation processes of private universities within the contexts of knowledge globalization, digital transformation, and innovation-driven competition. The model is developed through the integration of theoretical approaches related to the Entrepreneurial University, Digital University, Innovation Ecosystem, and Smart Education Ecosystem frameworks in order to analyze the relationships among strategic governance, technological capability, research internationalization, and innovation ecosystem development within higher education institutions. The analytical model focuses not only on internal organizational dimensions but also on the influences of policy environments, labor markets, technology industries, and global knowledge networks on the evolution of private universities. The proposed strategic analysis model is expected to function as an open theoretical framework for future studies on smart universities, digital universities, and innovation-driven higher education institutions. Moreover, the model may support policymakers and university leaders in formulating long-term development strategies, forecasting future educational trends, and enhancing academic competitiveness within digitally globalized environments. Owing to its interdisciplinary nature and adaptive capacity, the proposed analytical framework has the potential to become a significant research foundation for future investigations into higher education transformation in the twenty-first century.

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VAI TRÒ CHIẾN LƯỢC CỦA CÁC TRƯỜNG ĐẠI HỌC NGOÀI CÔNG LẬP TRONG HỆ SINH THÁI KHỞI NGHIỆP QUỐC GIA, ĐỔI MỚI SÁNG TẠO VÀ HỢP TÁC QUỐC TẾ: *TIẾP CẬN QUẢN TRỊ ĐẠI HỌC TRONG BỐI CẢNH CHUYỂN ĐỔI SỐ TOÀN CẦU*

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Tóm tắt:

Trong bối cảnh chuyển đổi số toàn cầu và sự phát triển mạnh mẽ của nền kinh tế tri thức, giáo dục đại học đang trải qua quá trình chuyển dịch sâu sắc từ mô hình truyền thống sang mô hình đại học đổi mới sáng tạo, đại học khởi nghiệp, đại học số và đại học toàn cầu hóa. Các cơ sở giáo dục đại học không còn chỉ đảm nhiệm chức năng đào tạo nguồn nhân lực mà ngày càng trở thành trung tâm sáng tạo tri thức, nghiên cứu ứng dụng, chuyển giao công nghệ và kết nối hệ sinh thái đổi mới sáng tạo quốc gia. Trong xu thế đó, các trường đại học ngoài công lập đang nổi lên như những chủ thể năng động, linh hoạt và có khả năng thích ứng nhanh với yêu cầu của thị trường lao động toàn cầu, đặc biệt trong phát triển nguồn nhân lực chất lượng cao, thúc đẩy khởi nghiệp sáng tạo, tăng cường liên kết doanh nghiệp và mở rộng hợp tác quốc tế trong giáo dục đại học.

Nghiên cứu này tập trung phân tích vai trò chiến lược của các trường đại học ngoài công lập trong hệ sinh thái khởi nghiệp quốc gia, đổi mới sáng tạo và hợp tác quốc tế thông qua tiếp cận quản trị đại học trong bối cảnh chuyển đổi số toàn cầu. Đồng thời, nghiên cứu đề xuất mô hình quản trị đại học thích ứng với kinh tế tri thức, giáo dục mở và môi trường cạnh tranh quốc tế. Phương pháp nghiên cứu được triển khai theo hướng tiếp cận hỗn hợp, bao gồm tổng quan hệ thống tài liệu (Systematic Literature Review – SLR), phân tích chính sách, nghiên cứu trường hợp, phỏng vấn chuyên gia và phân tích so sánh quốc tế nhằm bảo đảm tính toàn diện và độ tin cậy học thuật cao. Kết quả nghiên cứu cho thấy các trường đại học ngoài công lập đang từng bước trở thành trung tâm đổi mới sáng tạo, hạt nhân kết nối startup và cầu nối hợp tác quốc tế trong nền kinh tế số. Trên cơ sở đó, nghiên cứu đề xuất mô hình "Entrepreneurial–Digital–Global University

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Governance Model" như một khung quản trị đại học thế hệ mới.

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