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Theoretical Modeling of Knowledge Management-Artificial Intelligence Synergy in Fifth-Generation Universities for Higher Education Transformation

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Abstract

Purpose: This study aims to develop a theoretical model explaining how synergy between knowledge management and generative artificial intelligence emerges and operates, and to identify the key components, underlying mechanisms, and resulting outcomes that contribute to the transformation of higher education.

Methodology: Adopting a grounded theory design, the study collected data through semi-structured interviews with 20 faculty members, university administrators, and higher education policy experts, complemented by an analysis of official documents and institutional reports. Interview transcripts were systematically analyzed using open, axial, and selective coding. Purposeful sampling continued until theoretical saturation was achieved. Qualitative data analysis software supported the organization and categorization of the data.

Findings: The analysis yielded five core categories: (1) digital transformation and technological infrastructure, (2) research innovation and data-driven scholarship, (3) personalized and flexible learning, (4) knowledge-oriented culture and human resource empowerment, and (5) intelligent policymaking and institutional support. Together, these categories form an integrated theoretical model that explains the synergy between knowledge management and artificial intelligence within universities.

Conclusion: The structured integration of generative artificial intelligence with knowledge management processes enhances scientific innovation, improves teaching and learning quality,accelerates knowledge commercialization, and strengthens the social and international impact of universities.

Value: Unlike previous studies that examined knowledge management or artificial intelligence in isolation, this research develops a context-specific grounded theoretical model that conceptualizes their interaction as a synergistic mechanism for transforming fifth-generation universities. The model introduces a novel paradigmatic framework linking causal conditions, strategies, and outcomes, thereby contributing both theoretical advancement and practical guidance for higher education transformation.

Keywords: ***Digital transformation, Research Innovation, Personalized Learning, Intelligent Policymaking***

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Extended Abstract

Introduction: In recent decades, higher education systems have faced complex and rapidly evolving global challenges that require a reconsideration of their missions, structures, and academic processes. Universities have historically evolved through several generations, beginning with the first generation, which focused primarily on teaching, followed by the second generation that combined teaching and research. The third generation introduced an entrepreneurial orientation, while the fourth generation emphasized community engagement and social responsibility (Etzkowitz, 2008). However, the growing complexities of the twenty-first century—including digital transformation, the globalization of knowledge, and environmental crises—have led to the emergence of the concept of fifth-generation universities. These institutions extend beyond traditional roles in education, research, and social interaction to assume a more active role in leading global transformations, promoting sustainable development, and integrating advanced technologies, particularly artificial intelligence (Chakraborty, 2024; Kabashkin et al., 2023). Fifth-generation universities emphasize several key characteristics, including the integration of advanced technologies—especially artificial intelligence—flexible and personalized learning systems, organizational agility in responding to emerging crises, and a strong commitment to social and environmental sustainability (Kabashkin et al., 2023; Mohamedbhai, 2023).

Purpose: the present study aims to develop theoretically model of the synergy between knowledge management and generative artificial intelligence and to identify the key components, underlying mechanisms, and implications of this synergy for the transformation of higher education.

Methodology: This qualitative and exploratory multi-phase study employed a grounded theory approach, integrating insights from a systematic literature review and field data collected through interviews. The research was conducted in three primary phases:

Phase 1: Collection of field data through semi-structured interviews.

Phase 2: Systematic and analytical review of the relevant literature.

Phase 3: Integration of findings from both the field data and the literature review.

For data analysis, grounded theory coding procedures were applied through the following stages:

- Open coding: Interview data were segmented into sentences and key concepts, and initial labels were assigned to the extracted concepts.
- Axial coding: Relationships among codes and conceptually similar items were identified, resulting in the formation of thematic categories.
- Selective coding: The core category and the relationships among the main concepts were identified, and a conceptual model of knowledge management in fifth-generation universities was developed.

Findings:

Open Coding

In the initial stage, semantic units extracted from the interview transcripts were identified and recorded as preliminary codes. These codes were subsequently grouped based on conceptual similarity to form subcategories, which were then organized into broader main categories. A sample of the open coding process is presented in the table below.

Table 1. Main Categories

Row	Frequency	Main Category	Subcategory	Initial Code	Interview Excerpt
1	14	Knowledge-Oriented Culture and Leadership	Managerial Support	Knowledge Support	University management continuously supports activities related to knowledge management.
6	13	Human Resources and Learning	Continuous Training	Workshop	Continuous training programs are organized to enhance the capabilities of university members.
11	14	Technological and Digital Infrastructure	Information Systems	Central Database	The university uses centralized databases to manage and store knowledge.

Axial Coding

In this stage, using Strauss and Corbin's paradigm model, the relationships among the identified categories were examined, and the central phenomenon was extracted.

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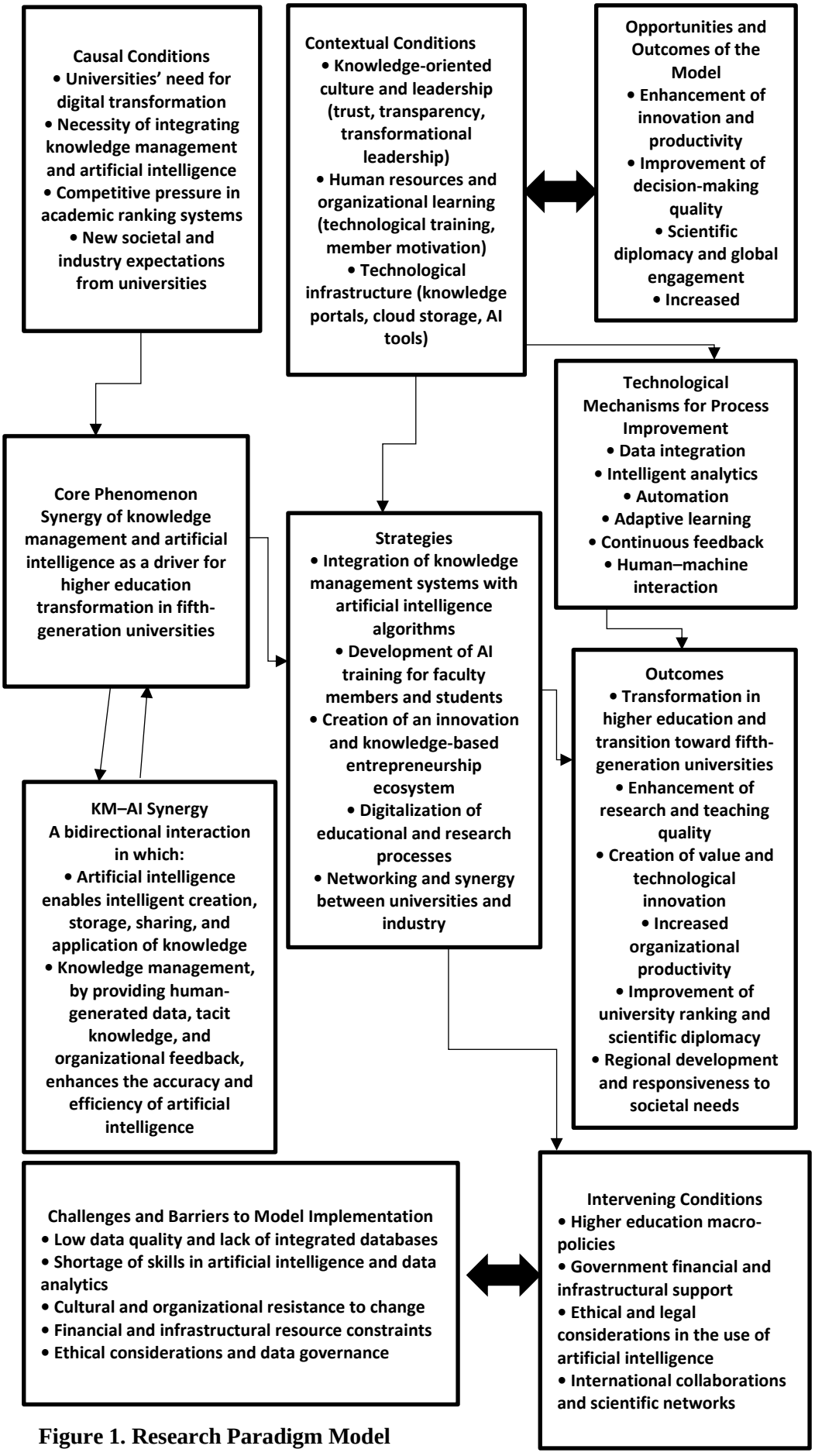

Figure 1. Research Paradigm Model

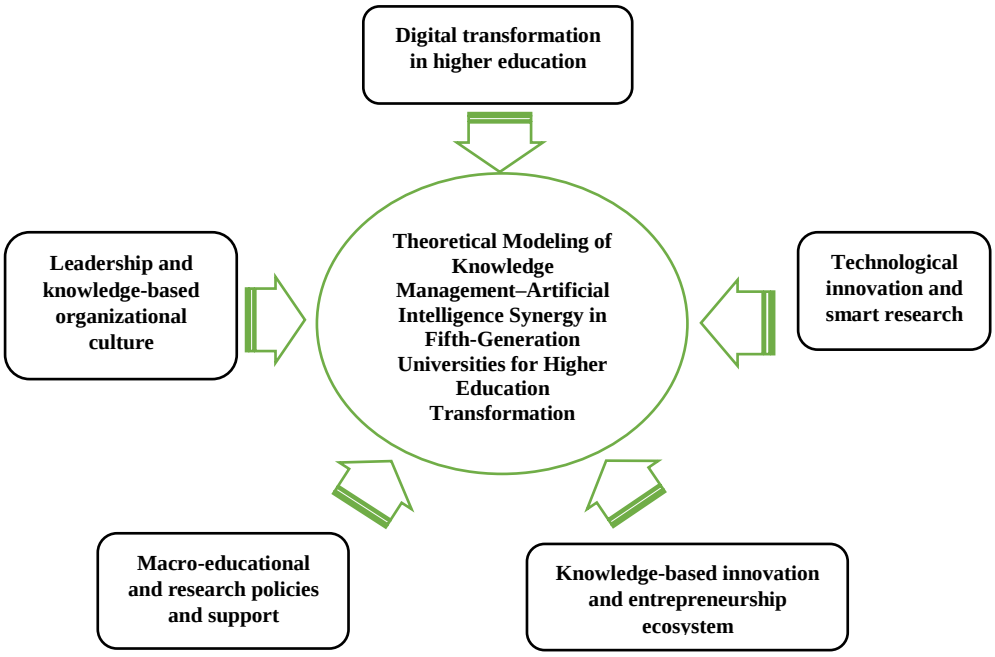

Figure 2. Research Model

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Conclusion: The findings of this study show that the synergy between Knowledge Management (KM) and Artificial Intelligence (AI) constitutes a core phenomenon capable of transforming and enhancing the quality of teaching and research in fifth-generation universities. Through open, axial, and selective coding, five main categories were identified—digital transformation in higher education, technological innovation and smart research, knowledge-oriented leadership and organizational culture, knowledge-based innovation and entrepreneurship ecosystem, and macro-level educational and research policies and support. These categories interact dynamically to create the conditions necessary for this transformation.

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