Cultivating AI-Ready Graduates: Curriculum Coherence and Tiered Competency Development in Business Education

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Abstract

As artificial intelligence reshapes professional practice, business education faces a curricular design challenge: how to embed AI capability development without reducing it to tool training or isolating it within a single course. This paper presents a theoretically grounded, qualitative curriculum design study that advances a Tiered Curriculum Integration Approach to embed eight workforce-relevant AI competencies across a Bachelor of Business Administration (BBA) program in a US-based university. The study positions AI integration not as technological adoption, but as a problem of curriculum coherence, cognitive development, and the urgent need to build AI competency in business education in response to the evolving business needs. Drawing on curriculum theory, adult learning theory, and constructivist pedagogy, the framework reconceptualizes AI competency development as a vertically scaffolded process across the undergraduate experience. The research documents a multi-phase qualitative methodology used to identify and define eight core competencies aligned to business workforce expectations: AI literacy and fundamentals; data privacy literacy; advanced prompt engineering; AI tools and automation; programming AI agents; critical thinking and problem-solving; strategic AI use; and AI communication skills. Competencies were derived through environmental scanning of employer discourse, review of AI literacy frameworks, and iterative faculty working sessions using thematic analysis. The conceptual contribution of the study lies in the development of a four-tier integration model, namely Foundations, Creation and Control, Building and Evaluation, and Leadership and Impact, explicitly mapped to Bloom's Taxonomy and the principles of constructive alignment. Rather than adding AI content horizontally, the model vertically scaffolds cognitive complexity from foundational comprehension to strategic evaluation and ethical leadership. This structure reflects constructivist assumptions that learners build knowledge through progressively complex engagement and aligns with adult-learning principles that emphasize relevance, autonomy, and authentic problem contexts. In the next phase of the project, curriculum mapping workshops engaged faculty in aligning course learning outcomes, assessment practices, and AI competencies within existing disciplinary structures. This process operationalized alignment between institutional goals, professional standards, and course-level pedagogy without requiring wholesale curriculum redesign. As a result, this study contributes a replicable model for university programs seeking to systematically and ethically integrate AI into curricular design.

Keywords: *curriculum design, AI curriculum integration, AI competencies, business education*

1. Introduction

Artificial intelligence (AI) is rapidly transforming business functions, decision-making processes, and workforce expectations. From marketing analytics to financial forecasting and operations management, AI-enabled tools are becoming embedded across industries [5]. As a result, business graduates are increasingly expected to demonstrate not only familiarity with AI technologies but also the ability to critically evaluate, ethically apply, and strategically leverage AI in organizational contexts. Despite this shift, responses within business education have often been fragmented. Many institutions have introduced standalone AI or analytics courses, while others incorporate isolated assignments using generative AI tools. These approaches, however, frequently emphasize tool usage over deeper cognitive and ethical competencies and lack program-level coherence [16]. As a result, students may graduate with uneven exposure to AI concepts, limited critical evaluation skills, and insufficient preparation for real-world applications.

This paper argues that AI integration is fundamentally a curriculum design problem, rather than merely a technological or instructional issue. Specifically, the challenge lies in systematically embedding AI competencies across a program in ways that align with cognitive development, disciplinary learning, and

professional expectations. We address it through a Tiered Curriculum Integration Approach that embeds AI competencies across a Bachelor of Business Administration (BBA) program. The approach is grounded in curriculum theory, constructivist learning principles, and adult learning theory, and it emphasizes vertical scaffolding of competencies across courses rather than horizontal addition of content. The purpose of this paper is to document the qualitative design process used to (1) identify workforce-relevant AI competencies, (2) develop a tiered curriculum integration model aligned with Bloom's Taxonomy, and (3) map these competencies across a BBA curriculum. The study contributes a theoretically informed and practically applicable model for business schools seeking coherent and ethical AI integration.

2. Theoretical Framework

2.1. Curriculum Design and Constructive Alignment

Curriculum design has long been understood as an intentional and systematic process of aligning learning outcomes, instructional activities, and assessment practices [10]. Building on this foundation, [2] introduced the concept of constructive alignment, which emphasizes the alignment between what students are expected to learn and how they are taught and assessed. In the context of AI integration, constructive alignment highlights the limitations of ad hoc approaches. Simply introducing AI tools into assignments does not ensure that students develop meaningful competencies. Instead, AI-related learning outcomes must be explicitly defined, supported through appropriate learning activities, and assessed through authentic tasks. Without such alignment, AI integration risks becoming superficial and disconnected from broader educational goals.

2.2 Constructivist Learning Theory

Constructivist theory posits that learners actively construct knowledge through interaction with content, context, and experience [4], [14] Learning is not a passive process of information acquisition but an active process of meaning-making, shaped by prior knowledge and social context. Applying constructivism to AI education suggests that students must engage with AI tools in meaningful, context-rich ways. Rather than simply learning about AI concepts, students should experiment with AI outputs, evaluate their accuracy, and refine their use based on feedback. This iterative engagement enables deeper understanding and supports the development of higher-order thinking skills.

2.3 Adult Learning Theory

Adult learning theory, or andragogy, emphasizes that learners are self-directed, goal-oriented, and motivated by relevance to real-world contexts [7]. In business education, this implies that learning experiences should be authentic, problem-centered, and directly applicable to professional practice. In the context of business education, this implies that AI competencies must be situated within authentic disciplinary contexts rather than taught as abstract or purely technical skills. Students are more likely to internalize AI-related knowledge when it is directly connected to managerial decision-making, ethical dilemmas, and organizational challenges. Consequently, AI integration must occur within existing business courses, where students can apply AI tools to meaningful problems rather than treating AI as a separate domain.

2.4 Bloom's Taxonomy and Cognitive Development

Bloom's Taxonomy provides a framework for understanding cognitive progression, ranging from lower-order skills, such as remembering and understanding, to higher-order skills, such as evaluating and creating [1]. Effective curriculum design requires scaffolding learning experiences to support this progression. In business education, this progression is particularly important. Students must first understand fundamental concepts before applying tools, analyzing outputs, and ultimately using AI strategically and ethically. Aligning AI competencies with Bloom's Taxonomy ensures that learning is developmentally appropriate and cognitively rigorous.

2.5 Instructional Design Principles for Competency Development

To translate constructive alignment from a curriculum-planning principle into learning experiences, the study is additionally informed by instructional design frameworks that specify how skill development is sequenced and reinforced. Merrill's Five Principles of Instruction emphasize problem-centered learning, activation of prior knowledge, demonstration, application, and integration [9], providing rationale for designing authentic, workplace-relevant AI tasks that recur across tiers with increasing complexity. As learners engage in each tier, Gagné's Nine Events of Instruction offer micro-level structures, ensuring that learners receive clear expectations, guided practice opportunities, actionable feedback, and opportunities to transfer learning into workplace application [6]. Together, these frameworks support mastery progression by combining authentic performance with systematic scaffolding, supporting this study's goals of developing AI capability through sustained, program-level integration.

2.6 Synthesis

Together, these theoretical perspectives underscore the need for a structured, aligned, and progressive approach to AI integration. A tiered curriculum model enables institutions to move beyond fragmented interventions toward a coherent framework that supports both cognitive development and professional readiness. Importantly, such an approach reframes AI not as a discrete content area but as a capability that must be developed through sustained, aligned engagement across the curriculum. Within this framing, AI competencies are not endpoints but developmental outcomes that evolve as students progress through increasingly sophisticated levels of learning and practice. Ultimately, these theoretical perspectives support the central premise of this study: that meaningful AI integration in business education requires a tiered, programmatic approach that ensures coherence, cognitive progression, and alignment with professional practice.

3. Methodology

This study employs a qualitative, design-based research approach focused on curriculum development. Design-based research is particularly appropriate for addressing complex educational challenges, as it involves iterative design, implementation, and refinement of educational interventions in real-world contexts [15]. Unlike purely evaluative or experimental methods, this approach prioritizes the development of theoretically grounded and practically applicable solutions, making it well-suited to emerging areas such as AI integration in higher education. Our focus is on understanding how AI competencies can be identified, structured, and embedded within an existing program in a way that is both pedagogically sound and institutionally feasible.

3.1 Data Sources

The development of the AI competencies was informed by three primary qualitative data sources: (1) environmental scanning of workforce expectations, (2) review of AI literacy frameworks, and (3) faculty working sessions. These sources were intentionally selected to triangulate perspectives from industry, scholarship, and disciplinary practice, ensuring that the resulting competencies were both theoretically grounded and practically relevant.

The first data source involved an environmental scan of industry reports, professional publications, and job postings to identify emerging expectations for AI-related skills in business roles. This process included reviewing publicly available job descriptions across business functions such as marketing, finance, and human resource management, with particular attention to language referencing artificial intelligence, automation, data-driven decision-making, and digital tools. In addition, reports from consulting firms were examined to capture broader trends in workforce transformation driven by AI adoption. Through iterative review, patterns emerged emphasizing not only technical familiarity with AI tools, but also the ability to critically evaluate AI outputs, apply AI in decision-making processes, and communicate insights effectively. These findings informed the initial set of competency categories and ensured alignment with real-world business expectations.

The second data source consisted of a review of existing AI literacy and competency frameworks, including those proposed by Long and Magerko [8], UNESCO [12], and the U.S. Department of Labor's Artificial Intelligence Literacy Framework [13]. These frameworks provide structured definitions of AI-related knowledge, skills, and attitudes, often emphasizing interdisciplinary understanding and ethical awareness. The review focused on identifying common constructs across frameworks, such as foundational AI knowledge, data literacy, ethical reasoning, and human-AI interaction. Particular

attention was given to how these frameworks conceptualize AI literacy beyond technical expertise, incorporating critical thinking, societal impact, and responsible use.
The third data source involved a series of working sessions of the AI Pedagogy and Curriculum task force. These sessions served as a critical mechanism for contextualizing and operationalizing AI competencies within the BBA curriculum. The members engaged in collaborative discussions to interpret the preliminary competency categories, assess their relevance to disciplinary learning outcomes, and identify opportunities for integration within existing courses. Activities included reviewing sample assignments, mapping competencies to course objectives, and discussing appropriate levels of cognitive complexity based on course sequencing. These discussions were iterative, with competencies refined over multiple sessions based on faculty feedback and consensus-building.

3.2 Analytical Approach

Data were analyzed using thematic analysis [3]. The analysis was primarily inductive, allowing themes related to AI competencies and workforce expectations to emerge through a repeated review of the collected materials. Initial codes were developed based on recurring themes related to AI skills, competencies, and workplace applications. Initial coding focused on identifying recurring references to AI-related knowledge, skills, behaviors, and professional expectations across the environmental scan, literacy frameworks, and faculty discussions. Similar concepts were grouped into broader competency categories, which were subsequently refined through comparison across data sources.
The analytical process was iterative rather than strictly linear. Preliminary competency categories were discussed and revised during working sessions, during which participants evaluated their relevance, clarity, and applicability within business education contexts. These conversations helped refine the scope of individual competencies and distinguish between foundational and more advanced AI capabilities. For example, competencies related to basic AI literacy and tool usage were differentiated from those emphasizing strategic judgment, evaluation, and leadership.
In addition to identifying competency domains, the analysis also informed the development of the tiered integration structure. Patterns across the data suggested that AI competency development should occur progressively, with students moving from conceptual understanding toward increasingly complex applications and evaluations. These observations supported aligning the framework with Bloom's Taxonomy and informed the differentiation of curriculum-integration levels across the BBA program.
While the study did not aim to develop a formal theory, the analytical approach provided a structured and collaborative process for translating broad workforce and educational trends into an operational curriculum framework. The analysis emphasized practical applicability, curricular coherence, and alignment with the professional expectations of contemporary business education.

4. Development of AI Competencies

The development of the institutional AI competencies represented the transition from conceptual exploration to operational curriculum design. Building on the environmental scan, review of AI literacy frameworks, and collaborative faculty working sessions, the project focused on translating broad workforce and educational trends into a coherent competency structure appropriate for undergraduate business education. Rather than positioning AI as a standalone technical specialization, the framework conceptualized AI capability as an applied professional skill set that could be integrated across the BBA curriculum.
Throughout the development process, particular attention was given to ensuring that competencies reflected both workforce relevance and pedagogical applicability. Early discussions within the task force identified a common limitation in many AI integration efforts: an emphasis on procedural tool use without sufficient focus on evaluation, interpretation, and professional judgment. In response, the framework was intentionally designed to support higher-order engagement with AI technologies by emphasizing critical thinking, strategic application, ethical reasoning, and communication alongside technical interaction.
The framework was also developed to support the scalable integration within existing curricular structures. Rather than requiring wholesale program redesign, competencies were articulated in applied terms that faculty across business disciplines could adapt to existing course outcomes, assignments, and assessment practices. This approach aligned with institutional priorities related to innovation, equity, and collaboration.
Three considerations guided the refinement of the competencies. First, the framework prioritized workforce applicability by emphasizing the ability to apply AI in problem-solving and decision-making

contexts relevant to contemporary business practice. Second, ethical reasoning and responsible AI use were embedded throughout the competency structure rather than isolated as a standalone topic, reinforcing the importance of accountability, bias awareness, and critical evaluation, aligning with emerging guidance such as the U.S Department of Labor's AI skill standards [13]. Third, the competencies were structured developmentally to support progressive learning across the undergraduate experience, enabling students to move from foundational understanding toward more advanced application, evaluation, and strategic use of AI. The intent is to create a scaffolded learning experience, operationalized through Gagné's Nine Events of Instruction [6], which correspond to increasing levels of cognitive complexity, as outlined in Bloom's Taxonomy.

The resulting framework identified eight interconnected AI competencies designed to function as an integrated skill stack across the BBA curriculum (see Figure 1). These competencies were intended to be reinforced across courses and aligned with course-level outcomes, assessment strategies, and increasing levels of cognitive complexity throughout the program.

Fig. 1. AI Skill Stack

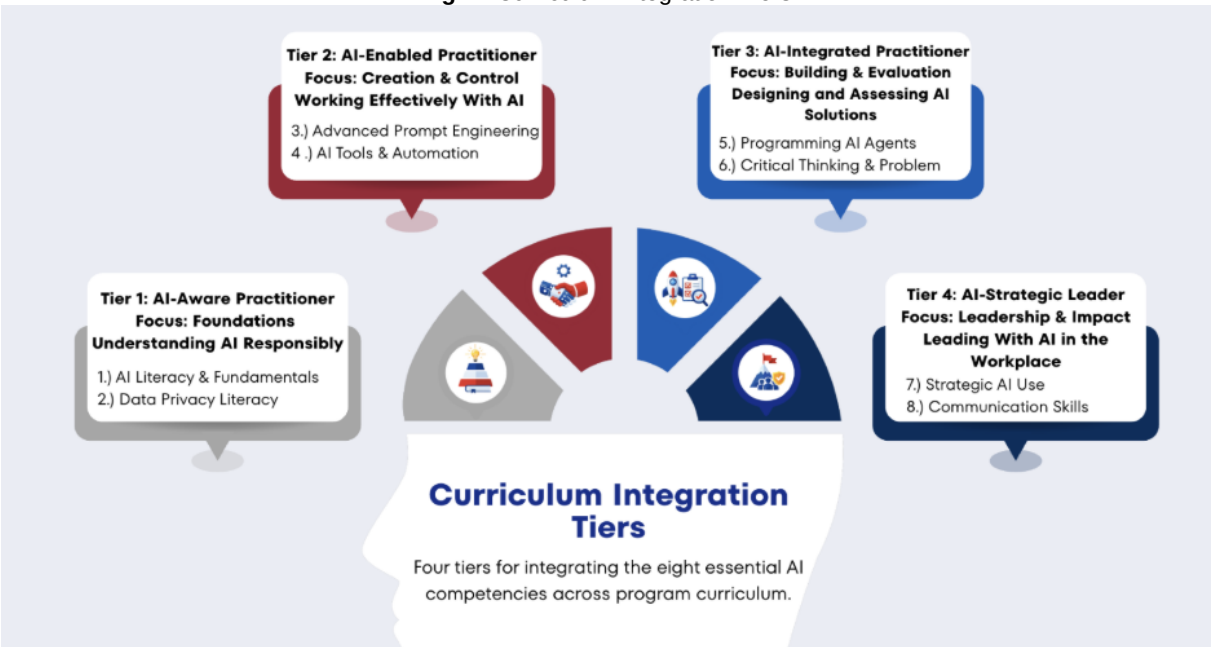
5. Tiered Curriculum Integration Model

To operationalize the AI competency framework within the BBA curriculum, a four-tier curriculum integration model was developed to support a structured implementation across courses and program levels. Rather than relying on isolated assignments or standalone AI instruction, the model was designed to facilitate intentional integration that could evolve alongside technological and workforce changes while remaining adaptable to existing curricular structures.

The tiered approach reflects the study's theoretical grounding in constructive alignment, constructivist learning theory, and adult learning theory by emphasizing developmental progression, repeated practice, and authentic application. Instead of organizing learning around specific AI tools, the model centers on transferable competencies and cognitive processes that can be adapted as technologies continue to change. This competency-centered approach was intended to reduce curricular disruption while providing faculty with a flexible structure for integrating AI within disciplinary contexts.

The model consists of four progressively complex levels: Foundations, Creation and Control, Building and Evaluation, and Leadership and Impact (see Figure 2). Each tier represents increasing levels of cognitive engagement, professional application, and learner autonomy. Together, the tiers provide a scaffolded progression that moves students from foundational understanding of AI concepts toward strategic, ethical, and contextually informed use of AI in professional settings.

Fig. 2. Curriculum Integration Tiers



The first tier, **Foundations**, focuses on developing basic AI literacy, including understanding core concepts, limitations, risks, and ethical considerations associated with AI technologies. At this level, students are introduced to AI terminology, foundational principles, and responsible use practices. Learning activities emphasize comprehension and awareness, aligning primarily with the lower levels of Bloom's Taxonomy, such as remembering and understanding.

The second tier, **Creation and Control**, emphasizes intentional interaction with AI tools through applied use, prompt development, and reflection on how inputs influence outputs. At this stage, students begin using AI to support learning and problem-solving activities while developing awareness of the strengths and limitations of AI-generated content. Learning experiences focus on application and experimentation, supporting progression toward greater learner agency and technological fluency.

The third tier, **Building and Evaluation**, shifts toward more advanced engagement with AI-supported processes and outputs. Students are expected to critically evaluate AI-generated information, assess accuracy and bias, and apply AI within discipline-specific contexts to support analysis and decision-making. This tier emphasizes higher-order cognitive processes associated with analysis and evaluation, including judgment, refinement, and evidence-based reasoning.

The final tier, **Leadership and Impact**, focuses on strategic and ethical application of AI within organizational and societal contexts. At this level, students are expected to communicate AI-informed insights to diverse audiences, consider broader ethical and professional implications, and demonstrate leadership in responsible AI use. Learning activities emphasize evaluation, synthesis, and creation, aligning with the highest levels of Bloom's Taxonomy.

Collectively, the four tiers provide a vertically scaffolded structure for integrating AI competencies across the curriculum. By distributing competency development across courses and program stages, the model supports gradual skill development, reinforces learning through repeated engagement, and reduces cognitive overload for adult learners, balancing academic, professional, and personal responsibilities. Most importantly, the framework positions AI competency development as an ongoing and integrated component of business education rather than a discrete technical skill acquired in isolation.

6. BBA AI Curriculum Mapping

Following the development of the tiered curriculum integration framework, the next phase of the project focused on operationalizing the model within the BBA curriculum through program-level mapping. Curriculum mapping is widely recognized as a mechanism for strengthening alignment between program outcomes, instructional practices, and student learning progression [11]. In the context of AI integration, the mapping process served as a strategy to translate abstract competency categories into discipline-specific learning experiences distributed across the undergraduate business curriculum.

The mapping process was guided by the principles of constructive alignment [2], scaffolded learning, and competency-based curriculum design. Rather than treating AI as a standalone subject area, the approach positioned AI competency development as an integrated, developmental process embedded within existing business disciplines. This design reflects emerging perspectives in higher education that emphasize AI literacy as a cross-functional professional capability rather than a purely technical specialization [8].

Courses were mapped according to the four-tier integration model based on three primary considerations: (1) the cognitive complexity of course-level learning outcomes, (2) the degree of authentic AI application appropriate within the specific discipline and corresponding workforce setting, and (3) the developmental progression of students across the program. Hence, introductory courses emphasizing foundational business concepts and digital literacy were aligned with Tier 1 (Foundations), while intermediate and advanced courses requiring applied analysis, evaluation, strategic decision-making, and professional communication were aligned with progressively higher tiers.

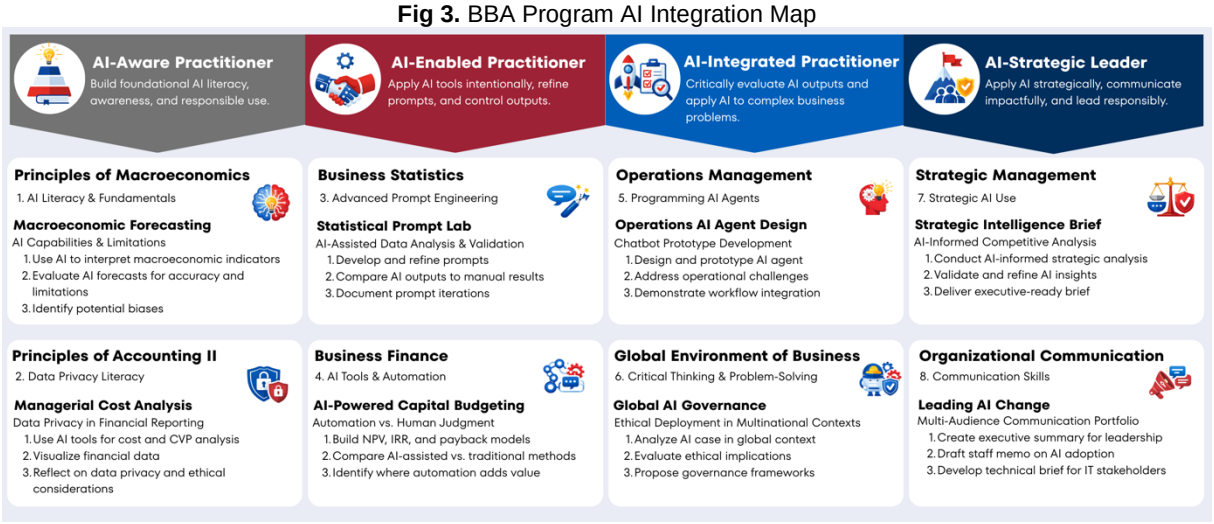
The mapping process intentionally emphasized authentic assessment and contextual application. Consistent with adult learning theory, students engage with AI within meaningful disciplinary contexts rather than through isolated technical exercises [7]. For example, in Principles of Macroeconomics, students evaluate AI-generated economic forecasts and assess their limitations, while in Business Statistics, students refine prompts and compare AI-assisted analyses with manually generated results. At more advanced levels, students move toward evaluating AI-supported strategic recommendations, designing AI-enabled workflows, and communicating AI-informed insights to organizational stakeholders.

The progression across tiers also reflects increasing levels of cognitive complexity aligned with Bloom's Taxonomy [1]. Early-course integration focuses on comprehension, awareness, and responsible use, while upper-level courses emphasize evaluation, judgment, synthesis, and strategic leadership. This developmental structure supports repeated exposure and reinforcement of competencies across courses, which is consistent with constructivist perspectives emphasizing iterative knowledge construction through progressively complex engagement [4], [14].

Importantly, the curriculum map was designed to support sustainable faculty adoption and curricular flexibility. By centering competencies rather than platform-specific tools, the framework allows faculty to adapt assignments and learning activities as AI technologies continue to evolve. This approach also minimizes the need for extensive course redesign by embedding AI competencies within existing learning outcomes and disciplinary practices. Instead, it presents as a natural enhancement of the existing curriculum.

Figure 3 illustrates the operationalized BBA AI curriculum map, including representative courses, aligned competencies, and examples of authentic assessments and learning activities across each tier. The map demonstrates how AI competency development can be distributed systematically across a business curriculum to support progressive, ethical, and workforce-relevant learning experiences.

Fig 3. BBA Program AI Integration Map



7. Conclusion

As artificial intelligence continues to reshape business practice, business education must move beyond isolated tool adoption toward coherent and developmentally structured curriculum integration. This study contributes to curriculum theory by extending principles of constructive alignment and scaffolded learning to program-level AI competency development within a BBA curriculum. The Tiered Curriculum Integration Approach provides a practical and scalable framework for embedding AI competencies across program courses while supporting ethical reasoning, cognitive development, and workforce relevance. Importantly, the framework was intentionally designed to enhance and modernize existing curriculum structures rather than require a complete program overhaul. By embedding AI competencies within existing disciplinary courses through learning activities and assessments, the model offers institutions a more sustainable and adaptable pathway for curricular innovation. This approach allows business programs to increase workforce relevance and respond to evolving employer expectations while minimizing disruption to faculty workload, accreditation structures, and established curricular sequencing. Because the BBA pilot has not yet been implemented, the present study is limited to the design and development processes underlying the framework. Future research will examine implementation outcomes, including student learning, faculty experiences, and the longitudinal development of AI competencies across the program.

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