NextGen Talent-Driven AI Educational Agent

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***Abstract*—This research addresses critical gaps in Artificial Intelligence (AI)-driven educational systems by developing a NextGen Talent-Driven AI Educational Agent framework that systematically integrates human-centric competencies to advance Sustainable Development Goal (SDG) 4. The methodology combines a comprehensive literature review of research articles, validation through expert interviews, and Confirmatory Factor Analysis (CFA). The framework operationalizes four core NextGen Talent dimensions through systematic integration into AI agent architecture, progressing from conceptual development through pilot implementation to scalable deployment. CFA results demonstrate satisfactory model fit (χ^2/df = 1.261, Cross-Field Innovators (CFI) = 1.000, Goodness of Fit Index (GFI) = 0.970, Root Mean Square Error of Approximation (RMSEA) = 0.026) with Cross-Field Innovators emerging as the most influential dimension (factor loading = 1.00). The technical architecture integrates ChatGPT's Natural Language Processing (NLP) capabilities with Role-Task-Output configuration, enabling personalized learning experiences that adapt to individual learner needs while maintaining pedagogical soundness. This human-centric approach addresses limitations in current AI educational systems including inadequate evaluation protocols, technical constraints in processing unstructured data, and insufficient consideration of socio-emotional learning factors. The framework provides concrete architectural principles for developing AI agents that enhance rather than replace human capabilities, offering scalable solutions for inclusive and equitable quality education aligned with SDG 4 principles.**

***Keywords*—adaptive thinkers, cross-field innovators, tech-business connectors, creative visionaries, Sustainable Development Goal (SDG)**

I. Introduction

Education is widely acknowledged as a foundational pillar for individual and societal advancement, serving as the primary mechanism for reducing inequalities and fostering sustainable development [1]. Recognizing this significance, the United Nations incorporated Quality Education as Sustainable Development Goal 4 (SDG 4), aiming to "ensure inclusive and equitable quality education and promote lifelong learning opportunities for all" [2]. Despite international efforts, achieving SDG 4 remains challenging, particularly due to unequal access, inadequate educational infrastructure, and a shortage of qualified educators, exacerbated by rapid technological and social changes [3].

To effectively respond to these challenges, innovative approaches leveraging emerging technologies, particularly Artificial Intelligence (AI), have been increasingly explored. Among the AI technologies, conversational agents and adaptive learning systems, powered by generative AI such as ChatGPT, have demonstrated considerable potential in providing personalized, accessible, and inclusive educational experiences [4]

However, extensive research has documented significant gaps and limitations in current AI-driven educational systems that hinder their effective implementation and scalability [5]. Previous research has consistently identified critical shortcomings in AI education implementations. Baradziej [6] and Murtaza *et al.* [7] highlight the absence of standardized evaluation protocols and metrics for AI-driven learning systems, creating incomparable results across studies and tools. Furthermore, systematic reviews reveal a shortage of comparative and longitudinal evaluations that test sustained learning gains and real-world transfer over time [6, 7]. Technical limitations persist in data quality handling, processing unstructured educational data, and capturing socio-emotional learning signals [8, 9].

Despite these limitations, AI-driven solutions align with UNESCO's vision for leveraging AI in education to bridge existing gaps, promote equity, and enhance educational quality. This approach supports the principles of Society 5.0—a human-centric technological society designed to foster sustainable development and societal well-being [10].

However, the successful implementation of AI technologies in education requires more than merely technological expertise; it necessitates a comprehensive approach that integrates key human-centric competencies and frameworks while addressing fundamental issues of accuracy and reliability. Any framework for AI educational agents must prioritize mechanisms for ensuring response accuracy, content validation, and pedagogical soundness to maintain educational integrity and learner trust [11, 12]. Author researches in "NextGen Talent", which encompasses crucial competencies identified as pivotal in organizational digital transformation

The proposal of the NextGen Talent framework into the design and development of AI-powered educational agents aligns strategically with UNESCO's roadmap for AI governance and pedagogical innovation. This approach ensures the creation of AI systems that not only meet technological criteria but also align ethically with educational equity, inclusiveness, and quality standards mandated by SDG 4. The proposed AI agents thus promise to provide not just generalized educational support but tailored, adaptive learning experiences accessible to learners across varying demographic and socioeconomic backgrounds.

This research seeks to investigate how systematically incorporating NextGen Talent competencies into the AI agent development process influences their effectiveness in educational environments. It will explore the intersection between technological innovation and human-centered design, emphasizing ethical considerations, equitable access, and scalability. The anticipated outcome is a comprehensive, NextGen Talent-informed AI educational agent framework that facilitates meaningful learning experiences, bridges educational inequalities, and promotes lifelong learning,

directly contributing to the fulfillment of SDG 4.

By merging technological advancements with the strategic human capabilities highlighted in the NextGen Talent framework, this study aims to create impactful educational solutions. These solutions are intended not only to enhance current educational practices but also to establish scalable, inclusive educational ecosystems better prepared to meet future societal challenges, thereby embodying the transformative potential of AI in the era of Society 5.0

II. Literature Review

Current AI educational frameworks suffer from fundamental fragmentation, addressing either technical optimization or human competency development in isolation rather than systematic integration. Existing approaches like Luckin and Holmes' [13] adaptive algorithms focus on technical personalization without comprehensive human talent frameworks, while Pedro *et al.*'s [14] AI governance lacks concrete methodologies for embedding human competencies into system design. Similarly, De Giuseppe and Tornusciolo's [15] AI tutoring systems and Dai's [16] talent development frameworks remain disconnected from practical AI implementation contexts. This fragmented landscape creates a critical research gap: no existing framework systematically translates organizational human competencies into AI agent architectural principles while maintaining educational equity and scalability. The novelty of this research lies in bridging this gap through the NextGen Talent framework, which uniquely integrates four empirically-validated human competency dimensions—Adaptive Thinkers, Cross-Field Innovators, Tech-Business Connectors, and Creative Visionaries—directly into AI educational agent design architecture, creating the first systematic methodology for developing human-centric AI educational systems that align technological advancement with SDG 4 objectives.

A. AI Transformation in University

Universities are experiencing a significant transformation as Artificial Intelligence (AI) is integrated into teaching and learning processes to advance SDG 4: Quality Education. Córdova-Esparza [17] note that AI-powered tools like conversational agents and *ChatGPT*-based tutors are being leveraged to personalize learning and provide on-demand support for students. For instance, AI-driven teaching assistants can adapt to each learner's needs by delivering individualized assignments and guidance, which enhances knowledge acquisition and problem-solving skills. Such applications illustrate how generative AI offers new avenues to improve educational outcomes in tertiary settings, from automating routine instructional tasks to enabling adaptive assessments. This AI-driven educational innovation aligns with the goals of SDG 4 by expanding access to quality learning resources and tailoring education to diverse student populations [18].

Recent empirical evidence reveals nuanced patterns in student acceptance of AI integration in higher education contexts. Faizin *et al.* [19] found that students who recognize tangible benefits from AI tools in their learning process develop more favorable attitudes toward technology adoption, with the strongest predictive relationship occurring between perceived ease of use and perceived usefulness (path coefficient = 0.668). This suggests that technical accessibility serves as a gateway to broader acceptance, indicating that universities must prioritize user-friendly AI implementations to facilitate successful adoption across diverse academic disciplines and cultural contexts.

At the same time, effectively transforming university education with AI requires strategic oversight and ethical safeguards. Researchers emphasize that AI should augment rather than replace human educators, and its adoption must be measured and principled [14]. In practice, this means institutions should only implement AI agents when they are demonstrably beneficial for learning and uphold humanistic values. Crawford *et al.* [11] and Pedro *et al.* [14] stress the importance of training academic leaders and instructors in AI pedagogy so they can guide these tools' use responsibly and mitigate ethical risks. Additionally, universities must invest in robust digital infrastructure and data systems to support AI platforms at scale. Globally, strong technological infrastructure and cross-sector collaboration have been identified as prerequisites for AI-fueled education initiatives to succeed, especially in regions with limited connectivity. In summary, AI has the potential to transform university settings by enhancing educational delivery and equity, but realizing this potential in line with SDG 4 demands careful planning, capacity-building, and a commitment to ethical, student-centered practices [20]

B. Adaptive Thinkers

Adaptive Thinkers (AT) refers to the capacity of an organization's leaders and workforce to rapidly adapt strategies and innovate in response to changing conditions. It entails a paradigm of adaptable leadership and flexible resource use, where continuous learning and quick strategic pivots drive progress. In the corporate context, a high level of strategic agility has a substantial impact on transformation outcomes, as it empowers organizations to navigate volatility and complexity effectively [21].

In educational institutions, developing Adaptive Thinkers is equally vital for implementing AI-driven initiatives aligned with SDG 4. University leaders and educators must be prepared to revise curricula, pedagogies, and policies as new AI tools emerge, demonstrating the same kind of agility seen in successful digital organizations. Matthew *et al.* [22] emphasize that educators in the era of Society 5.0 need to be "perpetual learners" who continually update their methods and skills in line with technological advances. This call for ongoing professional development and willingness to modify instructional strategies reflects the essence of strategic agility in the academic setting. By fostering AT, universities can more swiftly integrate AI agents (such as intelligent tutoring systems or administrative bots) into their operations and classrooms. Agile talent enables these institutions to experiment with AI solutions, learn from outcomes, and scale up effective practices, thereby accelerating progress toward quality and inclusive education [23].

C. Cross-Field Innovators

Cross-Field Innovators (CFI) is defined as the ability to integrate and apply knowledge across multiple disciplines to solve complex, real-world problems. In their study on digital transformation, Esquivel [24] found CFI to be the most

influential of the "NextGen Talent" dimensions for organizational innovation. This talent reflects a transdisciplinary approach to learning and problem-solving, wherein individuals and teams move beyond single-discipline expertise and combine insights from different fields. CFI involves creating and demystifying knowledge by blending interdisciplinary and multidisciplinary perspectives so that organizations can adapt to evolving challenges. In practice, a strong transdisciplinary orientation enables the incorporation of academic research, professional experience, and local context into unified solutions [25].

Applying CFI in the development of AI agents for education (SDG 4) is crucial, as educational innovation lies at the intersection of technology, pedagogy, and social considerations. Almandhari [26] highlight the importance of a humanistic and holistic framework when integrating AI into education – one that includes technical, cognitive, and emotional dimensions. This mirrors the transdisciplinary philosophy: effective AI-driven educational tools require collaboration among computer scientists, educators, psychologists, and ethicists to ensure the technology addresses learners' needs and upholds ethical standards. For example, designing a conversational AI tutor might involve expertise in machine learning, curriculum design, linguistics, and child development working in concert.

By cultivating CFI, universities can create AI educational agents that are technically robust while maintaining pedagogical soundness. The transdisciplinary approach advocated by Nedungadi *et al.* [27] ensures these systems are also culturally responsive, thereby directly supporting the quality and inclusivity goals of SDG 4 through comprehensive, multi-faceted educational solutions.

D. Tech-Business Connectors

Tech-Business Connectors (TBC) is critical for scaling AI solutions in universities and school systems. Building AI agents for education (such as intelligent tutoring systems or campus chatbots) is not just a technical endeavor; it demands an architectural perspective to integrate these tools into the existing educational ecosystem. Ahmed [28] points out that strong digital infrastructure is a prerequisite for leveraging AI to achieve equitable, quality education on a broad scale. This implies that educational institutions need to invest in robust IT architecture—ensuring reliable internet access, data security, and platform interoperability—especially when extending AI-driven services to remote or under-resourced areas. TBC in this context means having experts who can design and manage the complex interplay of learning management systems, AI applications, and data analytics in alignment with pedagogical goals. By employing Tech-Business Connectors, universities can more effectively integrate AI agents into their administrative and instructional processes, resulting in a cohesive digital learning environment that advances the aims of SDG 4 [29].

Tech-Business Connectors contributes the structural rigor and scalability necessary for implementing large-scale AI solutions [30]. With its emphasis on robust and adaptive system designs, enterprise architecture guides the development of AI educational agents capable of being efficiently deployed across diverse technological and organizational environments.

E. Creative Visionaries

Creative Visionaries (CV) refers to the cognitive adaptability and mindset required to drive innovation and embrace change. CV captures how individuals' internal models of reality influence their ability to transform organizations. The CV encompasses an exponential and entrepreneurial mindset that the capacity to envision bold possibilities and break free from limiting assumptions as well as openness to continual learning and networking [31]. A high CV enables people to overcome mental barriers (e.g., fear of change or rigid analogies) by leveraging past knowledge while reimagining future opportunities. Such mental flexibility and creativity are crucial for long-term success in fast-evolving digital environments [32].

In the context of AI agents in education, Creative Visionaries translates to the readiness of educators, students, and administrators to adjust their mindsets about teaching and learning with AI. Pradita [33] observes that the rise of AI in education is reshaping fundamental beliefs about the roles of teachers and learners, necessitating a shift towards digital humanism. This means stakeholders must re-envision traditional human-centered pedagogies to accommodate AI as a collaborative partner in the learning process. Embracing AI-driven tools often requires overcoming skepticism or habitual practices—essentially, changing the mental model of what classroom instruction looks like. Educators with strong CV are more likely to experiment with AI tutors or analytics, seeing these not as threats but as enhancements to student learning. Likewise, students benefit when they adopt a growth mindset toward technology, viewing AI as an opportunity to augment their educational experience.

By cultivating Creative Visionaries in academic communities, institutions create a culture that is receptive to AI innovations. Padua [34] emphasizes that this cultural transformation enables thoughtful integration of AI tools, while Murdan and Halkhoree [35] demonstrate how such mindset shifts directly improve educational quality and equity through sustained institutional commitment to innovative pedagogical approaches.

III. Research Methodology

A. Literature Review and Expert Interview

A comprehensive literature review was conducted to establish the theoretical foundation and identify the core competencies of "NextGen Talent". The literature search was performed across multiple academic databases including Web of Science, Scopus, IEEE Xplore, and ERIC, covering publications from year 2010 to ensure currency given the rapidly evolving nature of AI and digital transformation. Key search terms included combinations of "digital transformation", "NextGen Talent", "AI in education", "educational technology," "adaptive learning systems," and "SDG 4 quality education". Selection criteria included: (1) peer-reviewed articles published in English, (2) studies focusing on organizational digital transformation or AI implementation in educational contexts, (3) research addressing talent competencies or human-centric factors in technology adoption, and (4) alignment with SDG 4

principles. Initial searches yielded 247 articles, which were screened based on title and abstract relevance, resulting in 65 articles for full-text review. Through this systematic review process, four recurrent talent dimensions were distilled: Adaptive Thinkers (AT), Cross-Field Innovators (CFI), Tech-Business Connectors (TBC), and Creative Visionaries (CV). The literature findings were subsequently validated through expert interviews with 10 educational technology specialists and organizational transformation consultants to confirm that these four NextGen Talent dimensions are critical for driving innovation in AI-enabled education

B. Framework Development

Based on the literature findings, the study developed a NextGen Talent framework tailored to AI in education through a systematic approach combining theoretical foundations with empirical validation. This framework adaptation was specifically guided by Capability Theory [36], which explains how organizations develop, integrate, and reconfigure internal and external competencies to address rapidly changing environments, and Organizational Learning Theory [37], which provides insights into how educational institutions adapt and evolve through continuous learning processes. The framework development also drew upon Technology Acceptance Model (TAM) principles [38] to understand how human factors influence AI adoption in educational settings. This theoretical foundation employed a mixed-methods research design that combined qualitative expert validation with quantitative Confirmatory Factor Analysis (CFA). The framework development process began with insights from digital transformation literature, where NextGen Talent drives organizational change through dynamic capability building and adaptive learning mechanisms, which were then mapped onto educational settings and aligned with theories of how organizations and learning systems evolve through capability development and knowledge integration. Following the methodology established in organizational digital transformation research grounded in capabilities theory, expert interviews were first conducted to validate the theoretical constructs derived from the literature review. This qualitative phase ensured that each talent dimension was appropriately defined within the educational context as dynamic capabilities, viewing students, teachers, and educational leaders as key stakeholders in AI-driven transformation. Subsequently, a quantitative survey instrument was developed to assess the perceived relevance and structural validity of the framework components. The survey employed a five-point Likert scale to measure the importance of items related to the four core talent dimensions: (1) Adaptive Thinking (AT), (2) Creative-Future Intelligence (CFI), (3) Technology-Business Convergence (TBC), and (4) Collaborative Vision (CV). Each dimension was given equal weight in the assessment process.

To establish the framework's construct validity and confirm the theoretical structure, Confirmatory Factor Analysis (CFA) was employed using structural equation modeling. This statistical approach validated the hypothesized relationships between the talent dimensions and their constituent competencies, ensuring that the framework accurately represents the underlying constructs necessary for implementing AI-driven educational transformation. The CFA methodology confirmed that the four-factor structure adequately captured the essential competencies needed for transformative learning experiences. Key requirements for educational technology—including curriculum integration, user engagement, data privacy, and scalability—were incorporated throughout the development process to ensure the framework's practical relevance. The resulting empirically-validated framework provides a structured model linking the four talent dimensions to specific competencies required for successfully implementing AI-driven, transformative learning experiences in educational settings.

C. AI Agent Design

The methodology included the conceptual design of an AI Educational Agent (a conversational tutor) aligned with the NextGen Talent framework and SDG 4 goals. The design process focused on features that promote inclusive and quality education. The agent is envisioned to provide personalized learning experiences by adapting to each learner's level and needs, offer broad accessibility and deliver adaptive feedback to guide improvement. These features reflect best practices in AI-driven education, where systems personalize learning and perform adaptive tutoring to improve outcomes. The agent's architecture was outlined with modules for natural language dialogue, student modeling, knowledge representation, and feedback generation. Emphasis was placed on ethical and user-centric design, so that the AI tutor supports equitable, high-quality education—a priority highlighted in global policy discussions. This design stage was iterative and informed by expert input from educational technologists, ensuring the agent's capabilities align with pedagogical objectives and accessibility standards.

D. Proposal of NextGen Talent-Driven AI Educational Agent

The integration of NextGen Talent competencies into AI educational agent design follows a systematic four-stage development process that ensures human-centric principles are embedded at every level, as illustrated in Fig. 1. This comprehensive approach progresses from initial conceptual design through real-world deployment, with each stage explicitly informed by the four core NextGen Talent dimensions: Adaptive Thinkers (AT), Cross-Field Innovators (CFI), Tech-Business Connectors (TBC), and Creative Visionaries (CV). In Stage 1 (Conceptual Development), all four talent dimensions are identified as core design principles from the outset, with AT guiding prioritization of personalized, real-time adaptation in teaching methods, CFI stressing the need for interdisciplinary knowledge bases supporting holistic STEM learning, TBC ensuring seamless integration into real educational contexts, and CV focusing on innovative, learner-centered outcomes that encourage creative problem-solving. Stage 2 (System Design & Prototyping) translates the conceptual framework into technical architecture, with AT informing adaptive learning strategies and agile iteration cycles, CFI guiding expansion of interdisciplinary knowledge bases, TBC influencing modular, scalable service design for platform integration, and CV shaping learner modeling and interaction design that builds

comprehensive mental models of each learner. Stage 3 (Pilot Implementation & Evaluation) involves controlled testing in real educational settings, with AT competency assessed through personalization capabilities observation, CFI validated through cross-subject deployment, TBC principles tested through workflow integration, and CV dimensions reflected in assessments of creativity and higher-order thinking encouragement. Finally, Stage 4 (Deployment & Scaling) rolls out the AI agent across broader educational environments, with TBC-informed modular architecture enabling quality-maintained scaling, AT and CV capabilities supporting diverse student populations while maintaining personalization, CFI foundation allowing broad subject support, and continuous improvement mechanisms ensuring sustained human-centered, pedagogically sound operation. Each talent dimension drives a deployment strategy in which the AI agent acts as a catalyst for quality education, aligning technological capabilities with human talent development through personalized learning at scale, interdisciplinary integration, scalable infrastructure, and creative innovation, with ongoing monitoring ensuring effective SDG 4 support through continuous assessment of learning outcomes, user satisfaction, and pedagogical effectiveness while maintaining the human-centric foundation established through the NextGen Talent framework.

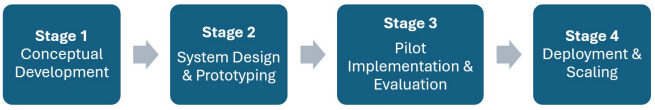

Fig. 1. Four-stage integration framework showing systematic progression from conceptual design to scalable deployment of NextGen Talent-driven AI educational agent.

IV. Result

A. NextGen Talent Framework

The systematic literature review of 247 articles, filtered to 65 through established inclusion criteria and validated by 10 expert interviews, identified four NextGen Talent dimensions as synthesized in Table 1, which presents the core dimensions and their constituent elements.

Table 1. NextGen Talent dimensions and elements

Dimensions	Item	Elements	Researchers									
			[39]	[40]	[41]	[42]	[43]	[44]	[45]	[46]	[47]	[36]
1. Adaptive Thinkers	1.1	Flexible Planning Strategy			●					●		
	1.2	Future Planning with Risk Control			●	●			●			●
	1.3	Digital Transformation Plan	●	●	●		●			●	●	
	1.4	Innovation-Driven Growth Strategy	●	●	●	●	●	●			●	●
2. Cross-Field Innovators	2.1	Quick Learning and Flexible Thinking		●		●	●	●	●		●	●
	2.2	Open Collaboration and Resource Sharing		●		●	●					
	2.3	Tech Skills with Information Organization		●	●		●	●		●		
	2.4	Understanding Connected Reality		●			●	●	●			
3. Tech-Business Connectors	3.1	Business and Technology Integration	●	●		●	●			●	●	
	3.2	Flexible System Design with Smart Oversight	●			●						
	3.3	Business Process Mapping	●			●						
	3.4	Resource Coordination				●				●	●	
4. Creative Visionaries	4.1	Unlimited Creative Thinking					●					●
	4.2	Business Owner Mindset					●		●			●
	4.3	Building Professional Connections		●		●			●			●
	4.4	Managing Creative Ideas		●	●		●		●			●

Fig. 2. NextGen Talent framework with four core competency dimensions for AI educational agent.

The NextGen Talent framework integrates four core talent dimensions and elements designed to enhance organizational digital transformation, particularly in educational contexts using AI-driven systems. This framework is designed to be adaptive to rapidly changing environments, and it fosters personalized, equitable learning outcomes aligned with the principles of Sustainable Development Goal (SDG) 4, which aims to ensure quality education for all as shown in Fig. 2.

B. NextGen Talent Framework Validation

Participants were selected using a multistage sampling method, with a sample of 410 people from whom informed consent was obtained. The sample included participants with different levels of age, position, and work experience, randomly sampled from stakeholder lists of Thai-based educational institutions at 37.6% (n = 154) and international educational organizations at 62.4% (n = 256). The multistage sampling method was selected due to the hierarchical structure of educational systems, with different levels randomly sampled from institutional lists based on specific educational departments and roles. The sample comprised four main categories: educational leaders and administrators (18.5%, n = 76), faculty and teaching staff (42.7%, n = 175), educational technology professionals (23.4%, n = 96), and students with educational technology experience (15.4%, n = 63). Following Hair *et al.*'s [48] recommendations for CFA sample size, which varies depending on model properties and suggests 10 times as many observations as

there are constructs (10×16 = 160), the 410 samples obtained exceeded the recommended minimum and were deemed sufficient through power calculations. Confirmatory factor analysis using the maximum-likelihood estimation method was conducted with Linear Structural Relations (LISREL) to confirm the factor structure of the NextGen Talent framework in educational AI contexts. Model fit was assessed using multiple indices including Chi-square statistic (χ^2/df), Comparative Fit Indices (CFI), Goodness of Fit Index (GFI), Adjusted Goodness of Fit Index (AGFI), Root Mean Square Error of Approximation (RMSEA), and Standardized Root Mean Square Residual (SRMR). According to established criteria by Hair *et al.* [49], good-fitting models should demonstrate χ^2/df values less than 2.00, CFI values greater than 0.95, GFI values greater than 0.95, AGFI values greater than 0.90, RMSEA values less than 0.05, and SRMR values less than 0.05. The research model demonstrated satisfactory fit to the observed data with acceptable values across all indices (χ^2/df = 1.261, CFI = 1.000, GFI = 0.970, AGFI = 0.950, RMSEA = 0.026, SRMR = 0.024).

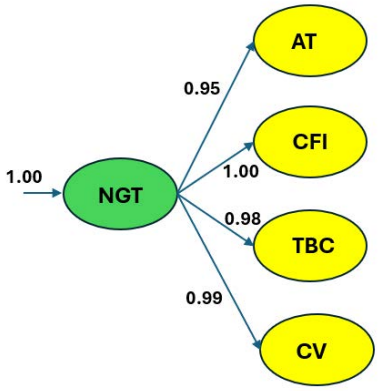

Fig. 3. Confirmatory factor analysis results validating the four-factor NextGen Talent framework structure.

Fig. 3. presents the four-factor structure of the CFA model for the NextGen Talent (NGT) framework in educational AI contexts. Cross-Field Innovators (CFI) demonstrated the highest factor loading of 1.00, while Adaptive Thinkers (AT) achieved a factor loading of 0.95. Cross-Field Innovators (CFI) emerged as the most effective dimension in fostering AI-driven educational transformation, with Creative Visionaries (CV) serving as the second most influential factor. While Adaptive Thinkers (AT) showed moderate capacity to support educational AI implementation, Tech-Business Connectors (TBC) ranked as the third most significant dimension. The findings confirmed the four-factor model's suitability for explaining the observed survey data in educational AI contexts. While Adaptive Thinkers (AT) showed moderate capacity to support educational digital transformation, Cross-Field Innovators (CFI) proved more critical than other dimensions for successful AI integration in educational environments.

C. NextGen Talent Dimensions in Educational AI Context

Adaptive Thinkers (AT)

Adaptive Thinkers (AT) are individuals or systems that can quickly change their approach when situations shift, combining four key strategies to enhance learning. Through *Flexible Planning Strategy*, they adjust teaching methods on-the-spot based on how each student is learning, while *Future Planning with Risk Control* helps them predict potential learning challenges and prepare backup solutions before problems arise. Their *Digital Transformation Plan* uses technology step-by-step to improve learning experiences from basic tools to advanced personalized systems, and *Innovation-Driven Growth Strategy* drives them to constantly develop new and creative teaching methods. In AI educational systems, these Adaptive Thinkers provide personalized content and feedback that matches each learner's needs by combining real-time adjustments, forward planning, digital innovation, and creative problem-solving, ultimately leading to better student engagement and improved learning results while making the system smarter over time

D. Cross-Field Innovators (CFI)

Cross-Field Innovators (CFI) are individuals or systems that combine knowledge from different areas to solve complex problems by mastering four essential capabilities. Through *Quick Learning and Flexible Thinking*, they rapidly absorb new information from various fields and adapt their problem-solving approach based on what each situation requires. Their *Open Collaboration and Resource Sharing* enables them to work across disciplines, bringing together experts from technology, education, psychology, and other fields while sharing knowledge and resources generously to create better solutions. Using *Tech Skills with Information Organization*, they effectively manage and connect information from multiple domains, organizing diverse knowledge in ways that make it accessible and useful for creating comprehensive learning experiences. Most importantly, their *Understanding Connected Reality* helps them recognize how different fields influence each other—seeing how technology impacts psychology, how pedagogy connects with neuroscience, and how social factors affect learning. In AI educational systems, Cross-Field Innovators enable agents to synthesize interdisciplinary knowledge and provide holistic, context-aware learning experiences that draw from the best insights across multiple domains, ensuring learners receive a comprehensive educational approach that addresses their complete development rather than isolated skills.

E. Tech-Business Connectors (TBC)

Tech-Business Connectors are specialists who ensure AI educational systems work smoothly within schools and universities by mastering four critical areas. Through *Business and Technology Integration*, they combine educational goals with AI technology solutions, making sure the systems serve actual teaching and learning needs rather than just being impressive tech features. Their *Flexible System Design with Smart Oversight* allows them to build AI systems in modular pieces that can easily adapt to different schools' needs while maintaining strong control and quality standards across all implementations. Using *Business Process Mapping*, they create clear visual guides showing exactly how AI fits into existing educational workflows—from student enrollment and assessment to teacher training and administrative tasks—ensuring nothing gets disrupted during implementation. Finally, through *Resource Coordination*, they manage all aspects of

integration including staff training, equipment, budgets, and technical support to work together seamlessly. These Tech-Business Connectors are essential for creating scalable, interoperable AI systems that align with educational goals while building the digital infrastructure needed for successful widespread adoption of AI in education, ensuring that technology truly enhances learning rather than creating additional complications for educators and students.

F. Creative Visionaries (CV)

Creative Visionaries are individuals who drive innovation and adaptability within educational organizations by combining four essential capabilities to transform how AI supports learning. Through *Unlimited Creative Thinking*, they push beyond conventional educational boundaries to envision breakthrough approaches for AI-powered learning, constantly exploring new ways for technology to inspire and challenge students. Their *Business Owner Mindset* drives them to take initiative in identifying opportunities for educational innovation, taking calculated risks to implement creative AI solutions, and spotting ways to turn imaginative teaching concepts into practical learning experiences. Using *Building Professional Connections*, they create networks with educators, technologists, researchers, and students to share innovative ideas and collaborate on developing creative AI applications that benefit the entire learning community. Most importantly, through *Managing Creative Ideas*, they systematically capture, organize, and develop innovative concepts for AI education, turning the best creative insights into real learning tools and experiences. In AI educational systems, Creative Visionaries drive the creative aspect of learner modeling by enabling AI agents to continuously update and refine their understanding of each student through innovative approaches, ensuring that the technology not only adapts to individual learner needs but also actively promotes creative problem-solving and encourages innovative thinking in students, ultimately fostering a culture of creativity and adaptability throughout the educational experience.

These dimensions and their elements collectively contribute to the design of AI educational agents that can offer personalized learning experiences, ensuring inclusivity, scalability, and adaptability to diverse educational needs

G. NextGen Talent Driven AI Educational Agent

The system development for NextGen Talent-Driven AI Educational Agents, as shown in Fig. 4. ChatGPT's General AI, NLP-Enabled Architecture, integrates advanced Natural Language Processing (NLP) capabilities with Generative AI to create personalized and interactive learning experiences. Powered by ChatGPT, based on the GPT-4 architecture, this system allows AI agents to understand and generate human-like text, enabling them to engage in meaningful conversations with students. The integration of Reinforcement Learning from Human Feedback enhances the AI's performance by aligning its responses with user preferences and pedagogical needs. This continuous learning process ensures that the AI agents are adaptive and responsive to diverse educational contexts, allowing them to tailor content and interactions to each student's individual learning needs.

The core strength of the AI system lies in its ability to adapt to learners' needs. By continuously adjusting the difficulty of tasks, providing real-time feedback, and recommending relevant resources based on individual progress, the system ensures personalized learning at scale. This approach not only bridges educational gaps but also enhances engagement and learning effectiveness. The system's human-centric design encourages students to take an active role in their learning, making the educational process both engaging and efficient. By integrating key competencies such as Adaptive Thinking, Cross-Field Innovation, Tech-Business Connectivity, and Creative Vision, the system fosters a deeper, more personalized learning experience while maintaining ethical and inclusive practices.

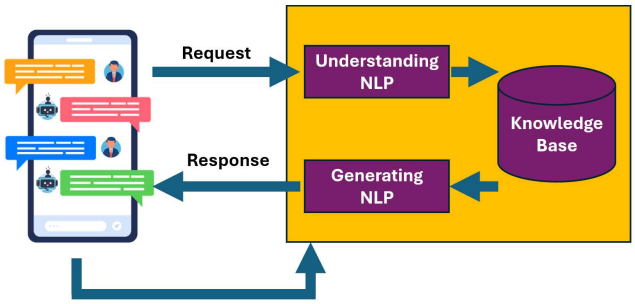

Fig. 4. Technical architecture integrating ChatGPT's NLP capabilities with NextGen Talent competencies.

Fig. 5. Role-task-output configuration framework operationalizing NextGen Talent dimensions into practical AI system behaviors.

As shown in Fig. 5., the Role (R) of the AI system is rooted in the NextGen Talent competencies, specifically Adaptive

Thinkers, Cross-Field Innovators, Tech-Business Connectors, and Creative Visionaries. These competencies ensure the AI agent can adapt to each learner's unique needs, providing real-time feedback, adjusting task difficulty, and suggesting appropriate resources. This aligns with the revised paragraph, which highlights the AI's strength in offering personalized learning experiences and continuously adapting to students' progress. The system also integrates knowledge from diverse fields to provide a holistic learning experience, encouraging creative problem-solving, as emphasized in the paragraph.

The Task (T) section of the system prompt reflects the AI's responsibilities. Additionally, the prompt encourages the AI to engage students actively by helping them analyze information, compare different methods, and evaluate the pros and cons of learning topics. This encourages active participation from students and directly links to the paragraph's emphasis on the system's ability to bridge educational gaps while fostering engagement. The task of stimulating creative thinking also ties back to the Creative Visionaries competency, where students are prompted to explore new ways of thinking and problem-solving, further enhancing the learning experience

Finally, the Output Format (O) ensures the system delivers clear, understandable, and accessible responses to students, mirroring the paragraph's call for a human-centric design that makes learning engaging and efficient. The system prompt ensures that responses are free from technical jargon and are structured in a way that is appropriate for undergraduate students. Additionally, by encouraging critical thinking and providing step-by-step guidance, the output format helps students evaluate and apply the content they've learned, which aligns with the adaptive learning.

V. Discussion

This study presents a novel integration of the NextGen Talent framework with AI-driven educational agents to advance SDG 4, bridging organizational transformation theory with educational technology design. Unlike previous studies that explored AI tutoring systems [15] or talent frameworks in isolation [16], our framework systematically incorporates human-centric competencies to enhance AI agent effectiveness. The findings extend existing research by going beyond technical personalization to include adaptive thinking capabilities, providing concrete architectural principles for responsible scaling, and systematizing transdisciplinary integration while embedding creativity directly into AI system design. The proposed framework offers practical advantages over current AI education tools by considering human factors from the design stage and enabling adaptation to diverse cultural contexts.

Critical limitations beyond infrastructure constraints require examination. Student data privacy presents fundamental challenges, as AI educational agents require extensive personal learning data, raising concerns about data ownership, consent, and potential surveillance [50, 51]. The risk of over-reliance on AI tutors may diminish students' capacity for independent critical thinking, with AI systems potentially narrowing learning pathways by optimizing efficiency over deep, reflective learning processes [13, 52]. Furthermore, AI systems may perpetuate educational inequalities by reinforcing cultural biases embedded in training data, disadvantaging marginalized communities and conflicting with indigenous knowledge systems [53, 54]. These ethical dilemmas highlight the need for robust data protection frameworks and careful attention to algorithmic bias.

Cultural adaptability for Global South contexts requires substantial consideration. Educational systems in Sub-Saharan Africa, South Asia, and Latin America face different challenges including multilingual environments, oral knowledge traditions, and community-centered learning approaches that conflict with Western individualistic models [3, 55]. The framework's emphasis on individual competencies may clash with collectivist educational philosophies where collaborative learning is prioritized [56, 57]. Beyond connectivity issues, sustainable AI deployment requires reliable electricity, maintenance capabilities, and local expertise—resources often scarce in developing regions [58]. Economic sustainability remains questionable without innovative funding mechanisms and participatory design approaches involving local stakeholders as co-creators rather than passive recipients [59, 60]. These limitations underscore the need for culturally responsive design approaches ensuring equitable quality education globally.

VI. Conclusion

This research extends organizational digital transformation theory into educational technology design by systematically integrating the NextGen Talent framework comprising Adaptive Thinkers, Cross-Field Innovators, Tech-Business Connectors, and Creative Visionaries into AI educational agent development. Building upon Capability Theory and Organizational Learning Theory, the study demonstrates how human-centric competencies can be operationalized within AI systems architecture. The confirmatory factor analysis (n = 410) validated the four-factor model structure, with Cross-Field Innovators emerging as the most influential dimension (factor loading = 1.00), followed by Creative Visionaries, confirming that transdisciplinary integration and innovative thinking capabilities are fundamental to effective AI-driven educational transformation. This empirical validation advances existing talent development frameworks by providing measurable constructs specifically tailored for educational AI contexts.

The framework addresses critical gaps identified in current AI education research by moving beyond purely technical personalization to incorporate systematic human-centered design principles. Unlike previous approaches that treat AI tutoring systems and talent frameworks in isolation, this study provides concrete architectural principles linking human competencies to AI system behaviors through the Role-Task-Output configuration. The integration of ChatGPT's NLP capabilities with NextGen Talent dimensions creates a structured methodology for developing AI agents that are simultaneously technically sophisticated and pedagogically sound. This represents a significant advancement over existing AI educational tools by embedding adaptive thinking, interdisciplinary knowledge integration, scalable system design, and creativity-fostering capabilities directly into the agent's core architecture from the design stage.

While acknowledging limitations including cultural adaptability challenges and infrastructure dependencies, the research establishes a foundation for human-centric AI educational development that transcends traditional technology adoption models. Future empirical validation through large-scale pilot studies and cultural adaptation research will be essential to confirm the framework's effectiveness across diverse educational contexts. The NextGen Talent-driven approach represents a paradigmatic shift toward AI systems that enhance rather than replace human capabilities in education, providing a replicable model for developing educational technologies that maintain human values while leveraging technological advancement to create more inclusive and effective learning environments.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHOR CONTRIBUTIONS

Suparoek Chootongchai led the research by conducting the conceptualization of the NextGen Talent-Driven AI Educational Agent framework, methodology design, literature review and synthesis, expert interview coordination, data collection and analysis, confirmatory factor analysis interpretation, framework development and validation, AI agent architecture design, manuscript preparation and writing, and revision of the manuscript based on editorial feedback. Paralee Maneerat contributed to the literature review support, data collection assistance, and manuscript review. All authors have read, reviewed, and approved the final version of the manuscript for publication.

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