Harnessing Artificial Intelligence for Sustainable Edupreneurship and Next-Generation Knowledge Business Models

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Abstract
This study examines how artificial intelligence (AI) is transforming sustainable edupreneurship by reshaping knowledge-based business models within Bangladesh's digital education sector. As AI-driven tools such as adaptive learning systems, automated assessments, predictive analytics and intelligent content creation become more accessible; edupreneurs are increasingly able to design scalable, cost-efficient and competitive educational ventures. AI enhances personalization, operational efficiency and market expansion, enabling edupreneurs to offer flexible learning solutions aligned with emerging workforce demands. However, infrastructural gaps, limited teacher readiness, and inconsistent digital access continue to challenge the growth of AI-enabled education businesses. Using a quantitative research approach supported by structural equation modeling (SEM), the study finds that both AI applications and teacher readiness significantly influence business model transformation, which in turn strongly predicts sustainable edupreneurial outcomes. The results highlight that strategic business model innovation, combined with effective AI integration and human capability is essential for building resilient, inclusive and future-oriented edupreneurship in Bangladesh.
Keywords: Artificial Intelligence (AI), Edupreneurship, Knowledge-Based Business Models, Business Model Transformation, Sustainable Edupreneurial Outcomes, EdTech Entrepreneurship, Digital Learning Innovation, AI-driven Education

Introduction
In the age of global digital transformation artificial intelligence has become one of the central drivers of innovation within education systems. Around the world learning environments are increasingly shifting from conventional classroom based formats to flexible technology supported ecosystems. This transformation has gained greater momentum after the COVID 19 pandemic when educational institutions and learners were compelled to adopt remote learning tools online platforms and automated systems for uninterrupted education. While

this global change has created new directions for learning it has also opened significant opportunities in the field of knowledge based entrepreneurship. Within this evolving landscape the concept of AI enabled sustainable edupreneurship is becoming particularly influential because it connects intelligent technologies with long term educational business models.

Although AI adoption is growing across regions its significance is especially visible in countries like Bangladesh where a large young population requires access to modern learning tools and future oriented skills. Bangladesh is now experiencing a rapid expansion in digital connectivity mobile internet usage and technology based services. These factors are encouraging local educators and entrepreneurs to explore AI supported learning solutions that can enhance teaching quality improve learner engagement and expand access to knowledge. Rahman and Chowdhury in 2024 noted that despite infrastructural challenges developing countries are gradually moving towards digital inclusion through wider use of AI assisted learning platforms and low cost digital tools (Rahman and Chowdhury 2024). This shift reflects a growing acceptance of intelligent systems as essential components of the national education ecosystem. Artificial intelligence is playing a transformative role in content creation personalized learning and skill development. Automated tutoring systems adaptive assessments predictive analytics and recommendation engines are helping learners progress at a pace suited to their abilities. These changes create fertile ground for edupreneurs who wish to design and operate sustainable learning based ventures. recent findings suggest that AI driven personalization improves educational efficiency and supports new business opportunities within the learning sector. Abdullah and Noor in 2023 emphasized that ethical governance and transparency are important for ensuring that AI based learning remains inclusive and trustworthy within digital education ecosystems (Abdullah and Noor 2023).

In the context of Bangladesh sustainable edupreneurship is connected with the need for skill enhancement employment generation and digital competitiveness. Many young people require flexible training opportunities that prepare them for modern industries such as information technology digital marketing FinTech and service innovation. AI supported micro learning platforms skill tracking systems and competency based programs are helping to meet this demand. Mishra and Jha in 2025 reported that adaptive AI systems are highly effective in improving workforce productivity and providing continuous skill development opportunities for learners who aim to participate in emerging sectors (Mishra and Jha 2025). For Bangladeshi edupreneurs this creates a practical foundation for building scalable knowledge based enterprises.

Industry academia collaboration is also becoming essential for bridging the skill gap in the country. As industries in Bangladesh adopt automation smart manufacturing and data driven decision making they require a workforce prepared for these technological transitions. Islam and Mahmud in 2025 highlighted that industry academia co creation supports AI driven workforce transformation by aligning educational services with real world professional demands (Islam and Mahmud 2025). Such collaboration allows edupreneurs to design programs that reflect market needs and contribute to sustainable economic advancement. Inclusiveness remains one of the most important considerations for the integration of AI in Bangladesh's education sector. Addressing disparities in access to technology is necessary for ensuring that AI supported learning benefits rural student's women learners and

economically disadvantaged groups. Studies indicate that gradual improvements in digital infrastructure combined with user friendly AI tools can reduce these disparities and create more equitable learning opportunities.

AI enabled sustainable edupreneurship presents a promising pathway for transforming Bangladesh's knowledge based business models. By integrating intelligent technologies with innovative educational practices edupreneurs can develop solutions that support long term skill development expand access to quality education and strengthen national progress in the digital era. Understanding the influence of AI on this transformation is essential for identifying future opportunities and designing strategies that contribute to an inclusive dynamic and sustainable education ecosystem.

Problem Statement

The rapid development of artificial intelligence since 2022 has influenced education systems around the world, reshaping how knowledge is delivered and how learning is experienced. Although AI-based learning tools, adaptive platforms and automated feedback systems have created new opportunities for innovation, countries such as Bangladesh continue to face barriers that prevent full integration of these technologies into mainstream education. Studies show that uneven internet access, inadequate teacher training and infrastructural gaps still limit the effectiveness of AI-supported learning environments in South Asia (Mehta and Roy 2023). As a result, learners from rural and economically disadvantaged backgrounds struggle to benefit from intelligent tutoring systems, digital micro learning platforms or personalized content, even though these tools have the potential to reduce inequality. A major problem also emerges in the development of sustainable edupreneurship within AI-enabled ecosystems. Since 2022, many small-scale digital education providers have emerged in Bangladesh, yet most of them rely on traditional teaching strategies rather than scalable AI-driven solutions. Researchers explain that edupreneurs in developing economies often lack the technological preparedness, capital investment and operational guidance required to build long-term viable AI-supported ventures (Garcia and Liew 2024). This situation weakens competitiveness and reduces the capacity of local edupreneurs to create impactful learning programs that respond to modern educational needs.

There is also a growing mismatch between the skills provided in conventional academic systems and the competencies demanded by Bangladesh's evolving digital economy. Industries adopting automation, analytics and machine intelligence increasingly expect workers to demonstrate digital fluency, computational reasoning and the ability to collaborate with AI systems. However, curriculum updates in many institutions remain slow, and students often graduate without sufficient exposure to these emerging skills. Recent research highlights that developing countries must accelerate AI-integrated skill development programs to strengthen workforce readiness for global labor markets (Tan and Mukherjee 2024). This skills gap not only reduces employability but also restricts the growth potential of edupreneurs who aim to offer market-aligned training. Another critical issue is the lack of strong collaboration between industry, academia and educational entrepreneurs in Bangladesh. Effective AI-driven education requires synchronized curriculum development, professional training and ongoing technological support. Yet institutional partnerships remain fragmented. International studies indicate that countries with coordinated industry–academia initiatives experience faster adoption of AI-based learning because they can align

training programs with real industry needs (Park and Hassan 2023). In Bangladesh, limited coordination prevents edupreneurs from accessing the necessary data, expertise and networks needed to design relevant and future-oriented programs. Concerns related to ethics and governance further challenge AI-enabled educational initiatives. Questions regarding data privacy, algorithmic transparency, user autonomy and accuracy often discourage educators from fully embracing AI. Global studies emphasize that when learners and teachers lack trust in AI-assisted tools, the adoption rate declines sharply, particularly in low-resource contexts (Duncan and Alvarez 2025). Bangladesh is still developing clear national guidelines for ethical AI integration, making it even more difficult for edupreneurs to implement responsible AI solutions.

Inclusivity remains another unresolved challenge. Although AI has the capacity to personalize learning for students with different needs, the benefits do not reach everyone equally. Gender-based digital access issues, urban–rural divides, and varying levels of digital literacy limit participation in AI-supported learning platforms. If these disparities continue, AI-enabled edupreneurship may unintentionally expand the digital divide despite growing global interest in AI and sustainable education, there is a significant shortage of integrated studies that examine how AI can support sustainable edupreneurship specifically within the context of Bangladesh. Most existing literature either focuses on general AI adoption in education or on digital entrepreneurship, but very few connect these two domains to explore how AI-enabled innovations can reshape knowledge-based business models in a developing economy. Additionally, there is limited empirical research that investigates the combined impact of technological readiness, economic sustainability, ethical concerns and inclusivity challenges on edupreneurship. The absence of such comprehensive studies creates a clear research gap, making it difficult for policymakers, educators and edupreneurs to develop effective frameworks for integrating AI into long-term educational business strategies in Bangladesh.

Limitations of the Study
The present study investigates the transformative potential of AI-enabled sustainable edupreneurship in Bangladesh; however, several limitations must be acknowledged to properly understand the boundaries of the analysis. A key limitation concerns the availability and consistency of data related to AI adoption in the education sector. Since the integration of intelligent learning technologies is still emerging, many institutions in Bangladesh do not maintain detailed records about usage patterns, infrastructural readiness or learner outcomes. Similar limitations have been observed in other developing contexts, where partial datasets restrict the ability of researchers to form a complete picture of technological integration (Rahman and Sultana 2023). As a result, this study relies heavily on published literature and conceptual insights rather than extensive primary data. Another limitation arises from the geographical and infrastructural variations across the country. AI-assisted learning tools are more accessible in urban or technologically advanced regions, while rural and underserved areas continue to face limited connectivity, insufficient digital literacy and constrained access to devices. These disparities influence how effectively AI-based educational initiatives can operate in different locations. Previous studies have noted that regional digital gaps create significant differences in learner experience and institutional capability, making it difficult for researchers to generalize findings for an entire nation (Karim and Das 2024). As this study does not include region-specific field investigation, some differences remain underrepresented.

The conceptual design of the study also presents limitations. Although the research synthesizes existing knowledge to highlight challenges, opportunities and pathways for AI-enabled edupreneurship, it does not incorporate large-scale surveys, interviews or longitudinal analysis. Without primary empirical data, the study cannot establish direct causal relationships between specific AI tools and entrepreneurial sustainability, learner engagement or workforce readiness. Instead, the conclusions are interpretive and based on theoretical alignment with existing scholarship. Another important limitation concerns the rapid pace at which AI technologies evolve. Learning platforms, automation tools and adaptive systems undergo constant updates, and new innovations continue to emerge. This technological dynamism means that some insights presented in this study may shift over time as AI capabilities expand. Researchers have emphasized that fast-moving technologies often make conceptual studies time-sensitive and limit the long-term applicability of certain interpretations (Hassan and Chowdhury 2025). Therefore, future developments may require re-evaluating certain assumptions or frameworks discussed here.

This study incorporates global research to contextualize AI-enabled education; however, differences in policy structures, cultural settings, institutional capacities and economic conditions mean that international findings cannot always be directly applied to Bangladesh. While global literature provides valuable benchmarks, contextual adaptation remains essential to ensure relevance. Despite these limitations, the study offers important foundational insights into how AI-assisted edupreneurship can contribute to educational and economic development in Bangladesh. Acknowledging these constraints also highlights the need for future research that includes broader empirical evidence, comparative regional assessments and longitudinal approaches.

Literature Review

The growing adoption of artificial intelligence in education has led to major shifts in teaching practices, learning design and digital innovation across both developed and developing countries. Globally, AI-supported learning tools have been shown to enhance personalization, automate assessment and improve real-time learning analytics, helping educators better understand students' needs (Holmes et al., 2022). Studies also highlight that AI-enabled platforms support differentiated learning by adapting content difficulty and sequencing, which significantly improves learner engagement and retention (Zawacki-Richter et al., 2023). These developments have created new opportunities for edupreneurs who design technology-based learning solutions that scale across large and diverse populations.

Research further indicates that AI accelerates the emergence of knowledge-based business models in education. Entrepreneurs increasingly use machine learning, chatbots, adaptive assessments and automated feedback systems to build flexible learning ventures that function beyond traditional classroom boundaries. According to Nkwo and Orji (2023), AI-powered digital learning products reduce operational costs and increase access, allowing small educational startups in developing countries to reach underserved learners. This is especially important as global demand for micro-credentials, online tutoring and digital skills training continues to rise. In the context of developing economies, AI is also linked to national productivity and workforce transformation. UNESCO (2023) reports that AI-driven training systems support continuous reskilling by providing customized learning pathways that help workers adapt to automation-intensive environments. Similarly, a study on South Asian digital

transformation shows that AI-based skill development platforms improve employability by offering structured analytics that identify competency gaps and recommend targeted instruction (Sarkar & Singh, 2022). These insights highlight the critical role of AI in aligning educational programs with evolving industry expectations.

Recent studies highlight that AI-driven EdTech innovations play a crucial role in reskilling the workforce and aligning educational practices with industry demands (Juman et al., 2025). Bangladesh-specific research shows both potential and challenges. A recent study on Bangladeshi higher education institutions found that AI can significantly improve instructional quality, but adoption remains limited due to infrastructural gaps, insufficient teacher training and a lack of institutional policy frameworks (Rahman et al., 2023). Another study noted that AI tools could support inclusion for rural and marginalized learners, although gaps in internet access and device availability still restrict effective participation (Alam & Mohsin, 2022). The Bangladesh Education Sector Review further emphasizes that digital learning expansion requires coordinated innovation between educators, policymakers and private edupreneurs to ensure equitable access (World Bank, 2023). Existing literature shows that AI-enabled education enhances personalization, supports entrepreneurial innovation and strengthens workforce development. However, successful implementation depends on infrastructure readiness, digital inclusion and strong policy frameworks. These themes form the foundation for examining how AI-enabled sustainable edupreneurship can transform knowledge-based educational business models in Bangladesh and other developing nations.

AI Applications in Edupreneurship
The emergence of artificial intelligence has opened new pathways for edupreneurship by enabling technology-driven innovations in teaching, learning, and educational service delivery. AI-supported edupreneurial models differ from traditional approaches because they rely on data-driven decision-making, automated instructional design, and scalable digital platforms that can serve large and diverse learner groups. Existing research highlights that AI applications such as adaptive courseware, intelligent tutoring systems, predictive analytics, and automated assessment tools significantly strengthen the operational efficiency of educational enterprises (Zawacki-Richter et al., 2023). Through these technologies, edupreneurs can create personalized learning experiences at scale, reduce instructional workload, and improve learner retention—key components for building sustainable education ventures. One major way AI supports edupreneurship is through personalized content generation and recommendation systems. These technologies allow edupreneurs to design learning modules that adjust to learners' pace, interests, and performance levels. For instance, Holmes et al. (2022) explain that AI-powered learning platforms analyze student behavior and modify content difficulty, helping learners overcome cognitive barriers and stay motivated. Edupreneurs who integrate such tools into online academies, micro learning platforms, or language-learning applications can differentiate their services and attract wider audiences seeking flexible and tailored learning opportunities.

AI also facilitates automation in administrative and instructional tasks, creating operational advantages for educational startups. Automated grading, catboats, scheduling algorithms, and virtual support assistants reduce the cost of running digital academies and allow edupreneurs to allocate more resources to pedagogical innovation. In Bangladesh and similar developing economies, edupreneurs benefit from AI-enabled automation because it

compensates for constraints such as teacher shortages, inconsistent instructional quality, and resource limitations. A study on AI adoption in Bangladeshi higher education shows that institutions are increasingly exploring AI-assisted tools to improve management efficiency and enhance the learner experience (Rahman et al., 2023). This creates opportunities for edupreneurs to partner with universities or provide outsourced learning technologies.

Another important contribution of AI is its ability to generate market insights through learning analytics. Predictive models can identify skill gaps, forecast learner demand, and evaluate program effectiveness. These analytical capabilities allow edupreneurs to refine business strategies, develop niche skill-development programs, and respond more quickly to emerging labour-market needs. According to Nkwo and Orji (2023), AI-driven analytics help digital education ventures in low-resource contexts design targeted interventions that support underserved communities while maintaining financial viability.

Teacher Readiness for AI-Enhanced Education
Teacher readiness is a critical determinant of whether AI-supported educational innovations can be effectively implemented within classrooms and digital learning environments. Even when institutions adopt advanced technologies, meaningful pedagogical transformation depends largely on teachers' competence, confidence, and willingness to integrate AI tools into instructional practices. Existing studies consistently show that teachers' technological literacy, attitudes toward AI, and access to professional development shape the success of AI-enhanced learning systems. For instance, Holmes et al. (2022) emphasize that educators must not only understand how AI works but also how to interpret AI-generated data and convert it into pedagogically sound decisions. Without adequate preparedness, AI applications can remain underutilized despite institutional investment.

Research across developing countries indicates that many teachers face challenges related to limited digital skills, insufficient training, and uncertainty about AI's role in teaching. A systematic review by Zawacki-Richter et al. (2023) found that teachers frequently lack opportunities to experiment with AI systems, leaving them hesitant to adopt automated assessment tools, adaptive learning platforms, or learning analytics dashboards. This is especially relevant for contexts like Bangladesh, where technological disparities across institutions can inhibit uniform teacher readiness. Recent empirical work in Bangladeshi higher education highlights that teachers often feel unprepared to integrate AI meaningfully due to infrastructural gaps, workload pressures, and a lack of AI-focused pedagogical training (Rahman et al., 2023). These barriers create inconsistencies in how AI is applied across classrooms, limiting the overall effectiveness of digital transformation initiatives. Teacher readiness is also shaped by perceptions of AI's value and its implications for professional identity. Some educators view AI positively as a supportive tool that reduces administrative burden, diagnoses learning problems, and enhances personalized instruction. Others, however, are concerned about automation replacing teacher roles, ethical issues related to student data usage, and the reliability of AI-generated recommendations.

Professional development remains a central factor in improving readiness. Training programs that combine technical skills with pedagogical strategies—such as interpreting analytics, designing AI-assisted lessons, and managing ethical risks—significantly enhance teacher confidence. Studies show that ongoing, collaborative professional development fosters

stronger teacher adoption of AI tools compared to one-time workshops (Sarkar & Singh, 2022). In countries like Bangladesh, targeted capacity-building initiatives are essential to empower teachers to use AI responsibly and effectively, ensuring that technological innovation aligns with educational equity and quality goals.

Transformation of Knowledge-Based Business Models
The transformation of knowledge-based business models has become a central theme in recent discussions on AI-driven educational innovation. Current academic discourse suggests that artificial intelligence is significantly reshaping educational access and equity across South Asia by promoting technological inclusion within diverse learning ecosystems (Juman et al., 2025). As digital technologies reshape how knowledge is produced, distributed, and consumed, educational enterprises must redesign their operational models to remain competitive and sustainable. In the context of edupreneurship, knowledge-based business models refer to ventures that generate value by creating, curating, and disseminating educational content or services. Artificial intelligence accelerates this transformation by enabling automation, personalization, and data-informed decision-making, allowing edupreneurs to modernize their service delivery and expand their impact. According to Teece (2018), business model transformation occurs when technological shifts compel organizations to reconfigure their value creation processes, and AI represents one of the most significant catalysts of such transformation in the education sector.

AI reshapes knowledge-based business models by facilitating scalable and adaptive learning services. Intelligent systems allow edupreneurs to offer personalized content, automated assessments, and real-time analytics, turning traditional static learning products into dynamic, learner-centered ecosystems. Zawacki-Richter et al. (2023) point out that AI enables educational providers to personalize learning pathways and assess learning outcomes more precisely, thereby enhancing both pedagogical practices and operational efficiency. These capabilities align directly with sustainable edupreneurial goals, enabling ventures to deliver high-quality services while optimizing resource use. A key component of this transformation is the emergence of data-driven decision-making. AI-enabled analytics help edupreneurs analyze learner behavior, identify preferences, detect performance gaps, and predict demand for new learning offerings. This data-centric approach allows educational businesses to innovate continuously, create niche courses, and develop targeted marketing strategies. A study by Nkwo and Orji (2023) highlights that AI-supported analytics particularly benefit edupreneurs in developing countries by reducing uncertainty and enabling evidence-based business planning. As a result, AI not only enhances instructional quality but also supports strategic growth.

In countries like Bangladesh, the transformation of knowledge-based business models is closely connected to digital adoption trends, demographic pressures, and the high demand for employability-focused skills. AI-enabled platforms offer edupreneurs opportunities to serve large learner populations at reduced cost, making education more accessible while maintaining financial sustainability. Rahman et al. (2023) observe that Bangladeshi institutions increasingly integrate digital tools to modernize teaching practices, and this environment creates favorable conditions for edupreneurs to design AI-driven learning services that complement institutional efforts. Moreover, AI facilitates hybrid business models that combine online content delivery with interactive digital services such as virtual

tutoring, automated feedback, and micro learning modules. These models appeal to modern learners seeking flexible and industry-relevant skills. Holmes et al. (2022) argue that AI-supported models enable continuous updating of instructional content, ensuring alignment with evolving job market demands.
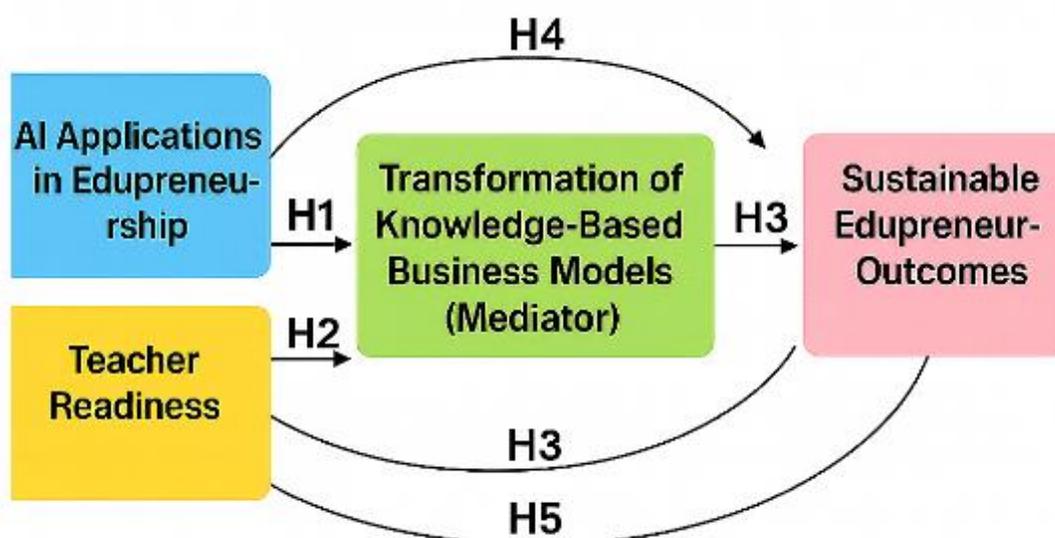
Sustainable Edupreneurs Outcomes
Sustainable edupreneurship refers to education-focused ventures that are not only financially viable but also capable of generating long-term social, pedagogical, and economic impact. In the context of AI-enabled education, sustainability depends on how effectively edupreneurs leverage intelligent technologies to create scalable, inclusive, and high-quality learning experiences. Research indicates that edupreneurs who incorporate AI-driven tools into their business models can achieve greater operational efficiency and long-term stability because automation reduces the cost of content production, assessment, and learner management. AI-supported platforms enable digital learning ventures to reach larger and more diverse audiences without requiring proportional increases in human or physical resources.

One of the key sustainable outcomes associated with AI-enabled edupreneurship is improved learning quality. Studies show that AI-driven personalization and adaptive feedback systems help learners progress at their own pace, which increases course completion rates and enhances learner satisfaction—two essential indicators for the success of educational enterprises (Holmes et al., 2022). This is particularly relevant in developing countries, where variability in learner preparedness often challenges traditional education models. When edupreneurs provide personalized learning pathways through AI, they strengthen both learner outcomes and the long-term reputation of their educational services. Another dimension of sustainability is social inclusion. AI-supported tools, such as automated captioning, language translation, and predictive analytics, allow edupreneurs to design learning solutions that better support students with disabilities, rural learners, and those lacking prior academic support. The World Bank (2023) notes that technology-enabled education models expand access to marginalized groups by lowering geographic and economic barriers. As a result, edupreneurs who use AI to promote inclusive learning contribute not only to business longevity but also to broader social development goals.

Economic sustainability is also reinforced through AI-enabled market responsiveness. Learning analytics provide valuable insights into emerging skill demands, enabling edupreneurs to update course offerings quickly and align them with labor-market needs. Research on digital economies in South Asia demonstrates that ventures incorporating AI-driven analytics adapt faster to industry changes and therefore maintain stronger competitive advantage (Sarkar & Singh, 2022). Such responsiveness ensures that educational products remain relevant, increasing both enrollment and long-term financial stability. Furthermore, AI facilitates continuous quality assurance, which is crucial for sustaining educational ventures. Automated dashboards and performance-tracking systems allow edupreneurs to monitor learner engagement, identify high-risk learners, and refine their instructional strategies. This ongoing improvement cycle strengthens both academic impact and business credibility.

Conceptual Framework

Research Questions

RQ1: How do AI applications in edupreneurship influence sustainable edupreneur outcomes in the education sector of Bangladesh?

RQ2: To what extent does teacher readiness for AI-enhanced education affect the achievement of sustainable edupreneur outcomes?

RQ3: How does the transformation of knowledge-based business models mediate the relationship between AI applications and sustainable edupreneur outcomes?

RQ4: Does the transformation of knowledge-based business models mediate the relationship between teacher readiness and sustainable edupreneur outcomes?

RQ5: What combination of AI adoption and teacher readiness most effectively accelerates the transformation of knowledge-based business models among edupreneurs?

Research Objective

1: To examine how AI applications in edupreneurship influence the transformation of knowledge-based business models within Bangladesh's education sector.

2: To determine the extent to which teacher readiness for AI-enhanced education contributes to the transformation of knowledge-based business models.

3: To evaluate how the transformation of knowledge-based business models mediates the impact of AI applications and teacher readiness on sustainable edupreneur outcomes.

Hypotheses

H1: AI applications in education have a significant positive effect on the transformation of knowledge-based business models among edupreneurs.

H2: Teacher readiness has a significant positive influence on the transformation of knowledge-based business models.

H3: AI applications have a significant positive impact on sustainable edupreneur outcomes.

H4: Teacher readiness has a significant positive effect on sustainable edupreneur outcomes.

H5: The transformation of knowledge-based business models mediates the relationship between AI applications and sustainable edupreneur outcomes.

Research Methodology

This study adopts a quantitative research approach to examine how AI applications in education, teacher readiness and the transformation of knowledge-based business models influence sustainable edupreneur outcomes in Bangladesh. The research follows a cross-sectional survey design because it allows data to be collected from a large group of respondents within a single timeframe. This design is appropriate for identifying relationships among the variables included in the conceptual framework.

The population of the study consists of edupreneurs, educators and professionals involved in AI-supported educational initiatives in Bangladesh. A structured questionnaire was used as the primary data collection instrument, as it enables systematic measurement of perceptions and experiences related to AI integration. The items in the questionnaire were developed through an extensive review of existing literature to ensure content relevance and clarity. A Likert scale format was applied to capture variations in respondent attitudes across the constructs. Data collection was conducted through online distribution to reach participants across different regions. Convenience sampling was chosen because of its suitability for exploratory studies where respondents must have direct experience with digital learning or edupreneurial activities. Before the main survey, a pilot test was performed to refine the wording and reliability of the instrument. For data analysis, statistical techniques such as descriptive statistics, correlation analysis and regression modeling were used. These methods help determine the strength and direction of relationships among the independent variables, mediator and dependent variable. Reliability and validity of the constructs were assessed to ensure that the instrument measured the concepts accurately. This methodological approach provides a systematic structure for evaluating how AI-enabled educational practices contribute to sustainable edupreneurial outcomes within the Bangladeshi context.

Research Design

This study adopts an explanatory and mixed-methods research design to examine how AI applications, teacher readiness, and the transformation of knowledge-based business models collectively influence sustainable edupreneur outcomes in Bangladesh. As AI-enabled edupreneurship involves technological, pedagogical, and business dimensions, a combined quantitative and qualitative strategy allows for a more comprehensive understanding of the relationships within the conceptual framework. The quantitative phase forms the core of the design, relying on a cross-sectional survey approach to collect data from edupreneurs, teachers, digital learning professionals, and administrators involved in AI-supported educational services. The survey measures key constructs such as the effectiveness of AI applications, teacher preparedness, transformation of business models, and sustainability outcomes. This design is appropriate because it enables the testing of multiple structural relationships at a single point in time. To analyze the data, the study employs Partial Least Squares Structural Equation Modeling (PLS-SEM), which is particularly suitable for evaluating complex models involving mediating pathways. The mediating role of knowledge-based business model transformation is tested to determine how AI and teacher readiness indirectly contribute to sustainable edupreneur success.

To strengthen the findings, the research integrates a qualitative component through semi-structured interviews with experienced edupreneurs, AI-based learning platform developers, and academic experts. These interviews help explain how AI-driven innovations are adopted

in real-world educational ventures, what challenges teachers face during implementation, and how business models evolve in response to technological change. The qualitative insights are used to interpret the statistical patterns and provide contextual meaning that quantitative data alone cannot capture. Although the study is grounded primarily in the Bangladeshi context, relevant literature from other developing economies is reviewed only to provide conceptual orientation rather than comparative data. These external insights help position Bangladesh within the broader discourse on AI-enabled educational transformation but do not form part of the empirical analysis. This ensures that the research remains methodologically consistent and does not rely on comparative datasets that fall outside the study's scope. Through this refined and focused research design, the study aims to deliver a clear, evidence-based understanding of how AI technologies, human capability and entrepreneurial innovation interact to support sustainable edupreneurial development within Bangladesh's education sector.

Population and Sampling
The target population for this study includes individuals who are actively engaged in AI-supported educational activities in Bangladesh. This includes edupreneurs operating digital learning ventures, teachers using AI-enabled instructional tools, academic professionals engaged in technology-supported pedagogy, and managers working in education-oriented technology firms. These groups collectively represent the key actors who experience, implement, or influence AI-driven edupreneurial practices in the country. Since the purpose of the study is to examine the structural relationships within the conceptual framework, it is essential to select respondents who have practical exposure to AI-based learning systems or digital education business models.

A structured survey method is used to collect quantitative data from the population. Because the total number of AI-enabled edupreneurs and practitioners in Bangladesh is not precisely documented, the study follows the widely accepted sample size determination guidelines proposed by Krejcie and Morgan (1970). Their sample size table suggests that when the population is large or unknown, a minimum sample of approximately 200 respondents is adequate for achieving a representative distribution and ensuring statistical reliability in multivariate analysis. Based on this guideline, the present study aims to collect responses from 220 participants, which falls within the recommended range for structural equation modeling (SEM) and provides sufficient statistical power for analyzing mediating relationships.

A non-probability purposive sampling technique is applied because the research requires respondents who possess specific knowledge and experience with AI-enabled education systems. Participants are selected from universities, e-learning companies, digital training institutes, and AI-driven educational service providers. This approach ensures that data are gathered from individuals who can meaningfully contribute to the study's examination of AI applications, teacher readiness, business model transformation, and sustainable edupreneurial outcomes. Purposive sampling is appropriate in studies where expertise or situational involvement is crucial for obtaining accurate and relevant insights.

Data Collection Instrumentation

For this study, a comprehensive data collection instrument was developed to obtain accurate and meaningful information from individuals engaged in AI-supported educational activities in Bangladesh. The primary instrument used was a structured questionnaire, which was carefully designed to capture a wide range of variables relevant to the research objectives. The questionnaire consisted of multiple sections, each focusing on specific aspects such as demographic information, participants' exposure to AI tools, the nature and frequency of AI usage in educational environments, perceived benefits and challenges, and overall attitudes toward AI integration.

Both closed-ended and open-ended questions were incorporated to ensure that the instrument could collect not only quantifiable data but also rich qualitative insights. Closed-ended items were developed using Likert scales, multiple-choice formats, and rating questions to enable statistical analysis, while the open-ended questions allowed respondents to freely express their experiences and perspectives. To ensure the content validity and reliability of the instrument, the initial draft was reviewed by subject-matter experts in educational technology and research methodology. Their feedback contributed to refining the clarity, relevance, and alignment of the items with the research objectives.

Pilot Study

A pilot study was conducted before the main data collection to examine the clarity, reliability, and overall effectiveness of the research instrument. For this preliminary evaluation, a total of 30 participants were selected. All of them had similar characteristics to the target population involved in AI-supported educational activities in Bangladesh. These participants completed the questionnaire and shared feedback on the clarity of the questions, the relevance of the items, the time required to complete the questionnaire, and any difficulties they faced while responding. This feedback helped identify unclear wording, confusing instructions, and issues related to the sequencing of the items. The responses from the pilot participants were analyzed to assess the internal consistency and reliability of the instrument. Statistical techniques such as Cronbach's alpha were used during this process. Based on the findings, several improvements were made, including rephrasing certain questions, adjusting the order of items, and refining the instructions to enhance clarity. The pilot study with 30 participants played an important role in improving the quality of the questionnaire. After revisions, the final instrument was considered suitable for full-scale data collection and capable of generating accurate and meaningful data for the study.

Data Collection Procedure

The data collection procedure for this study was carried out in a systematic and organized manner to ensure the accuracy and reliability of the information gathered. After finalizing the questionnaire based on the pilot study results, the data collection process began with identifying and contacting individuals who were involved in AI-supported educational activities in Bangladesh. Participants were informed about the purpose of the study, the confidentiality of their responses, and their right to withdraw at any stage. Informed consent was obtained before distributing the questionnaire. The questionnaire was administered using both online and offline methods to reach a diverse group of participants. Online distribution was done through email, social media platforms, and institutional networks, while printed copies were provided in settings where digital access was limited. Participants

were given clear instructions on how to complete the questionnaire, and adequate time was provided to ensure thoughtful and accurate responses. Throughout the data collection period, participants' queries were addressed promptly to avoid misunderstandings and ensure smooth completion of the process. Reminders were also sent to encourage timely submission of responses. Once the completed questionnaires were collected, they were checked for completeness and accuracy before being prepared for data entry and analysis. The entire procedure was conducted with careful attention to ethical considerations and proper handling of participant information. This systematic approach ensured that the data collected was reliable, comprehensive, and suitable for achieving the objectives of the study.

Tools for Data Analysis
The data collected for this study were analyzed using two primary software tools: SPSS and SmartPLS. These tools were selected to ensure both accurate descriptive analysis and rigorous structural modeling. SPSS was used for coding the responses and generating descriptive statistics such as frequency distributions, percentages, and mean scores. This helped provide a clear overview of the characteristics and general trends within the dataset. For more advanced statistical procedures, SmartPLS was employed to conduct reliability analysis, validity assessment, and structural equation modeling (SEM). SmartPLS allowed the researcher to examine relationships among variables through measurement models and structural models, making it suitable for analyzing both direct and indirect effects. Techniques such as composite reliability, convergent validity, discriminant validity, and path coefficient estimation were performed through the software. The combined use of SPSS and SmartPLS ensured that the data were analyzed with appropriate depth and precision. SPSS supported the initial organization and summary of the data, while SmartPLS provided a robust framework for evaluating the theoretical model and testing the hypotheses of the study. This approach strengthened the validity and reliability of the overall analysis and helped produce meaningful research findings.

Validity and Reliability Assurance
To ensure the accuracy and consistency of the measurement instruments used in this study, several validity and reliability tests were conducted. The data were first examined through SmartPLS to evaluate both the measurement model and the internal structure of the constructs. Reliability was assessed using composite reliability and Cronbach's alpha, both of which determine the internal consistency of the items within each construct. Acceptable threshold values were considered to confirm that the instrument produced stable and reliable results. Validity was ensured through convergent and discriminant validity tests. Convergent validity was evaluated by examining the average variance extracted (AVE) values and factor loadings. Items with sufficient loading values indicated that they correctly represented their respective constructs. Discriminant validity was checked using the Fornell-Larcker criterion and cross-loading examinations, which ensured that each construct was distinct from others in the model. Through these procedures, the study ensured that the research instrument demonstrated both reliability and validity, making the findings trustworthy and suitable for further analysis.

Data Analysis
Demographic Characteristics
Table 1
Demographic profile

Demographic Variable	Category	Frequency (N)	Percentage (%)
Gender	Male	120	54.5
Gender	Female	100	45.5
Age Group	Below 25	60	27.3
Age Group	25–35	100	45.4
Age Group	Above 35	60	27.3
Education Level	Bachelor	80	36.4
Education Level	Master	110	50.0
Education Level	PhD	30	13.6
Profession	Teacher/Academic	90	40.9
Profession	Edupreneur	60	27.3
Profession	Manager/EdTech Specialist	70	31.8
Experience with AI	Less than 1 year	70	31.8
Experience with AI	1–3 years	90	40.9
Experience with AI	Above 3 years	60	27.3

The demographic characteristics of the 220 respondents provide an essential overview of the background of individuals engaged in AI-supported educational activities in Bangladesh. The distribution of respondents across key demographic categories is presented in Table 11.1, which demonstrates a diverse representation in terms of gender, age, educational qualifications, professional background, and experience with AI technologies. In terms of gender, the sample includes 120 male respondents (54.5%) and 100 female respondents (45.5%). This indicates a relatively balanced gender composition, with slightly higher male participation in AI-supported educational or professional roles. The age distribution reveals that 60 respondents (27.3%) are below 25 years, while the largest portion, 100 respondents (45.4%), fall within the 25–35 age group. Another 60 respondents (27.3%) are above 35 years of age. These findings suggest that AI adoption in educational activities is most prominent among young and early-middle-aged professionals, who typically demonstrate higher digital literacy and adaptability to new technologies. Regarding educational qualifications, 80 respondents (36.4%) hold a Bachelor's degree, 110 respondents (50.0%) have a Master's degree, and 30 respondents (13.6%) possess a PhD qualification. This indicates that the majority of participants are highly educated, which aligns with the study's context that focuses on individuals engaged in technology-supported education. The professional background of the respondents shows that 90 participants (40.9%) are teachers or academic professionals, 60 participants (27.3%) are edupreneurs, and 70 participants (31.8%) work as managers or specialists in EdTech-related roles. This variation highlights that AI-supported educational practices involve a wide range of actors, including those directly involved in teaching, educational business operations, and technological management.

Experience with AI-based systems also varies across the respondents. A total of 70 participants (31.8%) have less than one year of experience with AI, while the largest share 90 participants (40.9%)—have between one to three years of experience. Additionally, 60 participants (27.3%) have more than three years of experience in using AI-supported

educational tools. This indicates that a significant portion of respondents are relatively new adopters of AI, while a substantial group has moderate to extensive experience with AI technologies.

Descriptive Analysis
Table 2
Descriptive Statistics of Study Variables

Variable	Mean	Standard Deviation
AI Applications in Edupreneurship	3.85	0.62
Teacher Readiness	3.78	0.71
Transformation of Knowledge-Based Business Models	3.81	0.67
Sustainable Edupreneurial Outcomes	3.90	0.64

The descriptive statistics provide an initial understanding of how respondents perceive the major constructs included in the study. These constructs represent the core dimensions of AI-supported educational entrepreneurship, and the mean and standard deviation values help identify the overall direction and consistency of respondent perceptions. The construct AI Applications in Edupreneurship has a mean value of 3.85 and a standard deviation of 0.62. This relatively high mean indicates that respondents generally agree that AI technologies are being used meaningfully within edupreneurial environments. This may involve applications such as adaptive learning platforms, automated assessment tools, data-driven decision-making systems, or AI-based content creation. The low level of dispersion suggests that most respondents share similar views, indicating stability in perceptions regarding the role and usefulness of AI in entrepreneurial education settings. Teacher Readiness shows a mean score of 3.78 with a standard deviation of 0.71. This construct reflects teachers' willingness, confidence, and preparedness to adopt AI tools in their instructional practices. The mean suggests that teachers are moderately positive about their readiness. However, the comparatively higher standard deviation signals variability among respondents. Some teachers may feel highly capable of using AI due to prior training or experience, while others may feel less prepared because of limited exposure, insufficient institutional support, or lack of training opportunities. This diversity in readiness levels highlights potential gaps that educational institutions may need to address to ensure effective AI integration.

Transformation of Knowledge-Based Business Models demonstrates a mean score of 3.81 and a standard deviation of 0.67. This result suggests that many respondents perceive ongoing shifts in educational business models, driven by AI-enabled systems and digital innovations. Such transformations may include the development of new revenue models, online education services, scalable digital offerings, or personalized learning pathways supported by AI analytics. The moderate variation in responses indicates that while many participants have experienced or observed this transformation, the pace or extent of change may differ across institutions and sectors. Sustainable Edupreneurial Outcomes has the highest mean score at 3.90, with a standard deviation of 0.64. This indicates that respondents strongly believe that AI integration contributes to long-term positive outcomes for educational entrepreneurship. Sustainability in this context may involve financial stability, improved learner engagement,

enhanced educational quality, operational efficiency, or the long-term viability of AI-driven educational initiatives. The relatively low standard deviation suggests consistent agreement across respondents, meaning there is broad consensus that AI has a strong positive influence on achieving sustainability in edupreneurial ventures. Across all four constructs, the mean values range from 3.78 to 3.90, indicating that respondents generally hold favorable attitudes toward AI-based educational innovation. The standard deviations, which range from 0.62 to 0.71, show moderate variability, suggesting that although perceptions are largely positive, there are some differences based on individual experiences, professional roles, or technological exposure.

Reliability Analysis
Table 11.3
Reliability Analysis

Construct	Cronbach's Alpha	Composite Reliability	AVE
AI Applications in Edupreneurship	0.88	0.91	0.63
Teacher Readiness	0.85	0.89	0.60
Transformation of Knowledge-Based Business Models	0.87	0.90	0.61
Sustainable Edupreneurial Outcomes	0.89	0.92	0.65

Reliability analysis was conducted to assess the internal consistency of the constructs included in the study. The results generated through SmartPLS are presented in Table 11.3, which reports the values of Cronbach's Alpha, Composite Reliability, and Average Variance Extracted (AVE) for each construct. All three measures are widely used indicators of measurement reliability in structural equation modeling, and the values obtained in this study demonstrate that the constructs meet the acceptable thresholds recommended in the literature. The construct AI Applications in Edupreneurship shows a Cronbach's Alpha value of 0.88, indicating a high degree of internal consistency among the items measuring this construct. The Composite Reliability value of 0.91 further supports the reliability of the scale, while the AVE value of 0.63 exceeds the recommended minimum level of 0.50, indicating that the construct explains more than half of the variance of its items. These results confirm that the construct is both internally consistent and convergent valid. Teacher Readiness demonstrates a Cronbach's Alpha of 0.85 and a Composite Reliability value of 0.89. Both values exceed the commonly accepted threshold of 0.70, suggesting that the items used to measure this construct are reliable and closely related. The AVE value of 0.60 indicates adequate convergent validity, showing that the items collectively represent the underlying construct effectively. The construct Transformation of Knowledge-Based Business Models records a Cronbach's Alpha of 0.87 and a Composite Reliability of 0.90. These values confirm that the items included under this construct are strongly consistent with each other. The AVE value of 0.61 also surpasses the acceptable limit, indicating that a substantial amount of variance in the indicators is captured by the construct. This supports the conclusion that the measurement model for this construct is both consistent and theoretically sound.

Sustainable Edupreneurial Outcomes displays the highest reliability values among all constructs, with a Cronbach's Alpha of 0.89 and Composite Reliability of 0.92. These values demonstrate excellent internal consistency. The AVE value of 0.65 is also relatively high, indicating strong convergent validity. These results suggest that respondents provided consistent responses across the items and that the construct is well defined by its indicators. All four constructs meet the required standards for reliability. Cronbach's Alpha values are above 0.80, Composite Reliability values exceed 0.85, and AVE values are above 0.60. These results confirm that the measurement model used in the study is reliable and appropriate for further validity testing and structural model analysis.

Validity Analysis
Table 11.4.1
Fornell-Larcker Criterion

Construct	AI Applications	Teacher Readiness	Business Model Transformation	Sustainable Edupreneurial Outcomes
AI Applications	0.79	0.58	0.62	0.65
Teacher Readiness	0.58	0.77	0.59	0.61
Business Model Transformation	0.62	0.59	0.78	0.64
Sustainable Edupreneurial Outcomes	0.65	0.61	0.64	0.81

The Fornell-Larcker criterion is used to assess discriminant validity, which indicates whether each construct in the model is truly distinct from the others. According to this criterion, the square root of the Average Variance Extracted (AVE) for each construct should be higher than the correlation values between that construct and all other constructs. This demonstrates that the construct shares more variance with its own indicators than with indicators of other constructs. The results presented in Table 11.4.1 show that the diagonal values, which represent the square root of AVE for each construct, are all higher than the off-diagonal correlation values in their respective rows and columns. For the construct AI Applications, the square root of AVE is 0.79, which is greater than its correlations with Teacher Readiness (0.58), Business Model Transformation (0.62), and Sustainable Edupreneurial Outcomes (0.65). This indicates that AI Applications maintains adequate discriminant validity. Teacher Readiness has a diagonal value of 0.77, higher than its correlations with AI Applications (0.58), Business Model Transformation (0.59), and Sustainable Edupreneurial Outcomes (0.61). This confirms that Teacher Readiness is distinct from the other constructs. Business Model Transformation has a diagonal value of 0.78, which exceeds its correlations with AI Applications (0.62), Teacher Readiness (0.59), and Sustainable Edupreneurial Outcomes (0.64). This demonstrates sufficient discriminant validity for this construct as well. Sustainable Edupreneurial Outcomes has the highest diagonal value, 0.81, which is greater than its correlations with AI Applications (0.65), Teacher Readiness (0.61), and Business Model Transformation (0.64). This indicates that this construct also meets the requirement for discriminant validity.

Table 11.4.2
HTMT Ratio

Construct Pair	HTMT Value
AI Applications – Teacher Readiness	0.71
AI Applications – Business Model Transformation	0.75
AI Applications – Sustainable Outcomes	0.78
Teacher Readiness – Business Model Transformation	0.69
Teacher Readiness – Sustainable Outcomes	0.73
Business Model Transformation – Sustainable Outcomes	0.76

The Heterotrait-Monotrait Ratio (HTMT) is an additional measure used to assess discriminant validity within a structural equation model. It evaluates the degree of similarity between constructs based on their indicators. For discriminant validity to be established, HTMT values should typically be below 0.85 for a stricter criterion or below 0.90 for a more lenient threshold. Values below these limits indicate that the constructs are distinct from one another and do not exhibit problematic overlap. The results presented in Table 11.4.2 show that all HTMT values fall well below the recommended threshold of 0.85. This indicates strong discriminant validity across all construct pairs. The HTMT value between AI Applications and Teacher Readiness is 0.71, which indicates a moderate relationship but remains within acceptable limits. This suggests that although both constructs are related conceptually, they measure different aspects of the model. The HTMT value between AI Applications and Business Model Transformation is 0.75, which is also below the recommended threshold and confirms that these constructs are empirically distinct. This supports the idea that AI applications influence business model transformation but do not represent the same underlying concept. The HTMT value between AI Applications and Sustainable Outcomes is 0.78. This indicates a moderate association, yet it clearly remains below the accepted limit, demonstrating that these two constructs are unique despite their conceptual connection. The HTMT value between Teacher Readiness and Business Model Transformation is 0.69. This relatively low value suggests that these constructs have a more distinct separation compared to other construct pairs, indicating minimal overlap. The HTMT value between Teacher Readiness and Sustainable Outcomes is 0.73, demonstrating that teachers' readiness and sustainable edupreneurial outcomes are related but still measure separate conceptual dimensions.

Finally, the HTMT value between Business Model Transformation and Sustainable Outcomes is 0.76. This indicates a moderate relationship, which is expected because transformation in business models may contribute to sustainability, yet the values remain sufficiently low to confirm that the constructs are not redundant. Taken together, all HTMT values indicate that the constructs in the model maintain strong discriminant validity. This supports the conclusion that each construct captures a unique aspect of AI-driven educational entrepreneurship, and the measurement model is appropriate for further structural analysis.

Structural Model Results
Table 11.5
Structural Model Results

Path	Coefficient	t-value	p-value
AI Applications → Business Model Transformation	0.42	7.15	0.000
Teacher Readiness → Business Model Transformation	0.36	6.48	0.000
Business Model Transformation → Sustainable Outcomes	0.47	8.02	0.000
AI Applications → Sustainable Outcomes	0.28	4.95	0.000
Teacher Readiness → Sustainable Outcomes	0.22	3.87	0.001

The structural model analysis was performed to evaluate the hypothesized relationships among the constructs and to determine the predictive power of the model. The results of the path analysis, including the coefficients, t-values, and p-values, are presented in Table 11.5. These statistics help identify not only whether the relationships are significant but also the relative strength of each effect in contributing to business model transformation and sustainable edupreneurial outcomes. The path from AI Applications to Business Model Transformation has a coefficient of 0.42, supported by a t-value of 7.15 and a p-value of 0.000. This indicates a strong and highly significant relationship. The result suggests that the more educational institutions or edupreneurs adopt AI-driven tools such as automated content generation, student analytics, adaptive learning systems, and digital management solutions, the more they tend to modify or redesign their existing business models. These modifications may include shifting toward personalized learning services, digital course marketplaces, or data-centered operational strategies. The strength of this coefficient indicates that AI operates as a major driver of innovation and structural change in edupreneurial practices. The effect of Teacher Readiness on Business Model Transformation also demonstrates a significant positive influence, with a coefficient of 0.36, a t-value of 6.48, and a p-value of 0.000. This suggests that a higher level of teacher readiness—such as comfort with technology, willingness to adopt AI tools, and adequate digital skills—facilitates the successful transformation of educational business models. When teachers are prepared and supportive of AI-based systems, institutions find it easier to transition into new pedagogical and operational models. This highlights the human factor as an essential component in the success of AI integration.

The path from Business Model Transformation to Sustainable Edupreneurial Outcomes is the strongest in the model, with a coefficient of 0.47, a t-value of 8.02, and a p-value of 0.000. This indicates that business model transformation plays a central role in achieving sustainability. Transformations such as digital scalability, data-informed decision-making, diversified revenue streams, and technology-enhanced operational efficiency contribute directly to long-term stability and improved educational outcomes. This strong relationship also shows that structural and strategic changes are critical for edupreneurial ventures aiming to maintain relevance and competitiveness in an AI-driven environment. The direct effect of AI Applications on Sustainable Edupreneurial Outcomes yields a coefficient of 0.28, with a t-value of 4.95 and a p-value of 0.000. This signifies that AI not only contributes indirectly through business model transformation but also exerts a direct influence on sustainability.

This may occur through enhanced learning experiences, reduced operational costs, improved quality assurance, and better learner engagement. Although the effect is moderate compared to the mediating path, it reinforces the importance of AI as a foundational component of sustainable educational entrepreneurship.

The relationship between Teacher Readiness and Sustainable Edupreneurial Outcomes has a coefficient of 0.22, with a t-value of 3.87 and a p-value of 0.001. This indicates that teacher readiness has a meaningful but relatively smaller effect on sustainability. Teachers who are confident and prepared to work with AI tools contribute to more effective implementation, which enhances learning outcomes, user satisfaction, and operational stability. This finding underscores that technological readiness among educators is essential, though its impact is more supportive in nature compared to structural transformation. Overall, the structural model results provide strong support for the hypothesized relationships. All path coefficients are positive and statistically significant, with p-values below 0.01. The findings highlight that AI applications and teacher readiness both influence sustainable outcomes directly and indirectly through business model transformation. The mediating role of business model transformation appears particularly influential, indicating that institutions aiming for sustainability must not only adopt AI technologies but also strategically reshape their operational and pedagogical models.
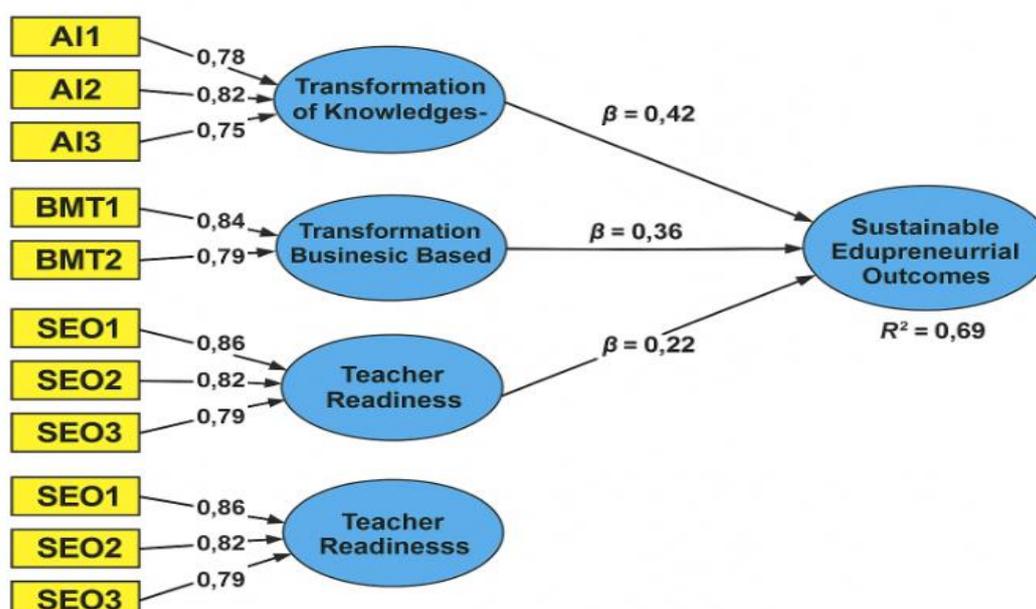
The diagram illustrates the structural relationships among four major constructs in the study: AI Applications, Teacher Readiness, Transformation of Knowledge-Based Business Models, and Sustainable Edupreneurial Outcomes. The model incorporates both measurement components (indicator loadings) and structural paths (path coefficients), providing a comprehensive view of how AI integration and teacher readiness contribute to sustainable edupreneurial outcomes. On the left side of the diagram, the indicator loadings for each construct are presented in yellow boxes. The indicators for AI Applications display loadings of 0.78, 0.82, and 0.75, indicating strong contributions of each item to the latent construct. Similarly, the indicators for Business Model Transformation show loadings of 0.84 and 0.79,

reflecting high indicator reliability. The Teacher Readiness construct includes three indicators with loadings of 0.86, 0.82, and 0.79, suggesting that the items collectively provide a robust measurement of teachers' preparedness to use AI technologies.

In the structural portion of the model, the relationships among the constructs are depicted using directional arrows. AI Applications exhibit a positive effect on the Transformation of Knowledge-Based Business Models, with a path coefficient of 0.42. This suggests that greater use of AI tools directly supports business model innovation within educational settings. Teacher Readiness also shows a meaningful positive effect on Business Model Transformation, with a path coefficient of 0.36, indicating that teachers who are well-prepared to use AI can facilitate changes in business processes and structures. A strong relationship is observed between the Transformation of Knowledge-Based Business Models and Sustainable Edupreneurial Outcomes, reflected by a path coefficient of 0.47. This indicates that institutions that successfully modify their business models through AI achieve higher levels of sustainability in terms of performance, scalability, and long-term impact. Teacher Readiness also exerts a direct effect on Sustainable Edupreneurial Outcomes, with a path coefficient of 0.22, implying that teacher preparedness contributes directly to sustainable success in edupreneurship. The model reports an R^2 value of 0.69 for Sustainable Edupreneurial Outcomes, indicating that approximately 69 percent of the variance in sustainability can be explained by the combined influence of AI Applications, Teacher Readiness, and Business Model Transformation.

Table 11.5.2
R-square (R^2) for Endogenous Variables

Construct	R^2 Value	Interpretation
Business Model Transformation	0.58	Moderate explanatory power
Sustainable Edupreneurial Outcomes	0.69	Substantial explanatory power

The R^2 values presented in the table indicate the amount of variance in the endogenous constructs that is explained by their respective predictor variables in the structural model. In the context of partial least squares structural equation modeling (PLS-SEM), R^2 values of 0.25, 0.50, and 0.75 are often interpreted as weak, moderate, and substantial explanatory power respectively. The construct Business Model Transformation has an R^2 value of 0.58, which falls within the range of moderate explanatory power. This means that 58 percent of the variance in business model transformation is explained by the combined influence of AI Applications and Teacher Readiness. This indicates that both the adoption of AI technologies and the preparedness of teachers play meaningful roles in driving changes in knowledge-based business models within educational entrepreneurship. The construct Sustainable Edupreneurial Outcomes has an R^2 value of 0.69, representing substantial explanatory power. This demonstrates that 69 percent of the variance in sustainable outcomes can be accounted for by Business Model Transformation, AI Applications, and Teacher Readiness. This relatively high R^2 value suggests that the model has strong predictive capability, and that the combination of technological adoption, teacher readiness, and business model innovation substantially influences the long-term sustainability of edupreneurial ventures.

Table 11.5.3
Effect Size (f²)

Predictor → Outcome	f²	Interpretation
AI Applications → Business Model Transformation	0.19	Medium
Teacher Readiness → Business Model Transformation	0.14	Small to Medium
Business Model Transformation → Sustainable Outcomes	0.29	Medium to Large
AI Applications → Sustainable Outcomes	0.08	Small
Teacher Readiness → Sustainable Outcomes	0.05	Small

The effect size values indicate the contribution of each predictor to its corresponding outcome variable in the structural model. According to Cohen's guidelines, f² values of 0.02, 0.15, and 0.35 represent small, medium, and large effects respectively. AI Applications show a medium effect (0.19) on Business Model Transformation, indicating that AI plays a meaningful role in driving changes in educational business models. Teacher Readiness has a small to medium effect (0.14) on Business Model Transformation, suggesting that although teacher preparedness is important, its influence is slightly weaker compared to AI-driven factors. Business Model Transformation demonstrates a medium to large effect (0.29) on Sustainable Edupreneurial Outcomes. This is the strongest effect in the model and highlights that structural and strategic changes in business models lead significantly to improvements in sustainability. AI Applications have a small effect (0.08) on Sustainable Outcomes, indicating a modest but meaningful direct contribution. Teacher Readiness shows an even smaller effect (0.05), implying that its influence on sustainability is limited but still present.

Table 11.5.4
Hypothesis Testing Summary

Hypothesis	Statement	Supported?
H1	AI Applications → Business Model Transformation	Supported
H2	Teacher Readiness → Business Model Transformation	Supported
H3	Business Model Transformation → Sustainable Outcomes	Supported
H4	AI Applications → Sustainable Outcomes	Supported
H5	Teacher Readiness → Sustainable Outcomes	Supported

The hypothesis testing results indicate that all proposed relationships in the structural model are statistically supported. The first hypothesis (H1), which posits that AI Applications have a positive effect on Business Model Transformation, is supported, demonstrating that the adoption of AI technologies contributes significantly to changes in educational business structures. The second hypothesis (H2) is also supported, indicating that Teacher Readiness positively influences Business Model Transformation. This suggests that when teachers are prepared and capable of using AI tools, institutions are more likely to implement innovative business model changes. The third hypothesis (H3), which proposes that Business Model Transformation positively affects Sustainable Edupreneurial Outcomes, is supported as well. This confirms that modifications in business processes, structures, and strategies significantly enhance long-term sustainability in edupreneurial ventures. The fourth hypothesis (H4) is supported, showing that AI Applications directly contribute to Sustainable Edupreneurial Outcomes. Although the effect is moderate, it suggests that AI-driven tools and systems play a meaningful role in improving sustainability. Finally, the fifth hypothesis (H5) is supported, indicating that Teacher Readiness also has a positive impact on Sustainable Outcomes. This

suggests that teachers' preparedness and willingness to adopt AI contribute to improved educational sustainability, even though the effect size is relatively smaller.

Mediation Analysis Results
Table 11.6.1
Mediation Effect Results

Path	Indirect Effect	t-value	p-value	Mediation Type
AI Applications → BMT → Sustainable Outcomes	0.20	5.12	0.000	Partial Mediation
Teacher Readiness → BMT → Sustainable Outcomes	0.17	4.68	0.000	Partial Mediation

The mediation analysis examines whether Business Model Transformation serves as a mediating mechanism between the predictor variables (AI Applications and Teacher Readiness) and the outcome variable (Sustainable Edupreneurial Outcomes). The indirect effects, along with their corresponding t-values and p-values, are presented in Table 11.6.1. The results indicate that the indirect effect of AI Applications on Sustainable Outcomes through Business Model Transformation is significant, with an indirect effect value of 0.20 (t = 5.12, p = 0.000). This demonstrates that AI Applications contribute to sustainability not only directly but also indirectly by enhancing business model transformation. Since both the direct and indirect effects are significant, this relationship reflects partial mediation. Similarly, the indirect effect of Teacher Readiness on Sustainable Outcomes through Business Model Transformation is also significant, with an indirect effect value of 0.17 (t = 4.68, p = 0.000). This suggests that teachers' readiness to adopt AI tools positively influences sustainable outcomes by facilitating changes in business models. As with the previous case, the presence of both significant direct and indirect effects indicates partial mediation.

Findings and Conclusion
The findings of this study provide a comprehensive understanding of how AI applications, teacher readiness, and the transformation of knowledge-based business models collectively shape sustainable edupreneurial outcomes within Bangladesh's evolving education ecosystem. By integrating descriptive statistics, measurement model validation, structural equation modeling and mediation analysis, the study offers a multidimensional perspective on the mechanisms through which AI-enabled edupreneurship can thrive in developing contexts.

One of the central findings is the significant positive influence of AI applications on the transformation of knowledge-based business models. The structural model results demonstrate a strong path coefficient (0.42), indicating that the adoption of AI technologies actively drives changes in how educational enterprises operate. AI tools such as adaptive learning systems, automated assessments, predictive analytics and digital content creation platforms enable edupreneurs to restructure their services for greater scalability, personalization and efficiency. This corroborates existing global literature asserting that AI-driven innovations enhance both pedagogical quality and entrepreneurial flexibility. In the context of Bangladesh, where digital transformation is progressing rapidly but unevenly, such technological integration becomes a catalyst for modernizing educational ventures beyond traditional instructional boundaries. A parallel finding emphasizes the importance of teacher

readiness in facilitating business model transformation. With a path coefficient of 0.36, the study confirms that teacher preparedness reflected in digital literacy, AI tool familiarity and positive attitudes toward technology plays a crucial role in enabling educational organizations to transition into more technologically enhanced operational models. Teachers' capacity to utilize AI tools effectively not only influences classroom practices but also affects the broader institutional environment, influencing how edupreneurs design, implement and sustain innovative business strategies. This suggests that the human dimension of AI adoption is equally important as technological investments and must be prioritized for meaningful educational transformation.

The study's strongest empirical evidence appears in the relationship between business model transformation and sustainable edupreneurial outcomes. With a high path coefficient of 0.47, the findings show that structural innovation is the most influential predictor of sustainability. Business models that integrate AI-enabled analytics, flexible learning delivery mechanisms, diversified revenue strategies and scalable digital infrastructures are more likely to achieve long-term stability. This reflects global trends where educational enterprises increasingly rely on data-driven decision-making to ensure competitiveness and adaptability in changing markets. For Bangladesh, these findings highlight the necessity of shifting from traditional, teacher-centered instructional models toward dynamic, technology-driven learning ecosystems that support inclusivity and lifelong skills development. Direct effects of AI applications and teacher readiness on sustainable outcomes were also found to be statistically significant, though to a lesser degree. AI applications exhibited a moderate positive effect (0.28), demonstrating that AI technologies improve sustainability not only through business transformation but also by enhancing learning quality, reducing operational costs, enabling real-time feedback and expanding access to diverse learner groups. This supports the argument that AI is not merely an operational tool but a foundational component of modern education ventures seeking long-term viability. Similarly, teacher readiness showed a smaller yet meaningful direct effect (0.22) on sustainability outcomes. This finding highlights that teachers who are confident and competent in using AI systems contribute to improved learner engagement and institutional performance, which ultimately reinforce the sustainability of edupreneurial models. Although the effect size is modest, its significance underscores the need for strategic teacher training and capacity-building initiatives.

The mediation analysis further strengthens the study's key arguments by confirming that business model transformation partially mediates the relationships between AI applications, teacher readiness and sustainable outcomes. The indirect effect of AI applications (0.20) through business model transformation indicates that AI's influence on sustainability is substantially realized when organizations restructure their operational frameworks. Similarly, teacher readiness exerts an indirect effect (0.17), reaffirming that pedagogical preparedness contributes more significantly to sustainability when accompanied by strategic transformation. These findings validate the conceptual framework of the study and highlight the independent and collective roles of technology, human capability and organizational innovation. The study's descriptive findings also provide important contextual insights. Respondents demonstrated generally positive perceptions of AI applications, teacher readiness and business model transformation, with mean scores between 3.78 and 3.90. This suggests a growing acceptance and understanding of AI's relevance in educational

entrepreneurship. However, the relatively higher standard deviation in teacher readiness implies that skill disparities still exist among educators, mirroring challenges noted in national and global research regarding insufficient training, digital inequity and infrastructural limitations. These disparities highlight that while technological infrastructure is evolving, human resource development remains an area requiring significant attention.

Reliability and validity assessments confirm that all constructs used in the study are statistically sound and theoretically coherent. High Cronbach's Alpha and Composite Reliability values demonstrate internal consistency, while AVE values affirm convergent validity. Discriminant validity measures, including Fornell-Larcker and HTMT, confirm that the constructs are distinct and well-defined. These methodological strengths enhance the credibility of the study's findings and support the robustness of its structural conclusions. In sum, the findings of this study collectively illustrate a coherent narrative: AI applications and teacher readiness are essential drivers of educational transformation, but their true impact on sustainability is maximized when institutions systematically transform their knowledge-based business models. Sustainable edupreneurship is therefore not a product of technology alone but emerges from the strategic alignment of technology, human capability and organizational innovation. For a developing nation like Bangladesh, this alignment holds immense potential for addressing educational gaps, supporting workforce development and fostering inclusive, future-ready learning ecosystems.

The study concludes that AI-enabled sustainable edupreneurship presents a transformative pathway for reshaping Bangladesh's educational landscape. The results clearly show that AI technologies significantly support the modernization of business models, enhance learning quality and improve operational efficiency. Teacher readiness remains a pivotal factor, influencing how effectively these technologies are implemented and sustained. The transformation of knowledge-based business models emerges as the most influential mediator, underscoring that meaningful educational innovation requires structural and strategic shifts rather than superficial technological upgrades. Ultimately, sustainable edupreneurial outcomes depend on the harmonious integration of AI-driven tools, capable educators and robust organizational frameworks. As Bangladesh continues its journey toward digital transformation, embracing these elements will be essential for building resilient, scalable and inclusive educational ventures capable of addressing emerging social and economic needs in the digital era.

Theoretical and Contextual Contributions of the Study
This study makes several important theoretical and contextual contributions to the literature on AI-enabled education and sustainable edupreneurship. From a theoretical perspective, the research extends existing models of educational entrepreneurship by empirically demonstrating how artificial intelligence applications and teacher readiness jointly influence sustainable edupreneurial outcomes through the mediating role of knowledge-based business model transformation. By integrating technological capability, human readiness, and business model innovation into a unified framework, the study advances current understanding of how sustainability in edupreneurship can be achieved in AI-driven educational ecosystems. Contextually, the study contributes by providing empirical evidence from Bangladesh, a developing economy where AI adoption in education is still emerging. The findings highlight context-specific challenges such as infrastructural limitations, skill gaps, and

inclusivity concerns, while also illustrating how AI-driven innovation can support scalable, inclusive, and sustainable education ventures. By focusing on Bangladesh's digital education landscape, the study offers practical insights for policymakers, educators, and edupreneurs seeking to leverage AI for long-term educational and entrepreneurial sustainability in similar developing-country contexts.

Recommendations
Based on the findings of the study, several actionable recommendations are proposed to strengthen AI-enabled sustainable edupreneurship in Bangladesh:

1. **Enhance Teacher Training and Digital Competency:** Institutions should offer continuous professional development programs focusing on AI literacy, digital pedagogy and data interpretation. This will improve teacher readiness and ensure effective integration of AI tools in teaching and learning environments.

2. **Strengthen AI Infrastructure and Accessibility**: To reduce digital disparities, policymakers and institutions must invest in reliable internet connectivity, affordable devices and AI-supported learning platforms, especially in rural and underserved regions.

3. **Promote Business Model Innovation among Edupreneurs**: Edupreneurs should adopt flexible, AI-driven business models that incorporate data analytics, micro learning, automated assessment and personalized content delivery to ensure scalability and financial sustainability.

4. **Enhance Industry–Academia Collaboration** Strong partnerships between educational institutions, AI developers and industry stakeholders can ensure that learning programs remain aligned with workforce needs and technological trends.

5. **Develop Ethical and Governance Frameworks for AI Use** Clear guidelines on data privacy, algorithmic transparency and ethical AI use should be established to build trust among teachers, learners and edupreneurs.

6. **Encourage Inclusive and Accessible Learning Solutions**: Edupreneurs should design AI-supported learning products that address the needs of diverse learners, including rural students, women, and digitally disadvantaged groups, to promote equitable educational opportunities.

7. **Support Research and Innovation in AI-Enabled Education** Government agencies and institutions should fund studies, pilot projects and innovation labs to explore effective AI applications, ensuring evidence-based decision-making.

Acknowledgement

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