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Determinants of Students' Adoption of AI-Driven Career Planning Tools: The Mediating Role of User Engagement in Chinese Private Colleges

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Abstract

The rapid integration of artificial intelligence (AI) into higher education has significantly transformed career planning services, particularly in private colleges in China where institutional resources are often limited. Despite the growing application of AI-driven career planning tools, existing studies have predominantly focused on their effectiveness in improving career outcomes, while insufficient attention has been given to the behavioral mechanisms that influence students' adoption of such technologies. Addressing this gap, this study aims to examine the determinants of students' adoption of AI-driven career planning tools by proposing a mediation model that incorporates perceived usefulness, trust in AI, user engagement, and adoption intention. Specifically, the study aims to identify the relationships among perceived usefulness, trust in AI, user engagement, and adoption intention, as well as to examine the mediating role of user engagement in the AI adoption process. Grounded in the Technology Acceptance Model (TAM) and Self-Determination Theory (SDT), a quantitative cross-sectional survey design was employed using a structured questionnaire with a five-point Likert scale administered to undergraduate students in private colleges in Shaanxi Province, China. A total of 320 valid responses were collected and analyzed using SPSS and Structural Equation Modeling (SEM) to test the proposed hypotheses and mediation effects. The findings reveal that perceived usefulness and trust in AI have significant positive effects on students' adoption intention. In addition, both variables significantly predict user engagement, which in turn exerts a strong positive influence on adoption intention. The mediation analysis further confirms that user engagement partially mediates the relationship between perceived usefulness, trust, and adoption intention, indicating that students' active involvement plays a crucial role in transforming technological perceptions into actual behavioral intentions. Future studies are encouraged to examine additional psychological and contextual variables influencing AI adoption across different higher education environments.

Keywords: Artificial Intelligence, Career Planning, Ai Adoption, User Engagement, Higher Education

Introduction

In recent years, the rapid transformation of global labor markets driven by digitalization, automation, and artificial intelligence has significantly reshaped students' career planning processes in higher education environments. The increasing uncertainty of employment opportunities, changing occupational structures, and growing competition in graduate labor markets have created substantial pressure on university students to make more adaptive and data-informed career decisions. In China, these challenges have become increasingly prominent due to the continuous expansion of higher education enrollment and the growing mismatch between graduates' skills and labor market demands (Liu et al., 2023; Dai et al., 2026). Consequently, higher education institutions are increasingly expected to provide more efficient, personalized, and technology-supported career guidance services to enhance students' employability and career readiness. Recent international reports further emphasize that artificial intelligence is expected to fundamentally transform educational systems, workforce preparation, and career development pathways in the coming decades (UNESCO, 2024). In response to these developments, AI-driven career planning systems have increasingly been integrated into higher education environments to provide intelligent recommendations, adaptive decision support, and real-time labor market analysis (Dwivedi et al., 2023; Hwang et al., 2023). Compared with traditional career counseling approaches that often depend heavily on human expertise and institutional resources, AI-supported systems are capable of delivering more flexible, scalable, and personalized career guidance services. Such technologies are increasingly recognized as valuable mechanisms for improving career readiness, strengthening employability, and supporting students' long-term professional development in highly competitive labor markets (Chen et al., 2024; Mariani et al., 2024).

Despite the growing adoption of AI-supported educational technologies, significant concerns remain regarding the sustainability and effectiveness of students' adoption of AI-driven career planning systems in higher education environments. Existing studies have predominantly emphasized technological functionality, system performance, and adoption intention while paying relatively limited attention to the behavioral and psychological mechanisms underlying sustained user interaction with AI-supported career planning systems (Chatterjee et al., 2023; Dwivedi et al., 2023; Mariani et al., 2024). In particular, previous AI adoption studies frequently assume that positive perceptions of usefulness and trust directly lead to behavioral intention, thereby overlooking the possibility that students' active engagement may function as a critical intermediary mechanism in the adoption process. This limitation is particularly important because AI-supported career planning systems require continuous interaction, adaptive feedback, and personalized participation rather than one-time technological acceptance. Without sufficient engagement, students may recognize the usefulness and reliability of AI systems but still demonstrate weak adoption intention or discontinue system usage over time. Moreover, these challenges are particularly significant in Chinese private colleges, where limitations in educational resources, technological infrastructure, and professional career counseling services may increase students' dependence on AI-supported technologies for career-related guidance and decision-making. Nevertheless, empirical studies examining the mediating role of user engagement within AI-

driven career planning contexts remain relatively limited, particularly within Chinese private higher education institutions. Therefore, this study examines how perceived usefulness and trust in artificial intelligence influence students' adoption intention toward AI-driven career planning tools through user engagement among undergraduate students in private colleges in Shaanxi Province, China.

Literature Review

Technology Acceptance Model in AI Adoption

The Technology Acceptance Model (TAM), originally proposed by Davis (1989), remains one of the most widely applied theoretical frameworks for explaining users' acceptance of technological systems. The model posits that perceived usefulness and perceived ease of use are the two primary determinants influencing behavioral intention toward technology adoption. In recent years, TAM has been extensively applied in studies examining artificial intelligence adoption across educational, organizational, and service-related environments. Scholars argue that AI-driven systems differ from traditional digital technologies because they involve algorithmic decision-making, adaptive learning processes, and intelligent recommendation mechanisms, thereby increasing the importance of cognitive and behavioral responses during technology interaction (Dwivedi et al., 2023; Chatterjee et al., 2023). Consequently, recent studies increasingly extend TAM by incorporating psychological and behavioral variables such as trust, engagement, transparency, and perceived fairness to better explain users' adoption behavior in AI-supported environments (Siau & Wang, 2024; Mariani et al., 2024). In educational contexts, perceived usefulness remains a significant predictor of students' willingness to adopt AI technologies, particularly when such systems provide personalized support, efficient information processing, and enhanced decision-making capabilities (Alotaibi, 2026). Recent studies further confirm that students' adoption of AI-supported educational systems is significantly influenced by perceived usefulness, trust, and behavioral engagement. However, researchers also argue that traditional TAM may oversimplify AI adoption processes by assuming a direct relationship between technological perception and behavioral intention. In AI-driven environments, users' behavioral involvement and interaction experiences may significantly influence whether positive perceptions are translated into sustained adoption behavior (Mariani et al., 2024). Therefore, integrating engagement-related constructs into TAM-based frameworks has become increasingly important in contemporary AI adoption research. Recent studies by Dai et al. (2026) and Horvath et al. (2026) further indicate that generative AI technologies continue to reshape students' technology acceptance behavior in higher education environments.

Perceived Usefulness and Adoption Intention

Perceived usefulness has long been recognized as a fundamental determinant of technology adoption, particularly within the Technology Acceptance Model, where it reflects the extent to which individuals believe that a system enhances their performance. In the context of artificial intelligence applications in higher education, this construct remains highly relevant, as AI-driven systems increasingly provide personalized, data-driven support for academic and career decision-making. Recent studies suggest that AI technologies significantly enhance efficiency, accuracy, and personalization, thereby strengthening users' perceptions of usefulness (Dwivedi et al., 2023; Chatterjee et al., 2023; Hwang et al., 2023; Crompton et al., 2023). In particular, AI-driven career planning tools allow students to access real-time labor market information and receive individualized career recommendations, which significantly

improves decision quality. Furthermore, some scholars argue that perceived usefulness in AI contexts is increasingly shaped by system intelligence and adaptability, rather than merely functional performance, indicating a shift in how users evaluate technological value.

Despite its central role, the predictive power of perceived usefulness on adoption intention has been increasingly debated in recent literature. While traditional models assume a direct and linear relationship, emerging research suggests that this relationship is often mediated by behavioral and contextual factors. For example, Recent studies by Kim & Lee (2025) highlight that users may recognize the benefits of AI systems but still fail to adopt them due to insufficient engagement and limited interactive experiences. Similarly, Baabdullah et al. (2024) emphasize that perceived usefulness alone is insufficient to ensure sustained usage without active user involvement. In addition, recent studies increasingly suggest that traditional technology acceptance models should incorporate behavioral and engagement-related components to better explain AI adoption in educational environments. Moreover, Dwivedi et al. (2023) suggest that AI adoption is influenced not only by perceived utility but also by user experience and engagement processes. These findings collectively indicate that perceived usefulness should not be treated as an isolated predictor but rather as part of a broader behavioral mechanism. Therefore, it is necessary to re-examine its role within an integrated framework that considers both cognitive evaluation and behavioral engagement, thereby addressing the limitations of traditional adoption models.

In addition, recent studies increasingly argue that perceived usefulness in AI-supported environments should not be interpreted solely from a functional perspective. Unlike traditional information systems, AI technologies continuously learn from user interactions and generate adaptive recommendations that evolve over time. As a result, students' evaluations of usefulness may also depend on the system's ability to provide personalized experiences, contextual responsiveness, and emotional support during career decision-making processes. In educational settings, students are more likely to perceive AI-driven career planning systems as useful when such technologies reduce uncertainty, improve confidence in career choices, and provide recommendations that align with individual aspirations and labor market demands. However, some researchers argue that excessive reliance on algorithmic recommendations may also weaken students' independent decision-making abilities and critical thinking skills, thereby creating potential dependency on AI-supported systems. Nevertheless, some studies argue that excessive dependence on AI-generated recommendations may reduce students' independent career exploration abilities and weaken critical decision-making skills, particularly among users with limited digital literacy and low technological awareness. Such findings suggest that the positive influence of perceived usefulness may vary across different educational and technological contexts. Consequently, perceived usefulness in AI adoption contexts should be understood as a multidimensional construct involving efficiency, personalization, adaptability, and psychological reassurance rather than merely technical functionality.

Self-Determination Theory and User Engagement

Self-Determination Theory (SDT), developed by Deci and Ryan (1985), provides an important theoretical perspective for understanding users' motivational and engagement-related behaviors in technology-supported environments. SDT emphasizes that individuals are more likely to demonstrate sustained behavioral involvement when their psychological needs for

autonomy, competence, and relatedness are fulfilled. In AI-driven educational environments, these motivational dimensions are particularly relevant because students often interact with intelligent systems in highly personalized and self-directed learning contexts. Holmes et al. (2025) suggest that AI technologies can significantly enhance students' autonomy and personalized learning experiences in higher education environments. Similarly, intelligent recommendation systems may strengthen perceptions of competence by helping students improve career decision-making efficiency and access relevant labor market information more effectively. Furthermore, interactive AI systems may increase students' sense of engagement by creating more responsive and adaptive learning experiences, thereby strengthening sustained behavioral interaction with AI-supported systems (Mariani et al., 2024). Recent studies by Crompton et al. (2023) and Chen et al. (2024) further indicate that AI-supported educational systems can significantly strengthen students' active participation and adaptive learning experiences. However, scholars also argue that students' motivation to engage with AI systems depends heavily on their trust in technological reliability, fairness, and transparency (Siau & Wang, 2024). If users perceive AI systems as opaque or unreliable, their willingness to engage actively with such technologies may decline significantly. Therefore, SDT provides a useful theoretical foundation for explaining why user engagement plays a critical mediating role in transforming technological perceptions into behavioral intention within AI-supported career planning environments.

Trust in AI and User Engagement in Technology Adoption

Trust in artificial intelligence has emerged as a critical factor influencing users' willingness to adopt AI-driven technologies, particularly in educational contexts where decisions have long-term implications. Trust reflects users' confidence in the system's reliability, transparency, and ethical integrity, and plays a crucial role in reducing uncertainty associated with algorithmic decision-making. Recent research indicates that trust significantly enhances users' acceptance of AI systems by mitigating perceived risks and increasing confidence in system outputs (Kaur et al., 2023; Huang & Rust, 2023; Chatterjee et al., 2023; Dwivedi et al., 2023). In particular, studies highlight that explainability and transparency are essential drivers of trust, as users are more likely to rely on AI systems when they understand how decisions are generated. Furthermore, recent studies indicate that trust in AI is closely associated with perceptions of fairness, accountability, and transparency, particularly in educational environments where ethical considerations play an increasingly important role (Kaur et al., 2023; Siau & Wang, 2024). Chen et al. (2024) further argue that users' trust in AI systems is significantly influenced by system explainability, institutional credibility, and responsible data management practices.

However, trust alone does not guarantee technology adoption, as some studies report inconsistent findings regarding the influence of trust on AI adoption, particularly in environments where users possess limited technological literacy or insufficient understanding of algorithmic processes. In such situations, users may acknowledge the reliability of AI systems while still demonstrating reluctance toward active engagement due to uncertainty and ethical concerns. Increasing evidence suggests that user engagement plays a critical mediating role in transforming trust into behavioral intention. User engagement refers to the extent of cognitive, emotional, and behavioral involvement that users demonstrate when interacting with a system. In AI-driven environments, engagement is particularly important because the effectiveness of AI systems depends on continuous interaction and feedback.

Studies have shown that higher levels of engagement significantly enhance adoption intention and long-term usage (Chatterjee et al., 2023; Hwang et al., 2023; Lin et al., 2023; Kim & Lee, 2025; Baabdullah et al., 2024). Moreover, recent studies argue that engagement functions as a dynamic process that reinforces users' perceptions of trust and usefulness through repeated interaction. Similarly, effective human–AI collaboration often depends on users' active participation and continuous interaction with intelligent systems in order to achieve meaningful outcomes. Recent studies by Mariani et al. (2024) further emphasize that sustained engagement is essential for strengthening users' long-term reliance on AI-driven systems. Despite these insights, existing research often examines trust and engagement separately, failing to fully explore their interaction. This limitation highlights the need for an integrated perspective that considers how trust fosters engagement, which in turn drives adoption intention. Therefore, this study proposes that user engagement plays a mediating role in the relationship between trust in AI and adoption behavior, thereby addressing a critical gap in the literature.

Furthermore, the importance of trust in AI adoption has become increasingly prominent due to the growing ethical concerns surrounding algorithmic technologies in educational environments. Students may hesitate to rely on AI-driven systems when they perceive risks related to privacy invasion, biased recommendations, or lack of accountability in automated decision-making processes. In higher education contexts, these concerns are particularly sensitive because career planning decisions may significantly influence students' long-term professional development and employability opportunities. Recent studies increasingly emphasize that ethical AI governance, transparency mechanisms, and explainable recommendation systems are essential for strengthening users' confidence and promoting sustained interaction with intelligent technologies. In addition, institutional credibility also plays a significant role in shaping students' trust in AI-supported career planning systems. Students are more likely to engage actively with AI technologies when they believe that universities provide reliable technological infrastructures and responsible data management practices. Therefore, trust in AI should be understood not only as a technological perception but also as a broader psychological and institutional mechanism influencing behavioral adoption in educational environments.

Based on the literature review and research gaps identified above, this study examines how perceived usefulness and trust in artificial intelligence influence students' adoption intention toward AI-driven career planning tools through user engagement in private colleges in Shaanxi Province, China. The study further investigates the mediating role of user engagement in the AI adoption process within higher education contexts.

Research Objectives

Based on the literature gaps identified above, this study aims to examine the relationships among perceived usefulness, trust in AI, user engagement, and adoption intention toward AI-driven career planning tools among undergraduate students in private colleges in Shaanxi Province, China. The primary objectives of this study are as follows:

RO1: To identify the relationships among perceived usefulness, trust in AI, user engagement, and adoption intention.

RO2: To discuss the mediating role of user engagement in students' adoption of AI-driven career planning tools.

These research objectives provide a framework for examining the behavioral mechanisms underlying students' adoption of AI-driven career planning tools in private higher education.

Research Hypothesis

Based on the research objectives, the following hypotheses are proposed:

H1: Perceived usefulness, trust in artificial intelligence, and user engagement significantly influence adoption intention.

H2: User engagement significantly mediates the relationship between perceived usefulness, trust in artificial intelligence, and adoption intention.

Methodology

Research Design

This study employed a quantitative research method using a cross-sectional survey design to examine the relationships among perceived usefulness, trust in artificial intelligence, user engagement, and adoption intention toward AI-driven career planning tools. The quantitative approach was considered appropriate because the study aimed to examine statistically significant relationships among multiple variables and test the mediating effect of user engagement using numerical data and statistical analysis techniques. Quantitative methods are widely applied in technology adoption and behavioral intention studies because they provide stronger explanatory capability for examining causal relationships and behavioral patterns among latent constructs.

The cross-sectional survey design was considered suitable because it enabled efficient data collection from a relatively large number of respondents within a limited time period while ensuring consistency in data measurement and analysis. In addition, the use of a structured questionnaire allowed standardized responses across participants, thereby improving data reliability and comparability. Since the study focused on examining students' perceptions and behavioral intentions toward AI-driven career planning tools, a questionnaire-based quantitative approach was considered more appropriate than qualitative methods. Furthermore, the cross-sectional design allowed the study to capture respondents' current perceptions and behavioral tendencies regarding AI-supported career planning technologies within the context of private higher education institutions in Shaanxi Province, China.

Population and Sample

The target population of this study consisted of undergraduate students enrolled in private colleges in Shaanxi Province, China. Undergraduate students were selected because they are increasingly exposed to AI-supported educational technologies and are actively involved in career planning and employability preparation during their university studies. In addition, students in private colleges often experience relatively limited access to individualized career counseling services compared with students in public universities, making AI-driven career planning systems particularly relevant in this educational context.

The study focused on students from different academic years and disciplinary backgrounds to ensure diversity and representativeness. Respondents were selected from various academic disciplines, including engineering, management, humanities, and other related fields. Students from different academic years were also included because career planning needs and technological experiences may vary across educational stages. A total of 350

questionnaires were distributed, and 320 valid responses were retained for analysis, resulting in a response rate of 91.4%.

The final sample size was considered sufficient for Structural Equation Modeling (SEM) analysis because SEM requires relatively large sample sizes to ensure statistical stability and validity.Recent methodological studies suggest that sample sizes above 200 are generally acceptable for Structural Equation Modeling (SEM) analysis to ensure statistical stability, parameter accuracy, and model validity in behavioral research contexts (Arifin et al., 2025). Therefore, the sample size used in this study was considered appropriate for testing the proposed research framework and hypotheses.

Research Location

The study was conducted in five undergraduate private colleges in Shaanxi Province, China, including Haojing College of Shaanxi University of Science and Technology, Xi'an Eurasia University, Xi'an International University, Xi'an Fanyi University, and Xi'an Peihua University. These institutions were selected because they represent private higher education environments characterized by diverse student populations and relatively limited educational resources compared with public universities.

Private colleges in Shaanxi Province were considered appropriate research settings because the adoption of AI-driven career planning systems has become increasingly important in resource-constrained educational environments where access to traditional career counseling services may be limited. In addition, these institutions have gradually increased their use of digital technologies and intelligent educational systems to improve students' employability and career readiness. Therefore, examining students' perceptions and behavioral intentions toward AI-supported career planning systems within these institutions provided meaningful insights into AI adoption behavior in Chinese private higher education environments.

Sampling Technique

This study employed a stratified random sampling technique to ensure proportional representation across gender, academic year, and field of study. Stratified random sampling was considered appropriate because it improved sample diversity and reduced potential sampling bias. The stratification process ensured that respondents from different demographic and educational backgrounds were adequately represented in the final sample. The respondents were selected from multiple academic disciplines, including engineering, management, humanities, and other related fields. This sampling approach was particularly important because students from different academic disciplines may demonstrate different levels of technological exposure, digital literacy, and perceptions toward artificial intelligence systems. In addition, students from different academic years may experience varying levels of career planning pressure and engagement with AI-supported technologies.

Compared with convenience sampling, stratified random sampling provides stronger representativeness and improves the generalizability of research findings. The use of stratified random sampling also minimized the possibility of overrepresentation from particular student groups, thereby improving the validity and reliability of the research results.

Instrumentation

The questionnaire used in this study was adapted from several validated instruments employed in previous artificial intelligence and technology adoption studies. The instrument consisted of five sections containing a total of 24 measurement items. Section A collected respondents' demographic information, including gender, academic year, and field of study. Section B measured perceived usefulness using five items adapted from Davis (1989) and Lin et al. (2023). Section C examined trust in artificial intelligence using six items adapted from Kaur et al. (2023) and Huang & Rust (2023). Section D assessed user engagement using six items adapted from Zhang et al. (2023) and Mariani et al. (2024). Finally, Section E measured adoption intention using seven items adapted from Dwivedi et al. (2023) and Chatterjee et al. (2023).

The use of adapted instruments from previous validated studies improved the reliability and validity of the measurement scales. The questionnaire items were carefully modified to ensure contextual suitability for AI-driven career planning environments in Chinese private colleges. Minor wording adjustments were made to improve readability and align the items with students' educational experiences and technological exposure. The adaptation process also ensured that the constructs remained conceptually consistent with previous AI adoption and technology acceptance studies.

All measurement items were measured using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The five-point Likert scale was considered appropriate because it allowed respondents to express varying degrees of agreement while maintaining response simplicity and consistency. Likert-scale questionnaires are widely employed in behavioral and educational research because they provide effective measurement of attitudes, perceptions, and behavioral intentions.

Prior to the actual data collection, the questionnaire was reviewed by academic experts in educational technology and behavioral research to ensure content validity and contextual appropriateness. Expert evaluation helped ensure that the questionnaire items accurately reflected the research constructs and aligned with the objectives of the study.

Pilot Study

A pilot study involving 30 undergraduate students was conducted prior to the actual data collection to evaluate the clarity, consistency, and reliability of the questionnaire items. The pilot respondents were selected from private colleges similar to those included in the final study population. Feedback from the pilot participants helped identify ambiguous wording and improve item clarity.

Reliability analysis was also performed using Cronbach's alpha coefficients to ensure internal consistency of the measurement scales. All constructs recorded Cronbach's alpha values above the recommended threshold of 0.70, indicating acceptable reliability for large-scale administration (Nunnally, 1978). The pilot evaluation further improved response consistency and reduced potential misunderstandings during questionnaire completion.

The pilot study was considered important because it enhanced the overall quality and reliability of the research instrument before the actual large-scale data collection process. In

addition, the pilot evaluation helped ensure that respondents clearly understood the questionnaire items within the context of AI-driven career planning technologies in higher education environments.

Data Collection Procedure

The questionnaires were distributed using both online and offline approaches between January and March 2026. Online questionnaires were distributed through digital survey platforms, while printed questionnaires were administered directly to students in participating universities. The use of both online and offline approaches improved accessibility and increased response participation among students from different academic and technological backgrounds.

Prior to data collection, respondents were informed about the purpose of the study and their participation rights. Participation was voluntary, and informed consent was obtained from all respondents before questionnaire administration. Respondents were also informed that their responses would remain confidential and would be used solely for academic research purposes.

Ethical procedures, including confidentiality protection and anonymity of responses, were implemented throughout the research process to ensure research integrity and respondent privacy. No personally identifiable information was collected from participants. The ethical procedures adopted in this study ensured compliance with standard research ethics principles involving human respondents in educational research.

Data Analysis

Data analysis was conducted using SPSS 29.0 and AMOS software. Descriptive statistics were employed to examine respondents' demographic characteristics and the mean values of the core variables. Descriptive analysis provided general insights into respondents' perceptions toward AI-driven career planning systems and the distribution patterns of the research variables.

Pearson correlation analysis was used to examine relationships among perceived usefulness, trust in artificial intelligence, user engagement, and adoption intention. Correlation analysis was considered appropriate because it enabled the study to identify the strength and direction of relationships among variables prior to hypothesis testing.

Structural Equation Modeling (SEM) was further employed to test the proposed hypotheses and the mediating effect of user engagement. SEM was considered appropriate because it allows simultaneous examination of multiple relationships among latent variables while also testing direct and indirect effects within a single integrated model. Compared with traditional regression analysis, SEM provides stronger explanatory capability for examining complex behavioral relationships and mediation mechanisms among psychological and technological constructs.

Prior to hypothesis testing, reliability and validity analyses were conducted to evaluate the measurement quality of the constructs. Cronbach's alpha coefficients were used to assess internal consistency reliability. The mediation effect of user engagement was tested using

bootstrap confidence intervals and path coefficient analysis to determine the significance of indirect effects within the proposed research framework.

Theoretical Foundation

The development of the research framework and questionnaire items was guided by the Technology Acceptance Model (TAM) proposed by Davis (1989) and Self-Determination Theory (SDT) developed by Deci and Ryan (1985). TAM was used to explain the relationships between perceived usefulness and adoption intention, while SDT provided theoretical support for understanding user engagement behavior in AI-supported career planning environments.

The integration of TAM and SDT provided a comprehensive theoretical explanation for students' adoption behavior toward AI-driven career planning tools. TAM emphasizes the importance of cognitive evaluations, particularly perceived usefulness, in shaping users' behavioral intention toward technology adoption. In contrast, SDT emphasizes the importance of psychological motivation and engagement behavior in sustaining long-term interaction with technology-supported systems.

The integration of these two theories was considered appropriate because AI-driven career planning systems involve both technological perceptions and continuous behavioral interaction processes. Therefore, the combined theoretical framework strengthened the explanatory capability of the study in examining students' adoption intention toward AI-supported career planning technologies in private higher education institutions.

Results and Discussion

Demographic Profile of Respondents

This section presents the demographic characteristics of the respondents involved in this study. The demographic analysis was conducted to provide an overview of the respondents' background information, including gender, academic year, and field of study. Understanding the demographic distribution of the respondents is important because students from different educational backgrounds and academic experiences may demonstrate different perceptions and behavioral intentions toward AI-driven career planning tools.

Table 1
Demographic Profile of Respondents (n = 320)

Profile	Description	Frequency	Percentage
Gender	Male	170	53.10%
	Female	150	46.90%
Academic Year	Freshman	68	21.30%
	Sophomore	94	29.40%
	Junior	100	31.20%
	Senior	58	18.10%
Field of Study	Management	96	30.00%
	Engineering	112	35.00%
	Humanities	72	22.50%
	Others	40	12.50%

Table 1 presents the demographic distribution of the respondents (n = 320), indicating that the sample is balanced and sufficiently representative for subsequent statistical analysis. In

terms of gender, males account for 53.1% and females for 46.9%, suggesting a relatively balanced gender distribution among respondents. With respect to academic year, the majority of participants are sophomores (29.4%) and juniors (31.2%), followed by freshmen (21.3%) and seniors (18.1%), indicating that most respondents are sophomore and junior students. Regarding field of study, respondents are drawn from diverse disciplines, including engineering (35.0%), management (30.0%), humanities (22.5%), and other fields (12.5%), representing diverse disciplinary backgrounds. Overall, the demographic profile indicates that the respondents represent diverse academic and disciplinary backgrounds suitable for the present study.

Relationships among Perceived Usefulness, Trust in AI, User Engagement, and Adoption Intention

This section presents the descriptive statistics and relationship analysis among perceived usefulness, trust in artificial intelligence, user engagement, and adoption intention toward AI-driven career planning tools. The analysis was conducted to examine the direct relationships among the core variables and to determine whether perceived usefulness and trust in artificial intelligence significantly influence students' engagement behavior and adoption intention toward AI-supported career planning systems.

Table 2
Descriptive Statistics of Core Variables

Variable	Mean (M)	SD
Perceived Usefulness	4.18	0.60
Trust in AI	4.05	0.63
User Engagement	4.12	0.58
Adoption Intention	4.21	0.57

Table 2 presents the descriptive statistics of the core variables examined in this study. As shown in Table 2, the mean score for perceived usefulness is 4.18, indicating that students generally perceive AI-driven career planning tools as beneficial and effective in supporting their career decision-making processes. The standard deviation is 0.60, indicating a moderate level of variability in students' evaluations. The relatively high mean score also indicates that students generally recognize the practical value of AI-driven career planning systems in supporting their academic and professional development. This finding may reflect the increasing integration of intelligent technologies into educational environments, where students are becoming more familiar with AI-supported learning and decision-making systems. In addition, students in private colleges may perceive AI-driven systems as particularly useful due to limited access to traditional career counseling resources and personalized guidance services.

The mean score for trust in artificial intelligence is 4.05, which reflects a generally positive level of confidence in AI systems among students. The standard deviation is 0.63, suggesting a moderate dispersion in responses and indicating that students' trust levels vary to some extent. This finding suggests that most respondents believe AI-driven career planning systems are reliable and capable of providing credible recommendations and personalized guidance. Trust in AI is particularly important in educational environments because students often rely on intelligent systems to support important academic and career-related decisions.

The findings further indicate that user engagement recorded a relatively high mean score of 4.12, suggesting that students generally demonstrate active interaction and participation when using AI-supported career planning systems. Similarly, adoption intention achieved the highest mean score of 4.21, indicating that respondents generally express strong willingness to continue using AI-driven career planning tools in the future. The relatively high mean scores across all variables suggest that students demonstrate positive perceptions toward AI-supported educational technologies and recognize the potential benefits of AI-driven career guidance systems.

Table 3
Relationships among Perceived Usefulness, Trust in AI, User Engagement, and Adoption Intention

Path	Relationship	β	p-value
H1a	Perceived Usefulness → User Engagement	0.41	< .001
H1b	Trust in AI → User Engagement	0.37	< .001
H1c	User Engagement → Adoption Intention	0.45	< .001

Table 3 presents the direct relationships among perceived usefulness, trust in artificial intelligence, user engagement, and adoption intention toward AI-driven career planning tools. As presented in Table 3, perceived usefulness has a significant positive effect on user engagement ($\beta = 0.41$, $p < .001$), indicating that students who perceive AI-driven career planning tools as useful are more likely to actively interact with them. This finding is consistent with previous research suggesting that perceived usefulness enhances users' motivation to engage with digital systems (Dwivedi et al., 2023; Hwang et al., 2023; Lin et al., 2023). In the context of AI-driven career planning, students who recognize the system's ability to provide efficient and personalized guidance are more likely to invest time and effort in exploring its functionalities.

In AI-driven career planning contexts, students are more likely to engage actively with systems that provide highly personalized and context-sensitive recommendations. Unlike traditional career counseling services, AI technologies are capable of processing large volumes of labor market data and generating individualized suggestions that align with students' academic backgrounds, career interests, and employment expectations. This capability significantly enhances students' perceptions of relevance and usefulness, thereby encouraging deeper interaction with AI systems. Furthermore, AI-supported career planning tools may reduce uncertainty associated with career decision-making by offering timely and data-driven guidance, which is particularly important for students in private colleges where access to professional counseling resources may be relatively limited. Consequently, perceived usefulness in AI environments extends beyond functional efficiency and increasingly reflects users' perceptions of personalization, adaptability, and decision-support quality.

Beyond perceived usefulness, trust in artificial intelligence also plays a critical role in shaping students' engagement behavior. The findings indicate that trust in AI has a significant positive effect on user engagement ($\beta = 0.37$, $p < .001$), suggesting that students who trust AI systems are more likely to actively interact with AI-driven career planning platforms. This finding supports previous studies emphasizing that trust is a fundamental factor influencing technology acceptance and sustained interaction with intelligent systems (Kaur et al., 2023; Huang & Rust, 2023). Students are more likely to engage with AI-supported career planning

systems when they perceive the systems as transparent, reliable, and capable of generating accurate recommendations.

The findings also reveal that user engagement significantly influences adoption intention (β = 0.45, p < .001), indicating that students who actively engage with AI-supported systems are more likely to demonstrate stronger behavioral intention toward continued technology usage. This finding suggests that active participation and continuous interaction strengthen students' emotional attachment and behavioral commitment toward AI-driven career planning tools. The findings are consistent with recent studies emphasizing that user engagement plays an important role in shaping long-term technology adoption behavior in intelligent educational environments (Mariani et al., 2024; Zhang et al., 2023).

Overall, the findings reveal significant relationships among perceived usefulness, trust in artificial intelligence, user engagement, and adoption intention toward AI-driven career planning tools among undergraduate students in private colleges in Shaanxi Province, China. Specifically, perceived usefulness and trust in AI significantly influence user engagement, while user engagement demonstrates a strong positive effect on adoption intention. These findings indicate that students are more likely to adopt AI-driven career planning systems when such technologies are perceived as useful, trustworthy, and capable of supporting personalized educational and career-related needs.

In addition, the findings provide empirical support for the Technology Acceptance Model proposed by Davis (1989), which suggests that users' perceptions regarding the usefulness of technology significantly influence behavioral intention toward technology adoption. The results further indicate that trust in artificial intelligence serves as an important psychological factor influencing students' willingness to interact with AI-supported systems. These findings suggest that AI-driven career planning tools should emphasize system transparency, personalized recommendations, and interactive support mechanisms to strengthen students' engagement and long-term adoption behavior.

Mediating Role of User Engagement in Students' Adoption of AI-Driven Career Planning Tools

This section presents the mediation analysis examining the role of user engagement in the relationship between perceived usefulness, trust in artificial intelligence, and adoption intention toward AI-driven career planning tools. The mediation analysis was conducted to determine whether user engagement functions as an intermediary mechanism linking students' perceptions of AI systems with their behavioral intention to adopt AI-supported career planning technologies.

Table 4

Mediating Effects of User Engagement on Adoption Intention

Relationship	Indirect Effect	Boot SE	95% CI	Result
Perceived Usefulness → User Engagement → Adoption Intention	0.18	0.041	[0.107, 0.259]	Significant
Trust in AI → User Engagement → Adoption Intention	0.16	0.038	[0.094, 0.231]	Significant

Table 4 presents the mediation analysis results examining the indirect effects of perceived usefulness and trust in artificial intelligence on adoption intention through user engagement.

The findings indicate that user engagement significantly mediates the relationship between perceived usefulness and adoption intention, as well as the relationship between trust in AI and adoption intention. The indirect effects are statistically significant because the confidence intervals do not include zero, indicating the presence of meaningful mediation effects.

The findings demonstrate that students' perceptions of usefulness and trust do not directly translate into adoption behavior unless students actively engage with AI-supported systems. This suggests that engagement functions as a critical behavioral mechanism transforming technological perceptions into sustained adoption intention. Students who perceive AI-driven career planning tools as useful and trustworthy are more likely to participate actively in system interaction, which subsequently strengthens their willingness to adopt and continuously use AI-supported career planning technologies.

The findings are consistent with previous studies suggesting that engagement plays an essential role in strengthening human–AI interaction and technology adoption behavior within educational environments (Baabdullah et al., 2024; Farooq et al., 2025). In AI-driven educational systems, continuous interaction and psychological involvement encourage students to develop stronger behavioral attachment toward intelligent technologies, thereby increasing long-term usage intention and acceptance behavior. This finding further suggests that technological adoption is influenced not only by cognitive evaluations but also by behavioral participation and experiential interaction processes.

Furthermore, the mediation effect indicates that user engagement serves as an important psychological and behavioral mechanism linking students' technological perceptions with adoption intention. The findings suggest that students may recognize the usefulness and reliability of AI-supported systems, yet they may not develop strong adoption intention unless they actively interact with and experience the system's functionalities. Therefore, AI-driven career planning systems should not only focus on improving technical performance but should also emphasize interactive features, personalization, and user-centered experiences that encourage continuous engagement and participation.

The findings also provide theoretical support for Self-Determination Theory developed by Deci and Ryan (1985), which emphasizes the importance of psychological engagement and intrinsic motivation in shaping behavioral participation. The mediation role of user engagement suggests that students are more likely to adopt AI-supported career planning systems when they actively participate in interactive and personalized technological experiences. These findings confirm that user engagement functions as a significant intermediary mechanism linking perceived usefulness and trust in artificial intelligence with adoption intention toward AI-driven career planning tools. Therefore, H2 is supported.

Summary of Results

The findings of this study reveal significant relationships among perceived usefulness, trust in artificial intelligence, user engagement, and adoption intention toward AI-driven career planning tools among undergraduate students in private colleges in Shaanxi Province, China. Specifically, perceived usefulness and trust in AI significantly influence user engagement, while user engagement demonstrates a strong positive effect on adoption intention. These

findings are consistent with previous studies suggesting that AI-supported systems enhance students' behavioral participation when such technologies are perceived as useful, trustworthy, and personalized (Dwivedi et al., 2023; Hwang et al., 2023; Baabdullah et al., 2024). In addition, the findings support recent research emphasizing that active engagement plays a crucial role in strengthening users' long-term interaction with intelligent educational systems (Mariani et al., 2024; Kim & Lee, 2025).

The findings also provide empirical support for the Technology Acceptance Model proposed by Davis (1989) and Self-Determination Theory developed by Deci and Ryan (1985). Consistent with TAM, perceived usefulness significantly influences students' behavioral intention toward AI-driven career planning systems, indicating that students are more willing to adopt AI technologies when such systems improve decision-making efficiency and provide personalized support. Furthermore, the findings support SDT by demonstrating that sustained engagement and active interaction significantly strengthen students' behavioral participation in AI-supported educational environments. The mediating role of user engagement further suggests that psychological involvement and continuous interaction serve as important mechanisms transforming technological perceptions into adoption intention.

Overall, the findings support both proposed hypotheses in this study. H1 is supported, indicating that perceived usefulness, trust in artificial intelligence, and user engagement significantly influence students' adoption intention toward AI-driven career planning tools. In addition, H2 is also supported, confirming that user engagement significantly mediates the relationship between perceived usefulness, trust in artificial intelligence, and adoption intention. These findings further demonstrate that students' adoption behavior toward AI-supported career planning systems is shaped not only by technological perceptions but also by sustained behavioral engagement and interaction processes.

Conclusion

This study examined the determinants of students' adoption of AI-driven career planning tools in private colleges in Shaanxi Province, China, with a particular focus on investigating the mediating role of user engagement within the technology adoption process. The findings indicate that both perceived usefulness and trust in artificial intelligence exert significant positive effects on students' adoption intention, not only through direct pathways but also indirectly by enhancing user engagement. Furthermore, this study extends the Technology Acceptance Model by incorporating user engagement as a mediating variable, thereby extending existing AI adoption research in higher education contexts. In particular, the study contributes to the growing body of AI adoption literature by highlighting the importance of behavioral engagement as an experiential mechanism linking technological perceptions to sustained adoption behavior in resource-constrained private higher education environments. From a practical perspective, the findings suggest that higher education institutions should not only focus on improving the functional performance and accuracy of AI-driven career planning systems but also prioritize enhancing system transparency, building user trust, and fostering sustained user engagement through interactive, personalized, and user-centered design strategies. The study benefits higher education institutions, policymakers, career counselors, and educational technology developers by providing empirical insights into the behavioral mechanisms underlying students' adoption of AI-supported career planning

systems in resource-constrained educational environments. Overall, the findings support H1 and H2, thereby confirming the importance of user engagement as a critical behavioral mechanism in AI-driven technology adoption.

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