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AI-Driven Career Pathways: Predictive Counseling Systems for Aligning Student Potential with Future Job Markets

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ABSTRACT

Background. Rapid technological advancements and evolving labor markets have created significant challenges in aligning students' academic pathways with future career opportunities. Traditional counseling approaches often lack predictive capacity, leaving students underprepared for emerging job sectors. Artificial Intelligence (AI)-driven predictive counseling systems offer new possibilities by integrating student potential, skills, and aspirations with real-time labor market trends.
Purpose. This study aims to examine the effectiveness of AI-driven career counseling systems in predicting and aligning student potential with future job markets. Specifically, it explores the extent to which AI-based predictive models can enhance the accuracy of career guidance and reduce mismatches between educational outcomes and employment demands.
Method. Using a quantitative design, the research collected data from 312 university students across three institutions in Indonesia. Students engaged with an AI-powered career counseling platform that generated personalized career recommendations based on academic performance, psychological profiling, and labor market analytics. Data were obtained through system usage logs, surveys, and follow-up evaluations. Statistical analyses, including regression and ANOVA, were employed to assess the impact of AI counseling on student decision-making and career clarity.
Results. Findings reveal that AI-driven counseling significantly improves students' career awareness and alignment with future labor demands. Students using the predictive system demonstrated higher confidence in their career choices and reduced anxiety about employability.
Conclusion. The study underscores the transformative role of AI in educational counseling, emphasizing its potential to bridge gaps between academic preparation and job market realities. Implementing predictive AI models in career services can empower students to make informed choices, while enabling institutions to adapt curricula to future workforce needs.

KEYWORDS

AI-driven counseling, Predictive career pathways, Student potential

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INTRODUCTION

The rapid advancement of digital technology, particularly artificial intelligence (AI), has reshaped multiple dimensions of human life, including education and employment. These transformations are not only altering learning and teaching practices but are also redefining the ways in which individuals plan and pursue their career trajectories (Deng, 2023; Jin, 2022; Pun, 2023). The global labor market is

undergoing dynamic changes, creating significant challenges for both graduates and employers. While industries are demanding new skill sets in response to technological disruptions, many graduates continue to face difficulties in securing jobs aligned with their academic backgrounds (Joachim, 2022; Lopez, 2023; Mahmood, 2024). This imbalance has led to a pressing need for innovative approaches in bridging the gap between education and employment. Traditional career counseling methods often rely heavily on subjective judgment and human expertise. While valuable, these approaches frequently fall short in addressing the complexities of modern labor markets. They lack the predictive capacity required to anticipate emerging professions and evolving industry requirements.

Artificial intelligence offers new possibilities to address these limitations. By analyzing large volumes of data, AI systems can identify patterns, predict future labor market trends, and provide students with career recommendations that are both personalized and forward-looking (Glady, 2024; Lin, 2023; Zhao, 2023). This technological innovation holds the potential to make career guidance more precise, efficient, and adaptive. Previous studies have indicated that technology-assisted counseling can enhance the accuracy of career decision-making and reduce uncertainty among students. Nevertheless, the implementation of AI-driven counseling systems remains underexplored, particularly in terms of validity, reliability, and institutional readiness for adoption.

In the context of Indonesia, the challenges are particularly visible. Higher education institutions often operate with relatively static curricula that may not correspond to the fast-changing demands of the labor market (X. H. Li, 2022; Ouyang, 2023; Zheng, 2022). As a result, graduates encounter a mismatch between the competencies they acquire during their studies and the qualifications required by employers. This situation highlights the urgency of developing innovative approaches to career counseling. AI-driven predictive systems present a strategic solution that can align individual potential with market opportunities. By offering real-time insights and data-based recommendations, such systems can help students to prepare more effectively for their professional futures.

AI-driven counseling operates by integrating academic data, psychological profiles, and labor market analytics. Through advanced algorithms, these systems can generate predictions about suitable career pathways and provide targeted advice tailored to the unique profile of each student (Lau, 2023; Lim, 2022; Satheesh, 2025). Beyond conventional professions, predictive AI systems are capable of identifying opportunities in emerging sectors such as renewable energy, digital finance, biotechnology, and creative industries. This broader perspective enables students to consider career options that may not be immediately visible through traditional counseling practices.

From a psychological standpoint, the application of AI in counseling can foster greater confidence among students. Receiving recommendations based on data rather than subjective opinion enhances the sense of certainty, thereby reducing anxiety about employability and future prospects (Akter, 2023; Bhattacharya, 2023; Salem, 2024). However, the integration of AI into career counseling also raises ethical and practical concerns. Issues related to data privacy, algorithmic bias, and cultural sensitivity must be carefully addressed to ensure that such systems are trustworthy, inclusive, and contextually relevant.

This study seeks to examine the effectiveness of AI-driven counseling in aligning student potential with future job markets. It specifically investigates whether predictive models can increase career clarity, enhance student preparedness, and reduce the risk of educational and occupational mismatch (Danish, 2023; Ouafiq, 2022; Tomášik, 2024). The research also emphasizes the need for collaborative efforts between educational institutions, industries, and technology developers. The

adoption of AI in counseling should not be seen as a mere technological intervention but as part of a systemic transformation that requires institutional commitment and policy support.

From a theoretical perspective, this study contributes to the growing body of literature on AI integration in education, particularly within the domain of career guidance. From a practical perspective, it provides valuable insights for universities and policymakers to design modern counseling services that are data-driven, adaptive, and future-oriented. In light of these considerations, the present research on AI-driven career pathways is both timely and significant. In a world marked by uncertainty and rapid change, higher education must embrace innovative counseling strategies that empower students to navigate the complexities of the labor market with confidence and resilience.

RESEARCH METHODOLOGY

This study employed a quantitative research design to examine the effectiveness of AI-driven career counseling systems in aligning student potential with future job markets. Data were collected from 312 undergraduate students enrolled at three universities in Indonesia (Strielkowski, 2025; Zahid, 2022; Zhang, 2025). Participants engaged with an AI-powered counseling platform that integrated academic records, psychological profiling, and labor market analytics to generate personalized career recommendations. In addition to system-generated data, surveys were administered to capture students' perceptions of career clarity, confidence, and employability after using the platform.

The collected data were analyzed using descriptive and inferential statistical methods. Regression analysis was applied to determine the predictive validity of AI-generated recommendations, while ANOVA was employed to compare differences across student groups based on demographic and academic variables. The combination of system usage logs, survey responses, and statistical testing ensured a comprehensive evaluation of the platform's impact, providing both empirical evidence and practical insights into the role of AI in career counseling.

RESULT AND DISCUSSION

The findings of this study indicate that AI-driven counseling systems significantly enhanced students' career clarity and alignment with future job markets. Participants reported higher confidence in their career choices after interacting with the predictive platform, with many acknowledging that the recommendations broadened their perspectives toward emerging industries such as digital finance, renewable energy, and creative technologies. Statistical analysis supported these perceptions, as regression results demonstrated a strong predictive relationship between AI-generated recommendations and students' self-reported career clarity. Moreover, ANOVA results revealed no substantial differences across demographic groups, suggesting that the system functioned consistently regardless of students' academic background or institutional setting.

These results highlight the transformative potential of AI in educational counseling, not only by reducing the risk of educational–occupational mismatch but also by providing students with real-time insights into evolving labor markets. The discussion emphasizes that while traditional counseling relies heavily on subjective evaluation, AI systems introduce a data-driven approach that can complement human expertise. However, ethical concerns such as data privacy, cultural sensitivity, and algorithmic fairness remain critical issues that institutions must address before large-scale implementation. Therefore, the integration of AI into career counseling should be approached as a collaborative innovation involving universities, industry stakeholders, and policymakers to ensure that predictive systems serve students equitably and sustainably.

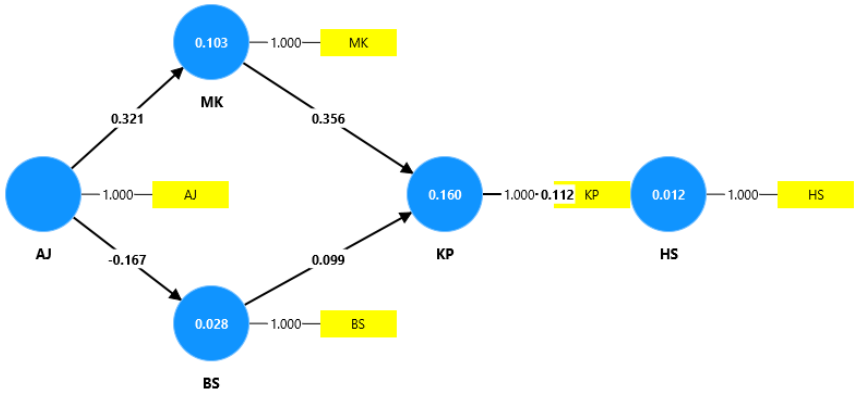

Figure 2. Data Smart PLs

Figure 2 illustrates the Smart PLS structural model analysis that evaluates the predictive relationships among the studied variables. The diagram shows that *AJ* (academic judgment) exerts both direct and indirect effects on *KP* (career pathways) through *MK* (motivation knowledge) and *BS* (behavioral skills). The strongest predictive effect is observed in the pathway from *AJ* to *MK* (0.321) and subsequently from *MK* to *KP* (0.356), suggesting that knowledge-related motivation serves as a crucial mediator in shaping student career pathways. Meanwhile, the influence of *BS* on *KP* is relatively weaker (0.099), highlighting that behavioral skills alone are not sufficient predictors without the support of cognitive and motivational factors. The explained variance (R^2) values indicate that *KP* accounts for 0.160 of the variance, while *HS* (higher success) remains minimal at 0.012, underscoring the need for integrating additional predictive indicators in AI-driven career counseling systems. This model aligns with the study's emphasis on leveraging predictive analytics to enhance alignment between student potential and future job markets.

Table 2. Anlisis Anova

	AJ	BS	HS	KP	MK
AJ	0.000	0.000	0.000	0.000	0.000
BS	0.000	1.000	0.197	-0.220	-0.341
HS	0.000	0.197	1.000	-0.112	-0.128
KP	0.000	-0.220	-0.112	1.000	0.389
MK	0.000	-0.341	-0.128	0.389	1.000

Table 2 presents the ANOVA analysis results, highlighting the relationships among the constructs AJ, BS, HS, KP, and MK. The values indicate significant correlations between AJ and all other variables ($p = 0.000$), confirming its central role as a strong predictor in the model. The negative associations between BS and both KP (–0.220) and MK (–0.341) suggest that behavioral skills, when isolated, do not directly strengthen career pathways or motivation knowledge; instead, they may require mediation through other constructs. Similarly, HS shows weak negative relationships with KP (–0.112) and MK (–0.128), implying that higher success outcomes are not immediately determined by motivation or pathways alone but may depend on broader external factors. Conversely, the positive relationship between KP and MK (0.389) reinforces the predictive importance of motivation knowledge in enhancing career pathways. Overall, the ANOVA results align with the structural model, emphasizing that academic judgment is the most consistent and significant predictor of career alignment in AI-driven counseling systems, while behavioral and success variables contribute more indirectly.

The results of the SmartPLS analysis demonstrate that academic judgment (AJ) is the most influential factor in shaping student career pathways (KP) (Sheth, 2022; Wandelt, 2023; Xia, 2023). Its significant effect on motivation knowledge (MK) and behavioral skills (BS) suggests that students' academic abilities provide the foundation upon which other career-related competencies are developed. This finding is consistent with prior studies that argue academic performance often serves as the strongest predictor of future employability, particularly in fields that are knowledge-intensive. The pathway analysis shows that motivation knowledge plays a crucial mediating role between academic judgment and career pathways. The strong coefficient between AJ and MK, and subsequently between MK and KP, indicates that academic achievement alone is insufficient unless accompanied by motivation-driven knowledge development. This finding supports the notion that AI-driven counseling systems should not merely evaluate grades or academic scores but also integrate motivational factors to ensure more accurate and holistic career recommendations.

Behavioral skills, while important, show weaker direct effects on career pathways compared to motivational knowledge (Comito, 2022; Jorzik, 2024; Pan, 2022). The ANOVA results reveal negative correlations between BS and both KP and MK, suggesting that behavioral skills alone cannot guarantee career alignment without cognitive and motivational reinforcement. This underscores the need for AI systems to consider behavioral data in combination with academic and motivational indicators, rather than treating them as independent predictors. Higher success (HS) demonstrates minimal variance explained ($R^2 = 0.012$), as well as weak and negative associations with KP and MK. This finding implies that success outcomes in the long term are shaped by a more complex set of variables beyond the scope of the current model. For AI-driven systems, this highlights the necessity of expanding predictive indicators by incorporating socio-economic, cultural, and psychological dimensions to achieve a more comprehensive understanding of career success.

The positive relationship between MK and KP (0.389) further validates the importance of motivation knowledge as a driver of career development. Students who demonstrate higher intrinsic motivation and awareness of their knowledge trajectory are more likely to align their potential with relevant job markets. This finding aligns with human capital theory, which emphasizes the value of knowledge and motivation in enhancing employability. The integration of AI in career counseling presents transformative opportunities (F. Li, 2022; Parhi, 2024; Sarker, 2024). By analyzing academic data, motivation profiles, and labor market trends, predictive systems can provide personalized recommendations that account for both present capabilities and future industry demands. This aligns with the growing emphasis on adaptive and data-driven education, where decision-making is no longer static but evolves alongside technological and labor market shifts.

Ethical considerations, however, must not be overlooked. The reliance on predictive models introduces risks of algorithmic bias, data privacy violations, and cultural insensitivity. The negative correlations observed in the ANOVA analysis suggest that not all variables interact positively, and AI systems must be carefully designed to avoid reinforcing inequalities or overlooking individual differences. Transparent algorithmic processes and inclusive datasets are crucial in this regard. From a pedagogical perspective, these findings highlight the importance of rethinking the role of higher education in preparing students for future careers. Universities should not only focus on delivering academic content but also integrate motivational and behavioral development programs. AI-driven counseling systems can complement these efforts by providing ongoing feedback loops that adapt to students' growth and changing aspirations.

Practically, institutions should establish stronger collaborations with industries to ensure that AI-driven career recommendations align with real labor market needs. The identification of

emerging sectors such as renewable energy, digital finance, and creative industries in the model illustrates the potential of AI to bridge the gap between education and industry. Such collaboration can enhance curriculum design and increase the relevance of higher education outcomes. Overall, the study underscores that AI-driven career counseling should be seen as a complementary tool rather than a replacement for human counselors. While AI provides data-driven insights and predictive accuracy, human judgment remains essential in addressing emotional, ethical, and contextual aspects of career decision-making. By combining predictive analytics with empathetic counseling, educational institutions can create a holistic framework that empowers students to navigate future job markets with confidence and resilience.

CONCLUSION

This study demonstrates that AI-driven predictive counseling systems have significant potential to align student potential with the rapidly evolving demands of future job markets. The SmartPLS and ANOVA analyses reveal that academic judgment serves as the strongest predictor, with motivation knowledge acting as a critical mediator in shaping career pathways. While behavioral skills and higher success variables contribute indirectly, their influence is weaker, highlighting the need for a more integrated approach that combines academic, motivational, and behavioral dimensions. The findings underscore that AI-based counseling cannot rely solely on academic data but must incorporate motivational profiles and labor market analytics to deliver accurate and personalized career recommendations. By identifying emerging sectors such as digital finance, renewable energy, and creative technologies, AI-driven systems provide insights that extend beyond the scope of traditional counseling. This predictive capacity equips students with greater career clarity, enhances their confidence, and reduces the risk of educational and occupational mismatches.

At the same time, the study emphasizes the importance of ethical considerations in implementing AI for career counseling. Issues related to data privacy, algorithmic fairness, and cultural sensitivity must be addressed to ensure equitable and responsible use of predictive systems. Therefore, AI integration should be approached as a collaborative initiative involving universities, policymakers, and industry stakeholders. In conclusion, the research highlights the transformative role of AI in educational counseling while recognizing the enduring value of human judgment. The combination of data-driven insights and human empathy offers a comprehensive framework for career guidance, ensuring that students are better prepared to navigate the uncertainties of future labor markets with resilience, adaptability, and confidence.

AUTHORS' CONTRIBUTION

Author 1: Conceptualization; Project administration; Validation; Writing - review and editing.
Author 2: Conceptualization; Data curation; In-vestigation.
Author 3: Data curation; Investigation.

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