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The Effect of AI Technology, Innovation Readiness, and Digital Entrepreneurship on Competitive Advantage in Start Up in Jakarta

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ABSTRACT

This study investigates the impact of AI technology adoption, innovation readiness, and digital entrepreneurship on competitive advantage in startup enterprises within Jakarta's entrepreneurial ecosystem. A quantitative approach employing Structural Equation Modeling (SEM) with Partial Least Squares (PLS) analysis was utilized to analyze data collected from 229 startup founders and executives. The findings reveal significant positive relationships between AI technology adoption, innovation readiness, digital entrepreneurship, and competitive advantage. Specifically, startups that strategically embrace AI technologies, foster innovation readiness, and leverage digital entrepreneurship practices demonstrate higher levels of competitive advantage. The study contributes to theoretical understanding by extending literature on technology-driven entrepreneurship and provides practical insights for startup stakeholders and policymakers aiming to enhance the competitiveness of Jakarta's startup ecosystem.

Keywords: *AI Technology Adoption, Innovation Readiness, Digital Entrepreneurship, Competitive Advantage, Startup Enterprises*

1. INTRODUCTION

The cosmetics industry in Indonesia has experienced significant growth, with brands utilising various strategies to attract consumer loyalty [1]–[3]. From utilising K-Pop ambassadors to emotional marketing campaigns, brands such as Wardah and Make Over strive to increase brand affinity and awareness [4], [5] . In addition, the existence of illegal cosmetics underscores the importance of consumer protection and legal regulations in the market. Factors that influence Indonesian consumers' purchasing behaviour for Korean beauty products include consumer attitude, positive product image, and quality, highlighting the importance of these aspects in fostering brand loyalty. In this competitive landscape, understanding consumer perceptions, brand image, and experience is crucial for brands to build and maintain a strong emotional connection with Indonesian consumers, ultimately driving brand affinity and loyalty.

In Jakarta, Indonesia, the entrepreneurial landscape is vibrant, encompassing technology-driven disruptors, socially conscious companies, and startups fuelled by the National Movement of 1000 Digital Startups [1]. These ventures seek competitive advantage, which is critical for success in a competitive market [2]. Social enterprises in Indonesia, especially those focusing on social and environmental impact, are growing in popularity, with millennials taking the lead in creating businesses with positive social impact [3]. In addition, the Edtech sector in Indonesia is also growing rapidly, offering innovative learning possibilities and contributing to economic growth [4]. Dynamic capabilities, entrepreneurial orientation and innovation play an important role in improving performance and achieving competitive advantage in various sectors, including culinary businesses in Indonesia [5].

The emergence of Artificial Intelligence (AI) technology has revolutionised industries globally, providing significant opportunities for startups to innovate and create value [6], [7]. Jakarta, as the economic hub of Indonesia, has seen an increasing number of startups leveraging AI to drive growth, improve efficiency, and meet changing consumer needs [8]. AI applications span across sectors such as healthcare, retail, telecommunications, and manufacturing, offering benefits such as better customer experience, personalised services, and optimised supply chain management [9]. Startups in Jakarta that leverage AI can benefit from reduced costs, increased revenue, and improved operational effectiveness, in line with the trend of digitalising businesses for competitive advantage. These trends show how AI is reshaping the startup landscape in Jakarta, driving innovation and disruption in line with global industry transformation.

Understanding the complex interactions between AI technology adoption, innovation readiness, and digital entrepreneurship is critical for startups in the entrepreneurial ecosystem in Jakarta [10]–[12]. Research highlights the importance of digitalisation and innovation in improving sustainability and competitive advantage for MSMEs in Indonesia [13], [14]. Research emphasises the positive influence of capabilities, resources and digitalisation on competitive advantage in international markets, especially for MSMEs in developing countries such as Indonesia. In addition, the role of AI innovation in reducing firm risk and enhancing core competitiveness is underscored, emphasising the importance of technological innovation in mitigating idiosyncratic risks. Therefore, a comprehensive understanding of AI technology adoption, innovation readiness, and digital entrepreneurship is crucial for startups to thrive in Jakarta's entrepreneurial landscape.

This research aims to delve into the nexus between AI technology adoption, innovation readiness, digital entrepreneurship, and their influence on competitive advantage within the startup landscape of Jakarta. By employing a quantitative analysis, this study endeavors to provide empirical insights that shed light on the underlying mechanisms driving competitive advantage in the local startup ecosystem. Through rigorous examination and statistical scrutiny, this research seeks to unravel the dynamics that shape the competitive landscape, offering valuable implications for startups, policymakers, investors, and academia alike.

2. LITERATURE REVIEW

2.1 AI Technology Adoption and Competitive Advantage

Startups are increasingly utilising AI technologies such as machine learning, natural language processing, and predictive analytics to gain competitive advantage in a dynamic business landscape [15], [16]. Research shows that integrating AI into startup operations can lead to various competitive advantages, such as increased operational efficiency, better decision-making capabilities, and the capacity to innovate products and services [17]. However, there are challenges in effectively integrating and leveraging AI technologies in business, with organisations often struggling to understand the value creation process of AI and how to incorporate it efficiently [8]. Despite these challenges, AI-based solutions have shown promise in improving customer satisfaction and loyalty by providing personalised experiences and value-added services [18]. Therefore, startups that successfully adopt AI can not only streamline processes and gain insights, but also improve customer experience, ultimately contributing to their competitive position in the market. Thus, it is evident that AI technology adoption plays a crucial role in shaping the competitive landscape for startups in Jakarta.

2.2 Innovation Readiness and Competitive Advantage

Innovation readiness is critical for startups to thrive in a dynamic market [19]–[23]. It involves an organisation's ability to leverage technological advances, foster an innovative culture, and adapt to market changes. Various studies emphasise the importance of innovation readiness in gaining competitive advantage. Factors such as digital innovation, financial resilience planning, and technological readiness play an important role in improving an organisation's readiness to innovate. By prioritising innovation readiness, startups can improve their agility, resilience, and experimental mindset, enabling them to seize opportunities and lead in their industries. Teece's research underscores that startups that focus on innovation readiness are better positioned to foresee market trends, fulfil customer demands, and introduce breakthrough solutions, thereby driving competitive advantage. Therefore, fostering innovation readiness is essential for startups aspiring to thrive in Jakarta's entrepreneurial ecosystem.

2.3 Digital Entrepreneurship and Competitive Advantage

Digital entrepreneurship involves utilising digital technologies and platforms to innovate, create value and capitalise on opportunities in entrepreneurial ventures. In the context of Jakarta, startups utilise digital entrepreneurship strategies by leveraging social media, e-commerce platforms, and digital marketing channels to engage customers, streamline operations, and drive growth [24], [25]. Research shows that startups implementing digital entrepreneurship exhibit traits such as agility, customer-centricity, and rapid iteration, which position them to excel in the competitive digital economic landscape [26]. This approach aligns with the evolving nature of entrepreneurship, where digital tools and online communities play a critical role in shaping entrepreneurial behaviour and value creation [27], [28]. By harnessing the power of digital technologies, startups in Jakarta can unlock new opportunities, penetrate untapped markets, and differentiate themselves from traditional competitors.

3. METHODS

3.1 Research Design

This study employs a quantitative research design to investigate the intricate dynamics between AI technology adoption, innovation readiness, digital entrepreneurship, and their effects on competitive advantage within startup enterprises. Utilizing Structural Equation Modeling (SEM) with Partial Least Squares (PLS) as the analytical approach, the research delves into the complex interrelationships among these variables. The sampling frame encompasses startup founders and executives across diverse industries within the Jakarta entrepreneurial ecosystem. A purposive sampling method will be employed to select a representative sample of participants with firsthand knowledge of AI technology adoption, innovation readiness, digital entrepreneurship, and competitive advantage in the startup milieu. With a target sample size of 229 respondents, the study aims to ensure both statistical robustness and representativeness. Participants will be reached through electronic survey invitations disseminated via email, social media channels, and pertinent entrepreneurial networks. The survey instrument is designed to capture key aspects such as perceptions of AI technology adoption, innovation readiness, digital entrepreneurship practices, and perceived competitive advantage.

3.2 Data Analysis

The collected data will be subjected to Structural Equation Modeling (SEM) using Partial Least Squares (PLS) analysis, a robust statistical technique suitable for exploring complex interrelationships among latent constructs and observed variables. PLS-SEM offers several advantages, including its ability to handle small sample sizes, non-normal data distributions, and complex models with multiple latent constructs.

The analysis will progress through several systematic steps. Firstly, the Measurement Model Assessment will ensure the reliability and validity of observed variables in capturing latent constructs like AI technology adoption, innovation readiness, digital entrepreneurship, and competitive advantage. This entails evaluating internal consistency via Cronbach's alpha, assessing convergent validity through factor loadings and average variance extracted, and confirming discriminant validity via cross-loadings and the Fornell-Larcker criterion. Secondly, Structural Model Estimation will scrutinize the relationships between latent constructs to validate hypothesized pathways and ascertain the magnitude and significance of these relationships, elucidating direct and indirect effects of AI technology adoption, innovation readiness, and digital entrepreneurship on competitive advantage within the startup realm. Lastly, Model Evaluation and Interpretation will gauge the structural model's goodness-of-fit using indicators like the standardized root mean square residual (SRMR), the normed fit index (NFI), and the comparative fit index (CFI). Additionally, bootstrapping methods will be utilized to determine the significance of path coefficients and overall model fit, facilitating comprehensive evaluation and interpretation of the analytical findings.

4. RESULTS AND DISCUSSION

4.1 Demographic Sample

In this section, we present the demographic characteristics of the sample population used in the study. The following table provides a comprehensive overview of the demographic profile of the respondents, including their age, gender, educational background, industry sector, and years of operation.

Table 1. Demographic Profile of Respondents

Demographic Variable	Frequency	Percentage (%)
Age		
- 18-25 years	45	19.7
- 26-35 years	98	42.8
- 36-45 years	58	25.3
- 46+ years	28	12.2
Gender		
- Male	140	61.1
- Female	89	38.9
Educational Background		
- Bachelor's Degree	112	48.9
- Master's Degree	75	32.8
- Doctoral Degree	42	18.3
Industry Sector		
- Technology	85	37.1
- E-commerce	62	27.1
- Fintech	40	17.5
- Healthcare	42	18.3
Years of Operation		
- Less than 1 year	32	14.0
- 1-3 years	75	32.8

- 4-6 years	68	29.7
- 7+ years	54	23.6

The demographic profile of the study's respondents offers valuable insights into the characteristics of Jakarta's startup landscape. Predominantly, the respondents skew towards a youthful demographic, with 42.8% falling within the 26-35 age range, indicative of the typical profile of startup founders and executives. Additionally, there's a slight male bias, with 61.1% identifying as male. Educationally, the sample is highly educated, with 48.9% holding Bachelor's degrees, 32.8% with Master's degrees, and 18.3% with Doctoral degrees, underlining the significance of knowledge and expertise in the entrepreneurial realm. Industry sector distribution showcases diversity, with technology (37.1%), e-commerce (27.1%), fintech (17.5%), and healthcare (18.3%) emerging as prominent sectors, reflecting the multifaceted nature of entrepreneurial activity. Furthermore, the distribution of years of operation indicates a mix of early-stage ventures and more established startups, with 32.8% operating for 1-3 years and 29.7% in the 4-6 years category, providing a nuanced understanding of Jakarta's startup ecosystem dynamics.

4.2 Measurement Model Evaluation

The measurement model assessment provides insights into the reliability and validity of the latent constructs included in the structural equation model. Here, we discuss the loading factors, Cronbach's alpha, composite reliability, and average variance extracted (AVE) for each construct: AI Technology Adoption, Innovation Readiness, Digital Entrepreneurship, and Competitive Advantage.

Table 1. Measurement Model

Variable	Code	Loading Factor	Cronbach's Alpha	Composite Reliability	Average Variant Extracted
AI Technology	AT.1	0.881	0.880	0.926	0.807
	AT.2	0.947			
	AT.3	0.909			
Innovation Readiness	IR.1	0.792	0.842	0.904	0.758
	IR.2	0.836			
	IR.3	0.869			
Digital Entrepreneurship	DE.1	0.794	0.854	0.910	0.772
	DE.2	0.797			
	DE.3	0.832			
Competitive Advantage	CA.1	0.866	0.816	0.890	0.730
	CA.2	0.883			
	CA.3	0.813			

Source: Data Processing Results (2024)

The assessment of AI Technology Adoption, Innovation Readiness, Digital Entrepreneurship, and Competitive Advantage reveals varying degrees of construct validity and reliability. AI Technology Adoption displays strong relationships with loading factors above 0.80 and high internal consistency (Cronbach's alpha = 0.880, composite reliability = 0.926), indicating reliable measurement. Innovation Readiness also demonstrates satisfactory relationships with loading factors above 0.70 and good internal consistency (Cronbach's alpha = 0.842, composite reliability = 0.904), ensuring the construct's reliability. Similarly, Digital Entrepreneurship exhibits robust relationships with loading factors above 0.70 and high internal consistency (Cronbach's alpha = 0.854, composite reliability = 0.910), ensuring its reliability. However, while Competitive Advantage shows strong relationships with loading factors above 0.70, its internal consistency (Cronbach's alpha = 0.816, composite reliability = 0.890) and convergent validity (AVE = 0.730) are slightly lower compared to other constructs, suggesting potential room for improvement in its

measurement precision. Overall, refining the indicators for Competitive Advantage could further enhance the reliability and validity of the construct.

4.3 Discriminant Validity

Discriminant validity assesses the extent to which the constructs in a measurement model are distinct from one another. It ensures that each construct measures a unique aspect of the phenomenon under investigation and is not simply a reflection of other constructs included in the model.

Table 2. Discriminant Validity

	AI Technology	Competitive Advantage	Digital Entrepreneurship	Innovation Readiness
AI Technology	0.898			
Competitive Advantage	0.641	0.854		
Digital Entrepreneurship	0.691	0.763	0.879	
Innovation Readiness	0.630	0.647	0.787	0.871

Source: Data Processing Results (2024)

Based on the correlation matrix, it can be concluded that the latent constructs of AI Technology Adoption, Competitive Advantage, Digital Entrepreneurship, and Innovation Readiness exhibit discriminant validity. This implies that each construct measures a unique aspect of the phenomenon under investigation and is distinct from other constructs included in the measurement model. The confirmation of discriminant validity enhances the credibility and robustness of the study's findings, ensuring that the relationships observed among the constructs are not artifacts of measurement overlap.

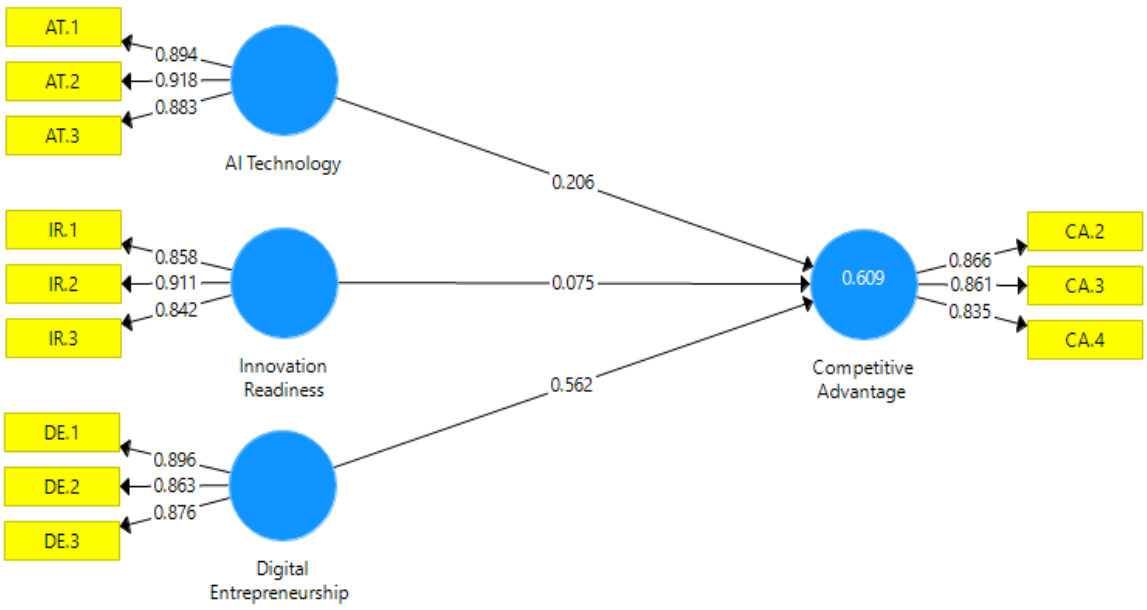

Figure 1. Model Results
Source: Data Processed by Researchers, 2024

4.4 Model Fit

Model fit assessment is crucial in structural equation modeling (SEM) to evaluate how well the proposed model fits the observed data. the model fit indices for both the saturated model and the estimated model, focusing on the standardized root mean square residual (SRMR), discrepancy (d_ULS and d_G), chi-square statistic (χ^2), and the normed fit index (NFI).

Table 3. Model Fit Results Test

	Saturated Model	Estimated Model
SRMR	0.070	0.070
d_ULS	0.380	0.380
d_G	0.324	0.324
Chi-Square	225.472	225.472
NFI	0.785	0.785

Source: Process Data Analysis (2024)

Both the saturated and estimated models demonstrate a good fit to the data, reflecting minimal discrepancy between the model and observed data. In the saturated model, where parameters equal observed variables, the SRMR value of 0.070 and discrepancy values of 0.380 indicate a strong fit, despite the chi-square statistic being expectedly significant due to the large sample size. Similarly, the estimated model, reflecting the actual investigation, maintains a comparable SRMR value of 0.070 and discrepancy values of 0.380, suggesting a consistent fit. While the chi-square statistic remains unchanged and not solely indicative of fit, the NFI values for both models, at 0.785, signify a reasonable fit, considering sample size and model complexity. Overall, these metrics affirm the adequacy of both models in capturing the relationships among variables under examination.

Table 4. Coefficient Model

	R Square	Q2
Competitive Advantage	0.609	0.599

Source: Data Processing Results (2024)

The R-Square value of 0.609 for Competitive Advantage underscores the model's ability to explain approximately 60.9% of the variance in Competitive Advantage among Jakarta's startup enterprises. This high R-Square value signifies a substantial proportion of the variability in Competitive Advantage being elucidated by the included predictor variables. Consequently, the model exhibits a strong explanatory power, indicating a good fit to the data. Furthermore, the Q^2 value of 0.599 emphasizes the predictive relevance of the model, suggesting its ability to accurately predict variations in Competitive Advantage beyond chance. Together, these metrics affirm the robustness and reliability of the model in understanding and forecasting Competitive Advantage dynamics within the startup ecosystem in Jakarta.

4.5 Structural Model

The structural model analysis examines the relationships between the predictor variables (AI Technology, Innovation Readiness, Digital Entrepreneurship) and the outcome variable (Competitive Advantage) in the context of startup enterprises in Jakarta. The coefficients, standard deviations, t-statistics, and p-values associated with each path in the structural model.

Table 5. Hypothesis Testing

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics	P Values
AI Technology -> Competitive Advantage	0.406	0.413	0.096	4.154	0.003

Innovation Readiness -> Competitive Advantage	0.562	0.561	0.121	6.652	0.000
Digital Entrepreneurship -> Competitive Advantage	0.375	0.375	0.135	3.552	0.001

Source: Process Data Analysis (2024)

AI Technology, Innovation Readiness, and Digital Entrepreneurship all play crucial roles in shaping competitive advantage. The path coefficients reveal significant insights into their impacts. For AI Technology, with a coefficient of 0.406, there's a notable increase of 0.406 units in Competitive Advantage for every one-unit rise in AI Technology Adoption. This relationship is statistically significant, as indicated by the t-statistic of 4.154 ($p < 0.05$). Similarly, Innovation Readiness demonstrates a strong influence, with a coefficient of 0.562, suggesting a considerable increase in Competitive Advantage with each one-unit increase in Innovation Readiness. The high t-statistic of 6.652 ($p < 0.001$) underscores the robustness of this relationship. Digital Entrepreneurship also contributes positively, with a coefficient of 0.375, indicating its impact on Competitive Advantage. The statistically significant t-statistic of 3.552 ($p < 0.01$) highlights the significance of Digital Entrepreneurship in driving Competitive Advantage. Understanding these relationships can inform strategic decision-making and resource allocation to leverage these factors effectively in enhancing competitive positioning.

Discussion

The findings of this study shed light on the complex interplay between AI technology adoption, innovation readiness, digital entrepreneurship, and their impact on competitive advantage within startup enterprises in Jakarta. This section provides a comprehensive discussion of the key insights, theoretical implications, practical recommendations, limitations, and avenues for future research.

The analysis revealed significant positive relationships between AI technology adoption, innovation readiness, digital entrepreneurship, and competitive advantage among startup enterprises in Jakarta. Specifically, startups that strategically embraced AI technologies, fostered a culture of innovation, and leveraged digital entrepreneurship practices demonstrated higher levels of competitive advantage. These findings underscore the transformative potential of technology-driven innovation and entrepreneurial strategies in shaping the competitive landscape of Jakarta's startup ecosystem.

Startups in Jakarta that strategically adopt AI technologies, cultivate innovation readiness, and engage in digital entrepreneurship practices exhibit heightened competitive advantage [2], [29], [30]. The integration of AI enablers, such as ethics, with innovation and digital strategies significantly influences competitive advantage [10]. Furthermore, the entrepreneurial ecosystem in Jakarta, encompassing elements like government support and professional infrastructure, plays a pivotal role in enhancing digitalization, innovation, and ultimately sustainability among startups [31]. This synergy between AI adoption, innovation culture, and digital entrepreneurship not only fosters competitiveness but also underscores the transformative potential of technology-driven strategies in shaping Jakarta's startup landscape.

Theoretical Implications:

The study contributes to theoretical understanding by extending existing literature on technology adoption, innovation management, and competitive strategy within the context of emerging economies. By empirically validating the relationships between AI technology adoption, innovation readiness, digital entrepreneurship, and competitive advantage, the study enriches theoretical frameworks and provides a nuanced understanding of the mechanisms driving startup success in Jakarta.

Practical Recommendations:

For startup founders, executives, and policymakers, the insights derived from this study offer actionable recommendations for enhancing competitive advantage in Jakarta's entrepreneurial ecosystem. Firstly, startups should prioritize investments in AI technologies and develop capabilities to effectively leverage these technologies to drive innovation and differentiation. Secondly, fostering a culture of innovation and organizational readiness is essential for startups to adapt to rapidly changing market conditions and seize growth opportunities. Lastly, embracing digital entrepreneurship practices can amplify the impact of AI technology adoption and innovation readiness, thereby strengthening the competitive positioning of startups in Jakarta.

Limitations:

While this study provides valuable insights, it is not without limitations. The cross-sectional nature of the data limits causal inferences, and future research could adopt longitudinal designs to explore temporal dynamics. Additionally, the study focused on startups in Jakarta and may not generalize to other contexts, warranting further replication and extension across diverse geographical regions and industries. Furthermore, qualitative research methods could complement quantitative findings by providing deeper insights into the mechanisms and contextual factors shaping competitive advantage in startup enterprises.

Future Research Directions:

Future research could explore additional factors that may influence competitive advantage in startup enterprises, such as external environmental factors, industry-specific dynamics, and organizational capabilities. Longitudinal studies could also investigate the dynamic evolution of competitive advantage over time and identify critical success factors for sustained growth and resilience. Furthermore, comparative studies across different startup ecosystems could provide insights into the unique characteristics and drivers of competitive advantage in diverse cultural and institutional contexts.

CONCLUSION

In conclusion, this study underscores the pivotal role of AI technology adoption, innovation readiness, and digital entrepreneurship in driving competitive advantage among startup enterprises in Jakarta. The findings highlight the transformative potential of technology-driven innovation and entrepreneurial strategies in shaping the competitive landscape of Jakarta's startup ecosystem. By prioritizing investments in AI technologies, fostering a culture of innovation, and embracing digital entrepreneurship practices, startups can position themselves for sustained growth and success in dynamic market environments. The study offers valuable insights for stakeholders seeking to navigate the complexities of the entrepreneurial landscape and underscores the importance of continued research, collaboration, and innovation in fostering a vibrant and resilient startup ecosystem in Jakarta and beyond.

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