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Analysis of Factors Influencing The Intention to Adopt ICT Among Employees of PT Perkebunan Tambi: A Preliminary Step Towards AI Development

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ABSTRACT

Technological advancements in the Industry 5.0 era highlight the amalgamation of humans with intelligent technology, including Artificial Intelligence (AI), to enhance organizational efficiency and sustainability. PT Perkebunan Tambi, a prominent agro-industrial enterprise in Indonesia, must comprehend the determinants that affect employee willingness to accept Information and Communication Technology (ICT) as a preliminary measure for AI deployment. This research intends to examine these elements utilizing the DOI, TAM, TOE, and UTAUT frameworks. A quantitative methodology was employed through a survey of administrative personnel at PT Perkebunan Tambi, utilizing PLS-SEM for data analysis to assess the interrelations among variables such as Relative Advantage, Compatibility, Social Influence, Perceived Usefulness, Perceived Ease of Use, and Intention to Use, with Generation serving as a moderating variable. The findings indicate that Relative Advantage and Compatibility substantially affect Perceived Usefulness and Perceived Ease of Use. Social influence exerts both direct and indirect effects on the desire to utilize ICT, with perceived usefulness serving as a mediator. The Perceived Ease of Use enhances the impact of Perceived Usefulness on intention. The moderating influence of Generation is insignificant, perhaps attributable to the predominance of Millennial respondents. Strategic proposals encompass enhancing technological culture, providing digital adaption training, and developing infrastructure to facilitate AI integration. This study offers theoretical insights on technology adoption literature and practical recommendations for agro-industrial enterprises undergoing AI-driven transformation.

Keywords: ICT Adoption; TAM; TOE; DOI; UTAUT; Artificial Intelligence

1. Introduction

The Industry 5.0 epoch positions intelligent technologies, including Artificial Intelligence (AI), at the center of worldwide industrial development. These technologies facilitate the automation of repetitive processes, large-scale data processing, and data-informed strategic decision-making.

Artificial intelligence has been utilized across multiple sectors, such as enhanced project management, optimization of energy consumption through the Internet of Things (IoT), and collaboration between humans and machines in manufacturing environments (Alves et al., 2023; Kaasinen et al., 2022; Longo et al., 2020; Nahavandi, 2019). A McKinsey research (2024) indicates that worldwide AI adoption surged from 50% to 72% within a year, with generative AI emerging as a highly sought-after innovation across all sectors. The World Economic Forum (2023) indicates that 74.9% of global enterprises want to implement AI-based technologies during the next five years, highlighting the increasing necessity for AI integration to enhance efficiency and competitiveness.

The usage of AI in the workplace is increasing, facilitated by platforms like ChatGPT, Gemini, and Microsoft Copilot, which enable employees to incorporate AI into their everyday duties to enhance productivity and aid decision-making (Devkota et al., 2022). In the context of ICT advancement, AI enhances the functionalities of current technologies, ranging from communication to data management, by offering more intelligent and adaptable solutions (Reznikov, 2024). The utilization of AI in administrative tasks enhances operational efficiency, as noted by Saprudin (2024), with AI deployment potentially decreasing manual processing time by 60%, augmenting worker productivity, and delivering data-driven insights for more successful strategies. The successful implementation of AI relies not solely on the technology, but also on comprehending ICT adoption behavior, organizational preparedness, managerial endorsement, and individual intentions, which are critical factors for ensuring effective implementation (Yang et al., 2007; Miller, 2015).

The advancement of Artificial Intelligence (AI) technology in the Industry 5.0 era presents significant opportunities for diverse sectors, including PT Perkebunan Tambi, which enhances sustainability strategies through technological integration to optimize operational efficiency and global competitiveness (Rozhkova & Rozhkov, 2022). PT Perkebunan Tambi, as an adaptable enterprise, has integrated numerous Information and Communication Technologies (ICT) into its administration, communication, data management, and marketing, initially prioritizing administration owing to its critical role in data management and coordination. Nonetheless, despite exhibiting a dedication to sustainability via the integration of contemporary technology, considerable obstacles persist, particularly regarding the adoption of AI, as most administrative personnel remain unaware of AI's potential for automating routine tasks and conducting data analysis, thereby impeding the company's preparedness for AI-driven digital transformation. This research is essential for examining factors such as individual perceptions, social influences, and management support that affect ICT adoption readiness as a preliminary step towards AI implementation, anticipated to enhance ICT functions, boost efficiency, competitiveness, and foster long-term corporate growth.

The research study indicates that the relative benefit of technology can enhance perceived utility, while its compatibility with organizational procedures promotes adoption (Baba et al., 2023; Choudhury & Karahanna, 2008; Gangwar et al., 2015). Social influence significantly affects individuals' intention to adopt new technology, particularly within a supportive work environment (Guetz & Bidmon, 2022; Li et al., 2022; Venkatesh et al., 2003). Within the framework of AI adoption, the constructs of perceived utility and perceived ease of use from the Technology Acceptance Model (TAM) are frequently employed to elucidate the psychological determinants that affect technology usage intention (Davis & Davis, 1989). This study seeks to examine these issues using an integrated framework of Diffusion of Innovation (DOI),

Technology Acceptance Model (TAM), Technology-Organization-Environment (TOE), and the Unified Theory of Acceptance and Use of Technology (UTAUT). This research aims to offer strategic suggestions to enhance PT Perkebunan Tambi's preparedness for AI-driven digital transformation. This stage is essential for enhancing operational efficiency, ensuring corporate sustainability, and maintaining firm competitiveness in the global market.

2. Literature Review

This study's analysis integrates many key theories to comprehend the elements influencing PT Tambi workers' intention to use Information and Communication Technology (ICT). The Technology Acceptance Model (TAM), created by Davis & Davis (1989), emphasizes that Perceived Usefulness (PU) and Perceived Ease of Use (PEOU) are the primary factors influencing an individual's desire to utilize technology. Tornatzky (1990) Technology-Organization-Environment (TOE) framework incorporates organizational and environmental dimensions, pertinent for comprehending the impact of external elements like competitive pressures and organizational preparedness. Studies by Lin & Chang (2011) and Chatterjee et al. (2021) demonstrate that Perceived Usefulness (PU) and Perceived Ease of Use (PEOU) are essential in influencing technology adoption intentions.

The Diffusion of Innovation (DOI) hypothesis by Rogers (2003) emphasizes relative advantage, compatibility, complexity, trialability, and observability as critical elements in technological uptake. Relative advantage denotes the degree to which a technology is seen to offer more benefits compared to prior techniques or systems . Technology having a substantial relative advantage is more readily embraced, since consumers see considerable benefits in its utilization. Studies conducted by Gangwar et al. (2015) and Baba et al. (2023) indicate that relative advantage positively affects perceived utility (PU) and perceived ease of use (PEOU). Compatibility denotes the degree to which new technology aligns with established organizational ideals, requirements, and procedures. A significant degree of compatibility enhances adoption, since the technology may be assimilated without disturbing the operational framework. Studies by Ahmadi et al. (2015) and Qin et al. (2020) underscore the significance of compatibility in enhancing perceived utility and ease of usage.

The Unified Theory of Acceptance and Use of Technology (UTAUT), formulated by Venkatesh et al. (2003), highlights social influence and facilitating environments as critical determinants in enhancing individual intent to use technology. Social influence is the degree to which individuals perceive themselves as affected by the thoughts or behaviors of others within their social environment. Research by Guetz & Bidmon (2022) and Li et al. (2022) indicates that social influence can impact technology adoption intention directly or via mediating factors such as perceived usefulness (PU) and perceived ease of use (PEOU).

Age has been recognized as a significant moderating component in technology adoption models Venkatesh et al. (2003). Numerous research integrating the Technology Acceptance Model (TAM), including those by Al-Gahtani (2008) and Riskinanto et al. (2017), demonstrate that age influences the intensity of the link among fundamental factors. Research by Yang and Shih (2020) indicates that younger personnel prioritize the advantages of technology, whilst older generations place greater importance on usability. Generational classification include age cohorts such as Baby Boomers, Generation X, Millennials, and Generation Z (Mahapatra et al., 2022).

The study hypothesis might be constructed in the following manner using the findings from the literature review that has been carried out.

H1a & b : Relative Advantage positively influences Perceived Usefulness and Perceived Ease of Use.

H2a & b : Compatibility positively affects Perceived Usefulness and Perceived Ease of Use.

H3a & b : Social Influence positively affects Perceived Usefulness and Perceived Ease of Use.

H4 : Perceived Ease of Use positively affects Perceived Usefulness.

H5 : Perceived Usefulness positively affects the Intention to Use.

H6 : Perceived Ease of Use positively affects the Intention to Use.

H7a & b : Generations moderates the association between Perceived Usefulness and Perceived Ease of Use to Intention to Use.

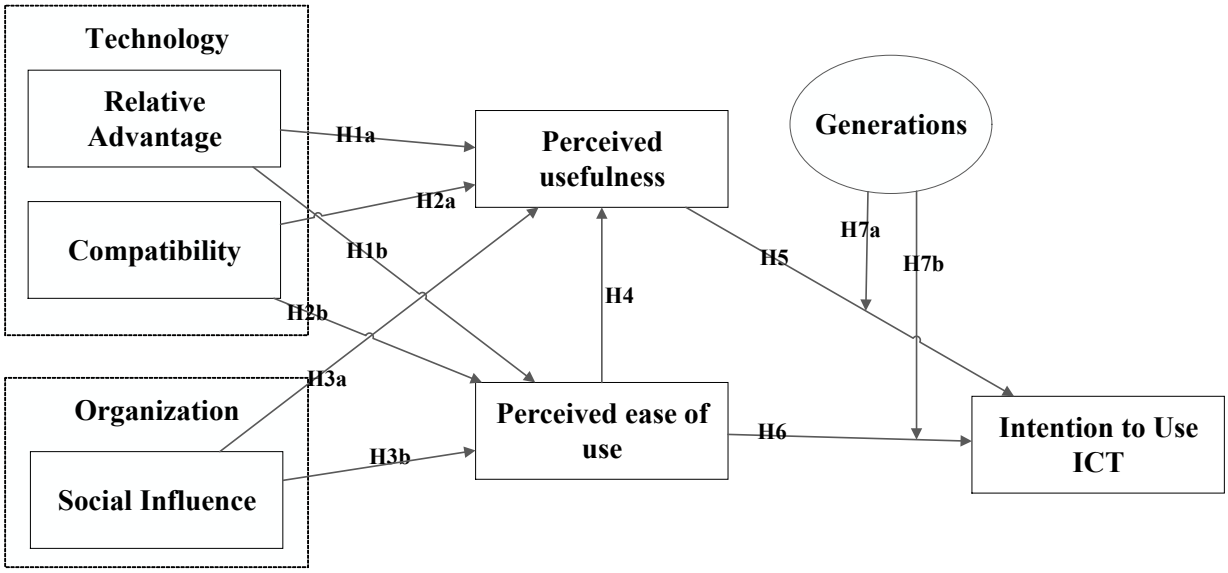

Figure 1. Research Framework

3. Research Methodology

This research was conducted at PT Perkebunan Tambi, Wonosobo, Central Java, which is known for its high-quality tea agro-industry sector. The study focused on the board of directors' administrative office and three manufacturing units (UP Tambi, UP Bedakah, and UP Tanjungsari) that manage data and run the organization. This site was chosen for its potential to boost agro-industrial efficiency and competitiveness with technology. Administrative personnel were purposively chosen and surveyed from September to December 2024 to acquire quantitative data. SmartPLS 4.0 was used for PLS-SEM analysis. For reliable coefficient

estimates and variable significance testing, bootstrapping was used. This study uses PLS-SEM because the population is small and experimental.

4. Results

4.1 Demographic Profile

The survey included a total of 58 respondents, categorized by generational composition as follows: Generation X comprises 10 individuals, accounting for approximately 17% of the total replies. Simultaneously, the Millennial Generation was the predominant group, including 40 individuals or around 69%. Generation Z accounted for 8 participants, or 14% of the overall responses. This survey has 0 responders from the Baby Boomer Generation. This demographic data offers a summary of age and generational distribution, highlighting the predominance of the Millennial Generation as the most engaged cohort in this poll.

4.2 Validity and Reliability

The results of the convergent validity test on Figure 2 indicate that all indicator outer loading values exceed the 0.70 threshold, as per the criteria established by Hair et al. (2021), signifying a robust link between these indicators and the measured concept. The Average variation Extracted (AVE) for each construct exceeds 0.50, signifying that over 50% of the construct variation is elucidated by its indicators.

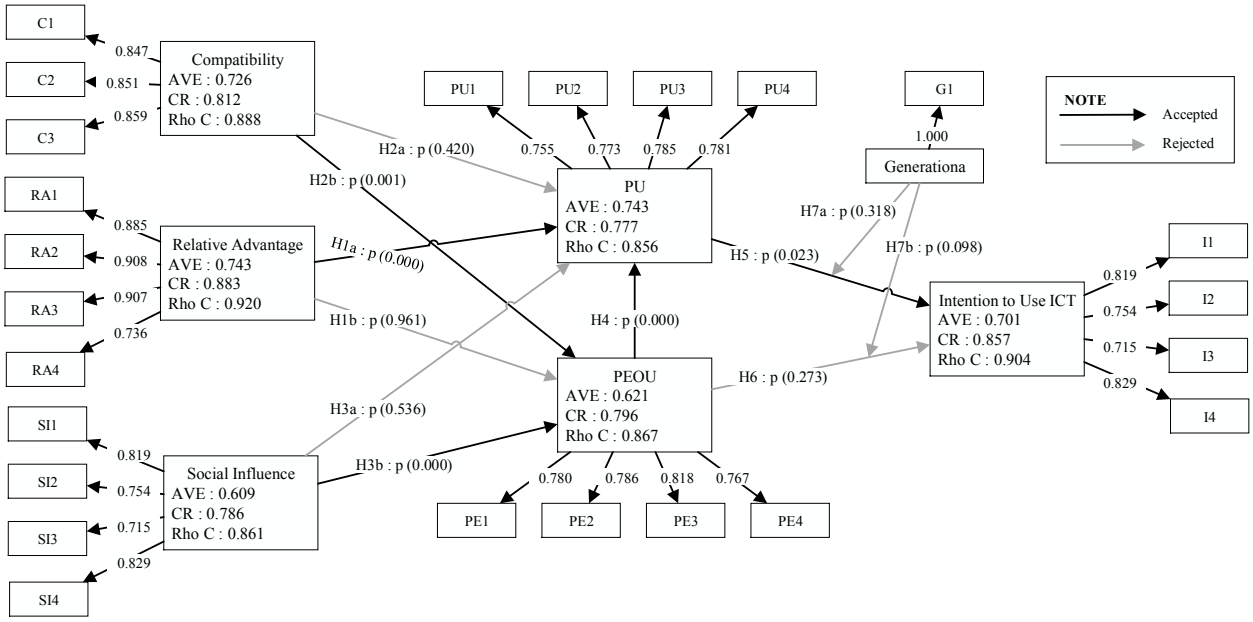

Figure 2. Structural Equation Modelling

Discriminant validity was assessed by Heterotrait-Monotrait Ratio (HTMT) values, all of which were below 0.90, therefore satisfying the criterion established by Henseler et al. (2015),

confirming that each construct had sufficient discrimination relative to other constructs. The reliability test indicates that the Cronbach's Alpha and Composite Reliability scores for all constructs above 0.70, the minimum threshold advised by Hair et al. (2021). These findings demonstrate that all conceptions exhibit sufficient internal consistency. The integration of convergent, discriminant, and reliability validity demonstrates that the measurement model possesses high quality to facilitate subsequent analysis.

Table 1. Discriminant Validity (HTMT Ratio)

	C	G	I	PU	PE	RA	SI	G x PU	G x PE
C									
G	0,095								
I	0,476	0,236							
PU	0,658	0,191	0,741						
PE	0,790	0,339	0,695	0,859					
RA	0,671	0,056	0,666	0,783	0,477				
SI	0,690	0,110	0,538	0,690	0,863	0,482			
G x PU	0,252	0,173	0,186	0,286	0,150	0,169	0,130		
G x PE	0,083	0,152	0,093	0,166	0,140	0,064	0,263	0,554	

Noted : *C (Compatibility), G (Generations), I (Intention to use), PU (Perceive Usefulness), PE (Perceive Ease of Use), RA (Relative Advantage), SI (Social Influence)*

4.3 Structural Modelling

4.2.1 Path Analysis

According to the route coefficient results in Figure 2, adhering to the p-value <0.05 requirement, the acceptable pathways are as follows: Compatibility has a considerable impact on Perceived Ease of Use (p = 0.001), which in turn influences Perceived Usefulness (p = 0.000). Additionally, Relative Advantage affects Perceived Usefulness (p = 0.000), while Social Influence impacts Perceived Ease of Use (p = 0.000). Moreover, Perceived Usefulness strongly influences Intention to Use ICT (p = 0.023). Conversely, other pathways, including Compatibility to Perceived Usefulness and Generation to Intention to Use ICT, lack significance as the p-value exceeds 0.05; hence, the hypotheses about these pathways are rejected.

4.2.2 Indirect Effect

The Total Indirect Effect results indicate a significant route (p < 0.05), demonstrating that Compatibility indirectly influences Perceived Usefulness via the mediator Perceived Ease of Use (p = 0.009). Moreover, Social Influence indirectly impacts Intention to Use ICT via the mediators of Perceived Ease of Use and Perceived Usefulness (p = 0.015), and it also indirectly influences Perceived Usefulness through the mediator of Perceived Ease of Use (p = 0.005). Alternative pathways in the Total Indirect Effect lack significance.

Table 2. Significant Total Indirect Effect

Path	Path Coefficient	T statistics	P values
Compatibility -> Peceive Usefulness	0,188	2,595	0,009
Perceived Ease of Use -> Intention to Use TIK	0,222	1,789	0,074
Social Influence -> Intention to Use TIK	0,255	2,442	0,015
Social Influence -> Peceive Usefulness	0,236	2,831	0,005

Table 3. Significant Specific Indirect Effect

Path	Path Coefficient	T-statistics	P-values
Perceived Ease of Use -> Peceive Usefulness -> Intention to Use TIK	0,222	1,789	0,074
Social Influence -> Perceived Ease of Use -> Peceive Usefulness	0,236	2,831	0,005
Compatibility -> Perceived Ease of Use -> Peceive Usefulness	0,188	2,595	0,009

In the Specific Indirect Effect, the established pathway indicates that Social Influence impacts Perceived Usefulness indirectly via Perceived Ease of Use, which serves as the single mediator ($p = 0.005$). Furthermore, Compatibility influences Perceived Usefulness indirectly, with Perceived Ease of Use serving as the mediator ($p = 0.009$). Alternative routes, including Relative Advantage and Perceived Ease of Use regarding Intention to Use ICT via particular mediators, are not statistically significant since the p-value exceeds 0.05.

4.3 Statistical Measures of Model Evaluation

According to the R-square (R^2) and Q-square (Q^2) results, the ICT Intention to Use measure has a R^2 value of 0.473, Perceived Usefulness has a R^2 value of 0.540, and Perceived Ease of Use has a R^2 value of 0.666, all classified as moderate based on Chin & Newsted (1999) criterion ($0.33 \leq R^2 < 0.67$). This indicates that each variable may be elucidated by the independent variables in the model by 47.3%, 54%, and 66.6% respectively. The Q^2 scores for ICT Intention to Use (0.244), Perceived Usefulness (0.434), and Perceived Ease of Use (0.497) exceed 0, demonstrating the model's significant predictive capacity. Consequently, this model effectively accounts for the variability of the dependant variable and has considerable predictive capability.

5. Discussion

The findings indicated that Relative Advantage and Compatibility significantly affect Perceived Usefulness and Perceived Ease of Use. This conclusion aligns with Choudhury & Karahanna (2008) research, which elucidates that technologies offering substantial advantages over conventional approaches are more readily embraced by consumers. Alignment with

organizational requirements and values promotes seamless technology integration, minimizing disruption to current work systems, as shown in the study by Gangwar et al. (2015).

Social influence exerts an indirect impact on the intention to utilize technology via the mediators of Perceived Usefulness (PU) and Perceived Ease of utilize (PEOU). The findings of the particular indirect effect test indicate that Social Influence exerts an indirect effect on Perceived Usefulness (PU); nevertheless, this effect is insufficient to impact the intention to use, whether through PU or Perceived Ease of Use (PEOU) independently. In the overall results of the indirect impact, Social Influence has a substantial indirect influence on the desire to use (t-statistic 2.442, p-value 0.015). This signifies that the indirect impact of Social Influence on the desire to use is derived from the joint mediating effect of Perceived Usefulness (PU) and Perceived Ease of Use (PEOU) jointly. This discovery corroborates the studies conducted by Guetz & Bidmon (2022) and Li et al. (2022), demonstrating that Social Influence operates via a confluence of mediating pathways.

The findings of hypothesis testing indicate that the moderating influence of generation on the link between Perceived Ease of Use (PEOU) and intention to use, as well as between Perceived Usefulness (PU) and intention to use, is insignificant. The moderating effect had an opposing direction, with a negative coefficient of -0.210 for the association between PEOU and intention, and a positive coefficient of 0.124 for the relationship between PU and intention. This suggests that younger generations, like Millennials and Gen Z, who are familiar with technology, prioritize its advantages (PU) over its ease of use (PEOU). Conversely, older generations prioritize simplicity of use to a greater extent. The predominant workforce of PT Perkebunan Tambi consists of digital natives (Millennials and Gen Z), hence technology adoption tactics should focus on highlighting the advantages of technology for younger employees, while ensuring user-friendliness for older employees is stressed. This conclusion aligns with the findings of Yang & Shih (2020), which indicates that the younger generation is more influenced by the productivity and relevance of technology.

The use of AI at PT Perkebunan Tambi necessitates a thorough strategy framework addressing organizational, technological, and human factors. Various strategies may be employed in accordance with the research findings. Initially, emphasizing the comparative advantage and perceived use of the technology is paramount. Exhibiting tangible advantages, such as enhanced job productivity, less administrative mistakes, and expedited data-driven decision-making, can bolster the perceived utility of AI among employees. This may be accomplished through training or simulations that illustrate the benefits of AI compared to conventional techniques. Secondly, guaranteeing the Perceived Ease of Use of the technology is essential for mitigating adoption obstacles. AI systems must be created for intuitiveness and clarity, bolstered by an extensive technical training program to enhance employees' proficiency in utilizing them. Third, enhancing social and organizational support can expedite adoption by utilizing superiors and colleagues as change agents. Designating mentors or technology "champions" inside the company might facilitate quicker adaptation for other employees. It plays an important role in driving engagement, which has a significant impact on organizational performance (Daryono et al., 2024). Fourth, evaluating and confirming the alignment of technology with organizational requirements (Compatibility) is an essential stage. AI must be integrable with current work systems to facilitate the transition and diminish opposition. This strategy guarantees that the new technology aligns with operational requirements and integrates seamlessly with the company's

work culture. This comprehensive approach establishes a robust framework for the effective adoption of AI at PT Perkebunan Tambi.

6. Conclusion

This study demonstrates that Relative Advantage and Compatibility greatly influence Perceived Usefulness and Perceived Ease of Use, with Compatibility notably impacting PEOU, which then impacts PU. Social influence affected perceived ease of use (PEOU) and indirectly impacted perceived usefulness (PU) through a mediating pathway, with PU ultimately serving as a substantial determinant of employees' desire to utilize information and communication technology (ICT). The moderating influence of generational characteristics on the connection between perceived usefulness (PU) and perceived ease of use (PEOU) with intention to use is not significant, possibly due to the predominance of the Millennial Generation among respondents, resulting in less variability across participants. These findings establish a strategic foundation for PT Tambi to emphasize the display of technological advantages, guarantee user-friendliness, facilitate social adaption via technology mentors, and seamlessly integrate AI with current operational systems. This initiative seeks to enhance the organization's efficiency, competitiveness, and preparedness for sustained AI-driven digital transformation. Future study should include respondents from a more equal distribution of generations to offer a more full understanding of the impacts of generational moderation on technology uptake.

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