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Assessing Artificial Intelligence (AI) Literacy and Readiness in Thailand's Workforce: Challenges and Opportunities for Digital Transformation

Vachirawit Kaewsawad[1,*], Jerzy Duda[2]

[1]*National Institute of Development Administration, International College, Bangkok 10240, Thailand*
[2]*AGH University of Krakow, Faculty of Management, Kraków 30-059, Poland*

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ABSTRACT

As this paper seeks to examine how Thailand's workforce readiness for AI technologies can be influenced by AI literacy, anxiety, and acceptance factors, the researcher has conducted an online survey of 318 respondents across multiple Thai industries as well as employing the Structural Equation Modeling or SEM to analyze the relationship between these factors. The modified Unified Theory of Acceptance and Use of Technology (UTAUT) framework has also been implemented and revealed that AI literacy can significantly reduce anxiety (β = -0.892, $p < 0.001$) while the effort expectancy strongly influences the AI acceptance (β = 0.370, $p < 0.001$). This suggests that there is a psychological barrier that should be addressed alongside technical skills improvement. The study has also found that AI literacy can positively influence performance expectancy (β = 0.262, $p < 0.001$) and effort expectancy (β = 0.327, $p < 0.001$) which enhances AI's perceived usefulness and ease of use. The author's model validates ten of the fourteen hypotheses, confirming that the facilitating conditions can significantly impact AI's acceptance while social influences show positive yet non-significant effects. These findings altogether provided actionable insights for policymakers and organizations to develop and adopt the targeted interventions that can enhance both AI competency and a more optimistic environment towards integration of AI technologies in Thailand's workforce.

Keywords: AI literacy; Digital transformation; Technology adoption; Workforce readiness

***Corresponding author:** vachirawit.kaewsawad@gmail.com **doi:** 10.14456/scitechasia.2025.63

1. Introduction

The concept of integration of Artificial Intelligence (AI) into organizational workflows has presented itself to many as one of the most significant technological and technical challenges in contemporary digital transformation efforts. While AI technologies can offer an unprecedented number of opportunities in terms of enhanced productivity, operational efficiency and innovation across different sectors, their successful implementation is solely reliant on the workforce's readiness for AI integration and their AI literacy levels. This technical gap between AI capabilities and human competencies has created an enormous barrier for full integration of AI into the workforce and, consequently, the digital transformation that requires such systematic assessment and intervention [1]. One of the technical problems of measuring and developing AI literacy in the workforce is that it has become increasingly more complex and difficult because of the AI systems evolving serendipitously from basic rule-based algorithms to sophisticated machine learning and generative AI models, each of which has different levels of user understanding and competency. Organizations across the globe have also faced this technical challenge of quantifying the AI readiness among their own workforce, identifying the specific knowledge gaps, and implementing the targeted training interventions that can maximize AI acceptance and minimize AI resistance [1-3].

The research itself finds its approaches to assess AI literacy and technology have evolved significantly over the past few decades. This can be seen in how early models are more focused on general technology adoption through frameworks such as the Technology Acceptance Model (TAM), which has emphasized the perceived usefulness of AI and its ease of usage as the key determinants of AI adoption [4][5]. Today, these approaches have evolved into more comprehensive models like the Unified Theory of Acceptance and Use of Technology (UTAUT) which has expanded the technical assessment to include the performance expectancy, effort expectancy, and social influence, as well as the facilitating conditions [5]. The recent technical advances have also recognized the limitations of these general frameworks when being applied specifically to AI which in turn has introduced a unique challenge related to trust, transparency, and ethical concerns. A contemporary approach has recommended incorporating AI-specific constructs such as AI anxiety to mitigate the challenge [6, 7]. Technical measurement of these constructs has also progressed significantly from being a basic survey instrument to a sophisticated structural equation modeling instrument that can identify complex relationships between variables [4, 6, 8].

Despite the aforementioned advancements, the current technical approaches to assess AI literacy and readiness have been obstructed by three critical limitations. First, these approaches typically limit generalizability of the relationship between literacy and acceptance to emerging economic landscapes with different technological infrastructures and cultural environments. Secondly, these models do not properly capture and present several important social and contextual factors which possibly impact new technology adoption. Lastly, the existing framework has lacked specificity in its measures of the distinct workforce demographics or industry segments with varying levels of AI literacy. In order to address these gaps, this research has developed a modified UTAUT framework that: (1) extends empirical investi-

gation to Thailand's workforce, facilitating examination of AI literacy and AI acceptance interrelationship in emerging socio-economic paradigm by distinct cultural and infrastructural parameters; (2) incorporating a more extensive and robust framework by introducing social influence and facilitating conditions variable to capture multidimensional interactions among AI constructs; and (3) segmenting structural equation modeling (SEM) analysis across diverse workforce demographics and industry contexts to identify context-specific adoption patterns. Therefore, this study provided a vigorous framework for the quantification of AI literacy and its readiness that can be generalized across different organization and national contexts.

To validate the technical framework, the authors have applied the framework within the context of Thailand's workforce, as sampled across multiple sectors. Thailand, as a nation, presents a particularly strong case study due to its recent implementation of the national AI strategy (2022-2027) as well as its position as an emerging economy that has undergone significant digital transformation. The technical assessment conducted in this study directly supports Thailand's five key strategies for establishing a robust AI ecosystem by providing quantitative metrics on current workforce readiness levels and identifying specific technical interventions that need to be achieved to resonate the national target of cultivating over 30,000 AI talents within the next six years [9, 10].

As such, based on these identified gaps and the importance of understanding AI readiness in Thailand's emerging economy context, this study seeks to address the following research questions:

- What is the current level of AI proficiency and readiness across different industry sectors in Thailand's workforce?
- What are the key challenges and opportunities to enhance AI skills and readiness in Thailand?
- How can policymakers adopt the AI skill development initiative to be more effective in Thailand's economic landscape?

2. Literature Review

2.1 AI literacy / AI skill

AI literacy is a multidimensional set of technical competencies that has enabled individuals to comprehend, evaluate, and effectively utilize AI technologies. Some of the recent technical frameworks have transformed from fundamental technology literacy models to a more specialized AI competency metric that measures a specific dimension. These specific metrics can include technical understanding, practical application skills, and critical evaluation abilities. The technical measurement of AI literacy has also evolved significantly over the past few decades, as seen with the early approaches focusing on broad digital literacy while the more recent, contemporary frameworks have incorporated AI-specific constructs and measurement instruments [11].

From the HRD perspective, AI literacy measurement has transformed to encompass the four distinct dimensions including skills (technical proficiency), relevance (contextual application), values (ethical considerations), and knowledge (theoretical understanding). Each of these dimensions will require specific measurement approaches; while some skills assessment typically employ the performance-based metrics, the knowledge assessment should utilize the standardized testing in-

struments. These technical measurement frameworks have recently started to incorporate more sophisticated structural modeling approaches to quantify the relationships between these different dimensions [3].

The methodological approaches to measuring AI literacy have gone through significant technical upgrades. As the early instruments have relied primarily on self-reported metrics with limited validation, the contemporary approaches have employed multi-method assessment which extends to include the performance-based evaluation, contextual application scenarios, and the validated instruments with the established relatability coefficients. These recent technical advances in AI literacy assessment methodologies now integrate with structural equation modeling (SEM) to quantify literacy through validated pathways between UTAUT constructs (e.g., effort expectancy, social influence) and behavioral intention.

2.2 Anxiety with AI technology

The adoption of AI across multiple industries has introduced both optimistic and pessimistic impressions to the workforce. AI anxiety, defined as the fear or uneasiness associated with the usage of AI technologies, can undermine job performance and the individual's ability to comprehend and ultimately, adopt AI into their daily professional life. Researchers have indicated that AI anxiety manifests through several distinct dimensions that affect acceptance and adoption in many ways [8, 12].

As the measurement of the technology-specific, related anxiety has recently evolved from unidimensional scales to sophisticated structural models that can capture the bidirectional relationship between anxiety and other variables. The initial technical approaches have measured general computer anxiety while the newer, contemporary methods have employed more technology-specific, such as AI-specific, anxiety scales that can quantify particular dimensions that are relevant to AI technologies [6]. These methodological advancements now have paved the path towards the statistical modeling of AI anxiety as both a dependent and a mediating variable in structural equation models.

This research has, therefore, employed a statistical method to establish how AI anxiety has a quantifiable impact on AI acceptance. Technical studies have used a structural equation modelling approach to demonstrate the mediating role of AI anxiety between literacy and acceptance [6].

2.2.1 Learning dimension of AI anxiety

The learning dimension concerns how an individual acquires knowledge about AI technology while staying informed about its advancements and effectively interacting with it [6]. This dimension often appears as reluctance towards the understanding of the technical aspects of AI technology such as reading the AI system manuals or taking classes about AI development. In a study by Schiavo et al., items such as "*Learning to interact with an AI system makes me anxious*" and "*Being unable to keep up with the advances associated with AI systems makes me anxious*" have predicted the resistance of AI adoption [6]. Meanwhile, in educational contexts, this dimension of anxiety has shown a pessimistic influence towards both intrinsic and extrinsic learning motivation [11].

2.2.2 Sociotechnical blindness dimension

This dimension is reflected as concerns regarding misuse, malfunction, or potential for AI to achieve consciousness and surpass human control [6]. It relates back to the broader societal fears about AI technology rather than personal competency concerns. Schiavo et al. has found that this dimension has significant implications on the acceptance of AI technologies with certain items such as "*I am afraid that AI systems may be misused*" and "*I am afraid that an AI system may get out of control and malfunction*" demonstrating a strong predictive implication for resistance against AI adoption [6]. Moreover, these concerns are often aggravated in high-stakes environments such as the healthcare or government sectors where AI system failures could cause grave consequences [12].

2.2.3 AI configuration anxiety

The AI configuration dimension seeks to focus on anxiety relations to humanoid features of AI technology [6]. This dimension captures how some individuals experience psychological discomfort during interaction with AI systems that mimic certain human characteristics. A study conducted by Schiavo et al. found that while this dimension is present in many individuals, it does not significantly predict the general AI acceptance [6].

2.2.4 Job replacement anxiety

The job replacement dimension is the apprehensions from individuals about the potential jobs displacement as a direct result from AI technology, either from dependency on artificial systems, loss of skills, or automation of human tasks [6]. Several studies have highlighted the existential anxiety related to AI, with one study in Saudi Arabia taking note that over 96% of respondents have expressed concern about their existential fears in regard to AI [13]. These anxieties are also particularly pronounced amongst the older generation of individuals and individuals in precarious employment situations [7].

2.2.5 Relationships between AI anxiety dimensions and AI acceptance

Research has shown that not all dimensions of AI anxiety are equally as impactful towards AI acceptance. Schiavo et al., for example, has mentioned that only the Learning and Sociotechnical Blindness dimensions can significantly predict the lower acceptance and intentions of AI systems usage [6]. Moreover, their study has also revealed that AI anxiety has served as a complementary partial mediator between AI literacy and acceptance, further suggesting that the increased literacy can reduce anxiety which in turn enhances acceptance [6].

2.3 AI acceptance / AI Adoption: theoretical framework

The acceptance of AI is crucial. The acceptance, along with the adoption of AI technologies is fundamentally tied to the workforce's readiness to the technology itself. This requires a comprehensive framework for assessment. The Unified Theory of Acceptance and Use of Technology (UTAUT), developed by Venkatesh et al., has provided a more comprehensive framework that is particularly well equipped for examining the roles of AI literacy and its connection with the workforce readiness for several reasons [5].

2.3.1 Relevance of UTAUT to AI literacy and readiness assessment

UTAUT have synthesized over eight technology acceptance frameworks and the-

ories. This includes the Technology Acceptance Model (TAM) and the Theory of Planned Behavior, making it particularly comprehensive for assessing the multidimensional nature of contemporary technology's readiness [5]. The framework's four core constructs which includes Performance Expectancy (PE), Effort Expectancy (EE), Social Influence (SI), and Facilitating Conditions (FC), have paved the way towards key dimensions of AI literacy and workforce readiness as follows:

- Performance Expectancy (PE) is a measurement of the degree to which individuals believe a technology will further enhance their job performance which can apply in various contexts, for instance, AI technologies. This construct has proven critical to assess AI literacy because it can capture how well the workforce can understand AI's potential benefits. [4, 5].

- Effort Expectancy (EE) is a measurement of the ease associated with the use of the given technology or system [5]. This construct can be linked to the practical skills component of AI literacy at hand, reflecting the capabilities of an individual to apply according to their AI knowledge.

- Social Influence (SI) is a measurement of what degree of necessity does the individual perceive for them to consider it essential for others to also believe they should acquire the new system [5]. Within the context of AI adoption, the organizational and peer attitudes can play an important role. This construct is proven to be essential in measuring the readiness from both the individual and organizational levels as it recognizes that AI adoption is a social process that can be influenced by workplace culture [2].

- Facilitating Conditions (FC) is a measurement of how an individual believes that an organizational and technological infrastructure is able to support their usage of the system, in this context, the AI technology. This construct is particularly important for assessing the workforce's readiness as it captures the environmental factors necessary for a successful AI implementation [2, 5].

In Schiavo et al.'s research, AI literacy has been positioned as an antecedent variable; however, the model being employed was TAM instead of the UTAUT. Their findings indicated that while literacy fosters positive acceptance attitudes, anxiety has served as a complementary partial mediator between literacy and acceptance. In their Structural Equation Modelling, it was exhibited that AI literacy positively influences the perceived ease of use and the perceived usefulness, thereby contributing to the overall AI acceptance. On the other hand, de Andrés-Sánchez and Gené-Albesa utilized a UTAUT-based model to explain chatbot acceptance amongst insurance policyholders, yielding the findings that social influence was the most influential variable, followed by effort expectancy and trust [4, 6].

2.3.2 Modifications to UTAUT for AI literacy and readiness assessment

While the standard UTAUT provides a solid foundation, the AI technologies have presented a unique challenge requiring specific modifications to the framework. This

research has extended UTAUT by incorporating the following:

- AI Literacy as an Antecedent Variable: Drawing on Schiavo et al.'s findings, AI literacy may be positioned as a direct antecedent to Performance Expectancy and Effort Expectancy which hypothesize that greater understanding of AI capabilities can enhance the perceived usefulness and ease of use [4, 6].
- AI Anxiety as a Mediating Variable: The research has incorporated AI anxiety as a mediator between AI literacy and acceptance, as based on the evidence that anxiety can influence how knowledge can be translated into technological acceptance [6, 8, 14].
- Privacy and Security (PS) as an Additional Construct: Given that AI's capabilities of handling data is unique, the research has added PS as a direct determinant of acceptance, reflecting the concerns that are specific to AI technologies [14].

This modified UTAUT framework, therefore, has enabled a more nuanced understanding and assessment of AI literacy and readiness through the process of capturing the cognitive (literacy), affective (anxiety), and environmental (facilitating conditions) dimensions that together can determine whether individuals or organizations are ready to effectively adopt AI technologies.

3. Study

While Thailand undergoes a significant digital transformation, AI literacy and workforce readiness are deemed critical for the successful adoption of AI technologies. This research aims to investigate the scope of AI literacy, anxiety, and acceptance in the Thai workforce with the following research questions:

- What is the current level of AI proficiency & readiness and how does the workforce perceive AI technology across industries?
- What are the key challenges and opportunities to enhance AI skills and readiness in Thailand?
- How can policymakers adopt the AI skill development initiative to increase its effectiveness in Thailand's economic landscape?

In this study, the "Thai workforce" refers to individuals currently employed in Thailand, either full-time or part-time, across all major sectors and industries who are Thai citizens or permanent residents. The online survey was administered in the Thai language and distributed via professional and industry networks, as well as social media platforms, to maximize reach among target working adults. The survey introduction clearly stated that only members of the Thai workforce should participate. While explicit screening questions were not included, demographic data were collected, and responses from individuals who were not employed or have never had working experience were excluded from the analysis.

3.1 Research hypotheses

3.1.1 PE influences AI acceptance

In accordance with the UTAUT framework, Performance Expectancy (PE), which refers to the belief that using AI will help improve job performance, is one of the strongest predictors of AI acceptance. It is,

therefore, logical to postulate that if individuals perceive AI technologies to be useful in enhancing their job performance, they are more likely to accept and adopt these technologies [5, 6].

3.1.2 EE influences AI acceptance

Effort Expectancy (EE) is the degree of ease related with the use of new systems or technology. In this hypothesis, the researcher suggests that the individuals who perceive AI tools as being easy to use are more likely to accept and adopt these technologies [3, 4].

3.1.3 SI influences AI acceptance

Social Influence (SI) refers to the extent to which individuals perceive that important others (such as managers, peers, or society) believe they should use AI technologies. Greater social influences from, for example, colleagues or societal expectations, will lead to greater acceptance of AI tools [2, 5].

3.1.4 FC influences AI acceptance

Facilitating Conditions (FC) refers to the belief that the necessary organizational and technical infrastructure is in place to support the use of AI technologies. This asserts that when workers believe they have the resources, training, and sufficient support to use AI, they are more likely to accept it as a part of their workflow [2, 5].

3.1.5 EE influences PE

This hypothesis speculates that Effort Expectancy (EE) directly influences Performance Expectancy (PE). When individuals perceive the ease of new systems or technology, they are more likely to believe that it will improve their job performance [5, 6].

3.1.6 PE influences intention to use AI

Performance Expectancy (PE) can significantly influence an individual's intention to use AI technologies. If workers view AI as a beneficial and relevant aid to their tasks, they are more inclined to use it [3, 4].

3.1.7 AI acceptance influences intention to use AI

Overall, AI acceptance can directly influence an individual's intention to use AI technologies. Higher levels of acceptance, driven by positive experiences and perceptions, are likely to lead to a greater intention to use AI in the future [5, 10].

3.1.8 PS influences AI acceptance

This hypothesis postulates Privacy and Security (PS), which refers to the users' trust in their data's security and privacy. Privacy and security can significantly impact AI acceptance because if an individual feels confident that their data is protected and secure, they will be more likely to adopt and accept AI technologies. Many studies show that trust in security factors can be a critical factor in user adoption, particularly in settings where security perceptions are strongly in relation to adoption rates such as mobile payment systems [4, 6, 14].

3.1.9 AI literacy influences AI acceptance

AI literacy can have positive impact upon AI acceptance. This means that higher AI literacy makes individuals more comfortable and knowledgeable in utilization of AI technologies which in turn fosters a more positive overall attitude and hospitality towards AI utilization by augmenting users' comprehension and perceived usefulness of AI. The research has also high-

lighted that generational differences, and individual knowledge and skills can further impact trust and acceptance, where those with better proficiency in information technology tend to trust and adopt AI [15].

3.1.10 AI literacy influences AI anxiety

An increased AI literacy can help reduce AI-related anxiety. Increase in familiarity with AI concepts and skillset can attenuate AI related anxiety through the process of enhancing user confidence and lower the feeling of uncertainty surrounding AI which could later be contributed to anxiety. In many cases, such as pediatric nurses, the correlation between AI literacy and anxiety is notably reductive. This means that AI literacy could reduce AI-anxiety and increase competency in the workforce [6, 8, 12, 16].

3.1.11 AI anxiety influences AI acceptance

AI anxiety can have negative impacts on AI acceptance. When many individuals feel anxious or fearful towards the concept of AI, they are, therefore, less likely to accept or utilize it. For example, in many supply chain firms, AI-induced anxieties have been discovered to be impeding adoptions of mobile payment services. It can be suggested, therefore, that training programs can reduce such anxieties and foster a more optimistic perception of AI. Since heightened anxiety can lead to hesitation or even resistance to adopt and integrate AI technologies altogether it can be hypothesized that AI anxiety plays a pessimistic role in AI acceptance [6, 14].

3.1.12 AI literacy influences Performance Expectancy (PE) & Effort Expectancy (EE)

AI literacy can have a positive impact upon acknowledgement in AI technology. Once individuals are well-equipped with AI knowledge and skill, they are able to acknowledge and be aware of advantages in their personal and professional matters. Thus, it can be hypothesized that AI Literacy positively relates with Performance Expectancy (PE) & Effort Expectancy (EE) accordingly [6].

3.1.13 AI anxiety impacts the relation between AI literacy and AI acceptance (Mediator)

AI anxiety can act as a mediator as well in the relationships between AI literacy and AI acceptance. In this trend, it is suggested that as AI literacy increases, reducing AI anxiety levels can prove critical in improving acceptance of AI technologies. Lower anxiety levels mean individuals will be more hospitable and receptive to AI tools, further expanding the positive effects of AI literacy on AI acceptance [6, 8].

3.2 Methodology and application of UTAUT for workforce readiness

This research has employed a quantitative methodology by using an online questionnaire to assess AI literacy, anxiety, and acceptance among the Thai workforce. The design of this questionnaire has been designed to be based on the UTAUT framework, modified to link between existing digital literacy skills and the advanced AI competencies that will be needed for Thailand's future workforce.

This research's methodological approach has applied UTAUT as a diagnostic tool and prescriptive tool for workforce development in three following paths:

- Skills Gap Identification: The modified UTAUT framework has enabled precise measurement of the distance between the current digital workforce competencies and the required AI skills by correlating performance expectancy and the effort expectancy with the specific AI literacy dimensions.

- Transition Pathway Mapping: Through the examination of the relationship between facilitating conditions, AI anxiety, and acceptance, this methodology identifies the organization, psychological and educational barriers that can impede the transition from digital literacy to AI readiness. This can allow policymakers to design comprehensive intervention strategies that can build upon the existing digital foundations rather than implementing the disconnected AI training programs.

- Targeted Intervention Design: In sampling across different industries, a more in-depth, industry-specific analysis of how the digital-to-AI skills gap can manifest upon different sectors. This approach, therefore, has provided actionable intelligence for Thailand's national AI strategy by revealing which industries have the greatest readiness gaps and which industries require AI competencies urgently.

The data collected through this methodological approach will be further analysed using SEM to further identify the complex relationships among workforce's AI literacy and readiness indicators. This analytical framework specifically examines how variables like AI anxiety mediate the relationship between existing skills and future readiness, providing a better understanding of the psychological dimensions of workforce transformation.

Through the application of UTAUT in this comprehensive manner, the methodology can provide a systematic approach to the understanding and addressing of the skills evolution necessary to support Thailand's vision to transition itself as an AI-driven economy, directly supporting the national target of cultivating of over 30,000 AI talents within the next six years as outlined in Thailand's national AI strategy.

3.2.1 Operationalizing UTAUT for AI literacy and readiness assessment

The modified UTAUT framework operated through a systematic approach that allows for a comprehensive assessment of AI literacy and readiness as the following:

- 1. Multi-dimensional Construct Measurement: The questionnaire has captured each of the UTAUT constructs through a validated multi-item scale, further allowing for a more reliable assessment of complex constructs. Performance Expectancy (PE) is measured through items that assess perceived productivity benefits of AI; Effort Expectancy or EE, through the items on perceived ease of learning and usage; Social Influence or SI through items on organizational and peer influence; and Facilitating Conditions or FC through items on the available resources and support.

- Integration of AI Literacy Assessment: AI literacy can be assessed using a modified version of the AI Literacy Scale or AILS as developed by Schiavo et al. which measures four

key dimensions: understanding of AI concepts, ability to use AI tools, capacity to identify AI applications, and awareness of ethical considerations. This provides a more comprehensive measurement of cognitive readiness of AI adoption [6].

- Anxiety Measurement as Mediating Factor: The AI Anxiety Scale (AIAS), as developed by Wang, is incorporated to measure how fear about AI might act as a mediator to the relationship between literacy and acceptance [17]. This can capture the effective dimensions of readiness that traditional UTAUT applications often overlook.

- Cross-sectoral Sampling Approach: This sampling technique is designed to collect data from diverse industries including IT, consumer products, industrial, finance, energy, and agriculture. This strategy enables the analysis into how AI literacy and readiness can vary by sector. This approach recognizes that readiness factors may manifest differently across different workforce contexts.

3.2.2 Analytical framework for assessing AI readiness

The data collected through the modified UTAUT framework has been analysed using SEM which has enabled the following:

- 1. Path Analysis of Direct and Indirect Effects: SEM has enabled the quantification of both direct (e.g., how AI literacy directly affects acceptance) and indirect effects (e.g., how AI anxiety mediates the relationship between literacy and acceptance).

- Validation of the Measurement Model: Confirmatory factor analysis is used to ensure and validate the measurement properties of each construct to guarantee that they can reliably capture the intended dimensions of AI literacy and readiness.

- Testing of Mediation Hypotheses: The analytical approach has enabled the testing of specific mediation hypotheses; for instance, whether anxiety mediates the relationship between literacy and acceptance; further providing insight into the psychological mechanisms of AI readiness.

- Industry-Specific Analysis: The analytical framework includes comparisons from different industries through multi-group analysis (MGA), enabling the identification of sector-specific barriers to AI literacy and readiness.

This methodological approach enables a comprehensive assessment of AI literacy and readiness that goes beyond simple technological acceptance to capture the cognitive, affective and contextual factors that, altogether, determine whether Thailand's workforce is prepared for AI implementation. Towards the extension of the UTAUT framework with the AI-specific constructs and applying the sophisticated analytical techniques, this research has provided a comprehensive assessment tool for measuring the workforce's readiness for AI technologies.

3.3 Measures

This research was designed to promptly test the proposed hypotheses through specifically made questionnaires wherein it was designed to gather data on AI literacy, anxiety, and acceptance within the context of the Thai workforce. The questionnaires target specific variables of interest from:

- Demographic Information: Collecting background information on respondents, including occupation, industry, age, gender, education level, and frequency of internet use. These demographic factors were considered essential for understanding variations in AI literacy, anxiety, and acceptance across different workforce segments.
- AI Acceptance: To measure AI acceptance, the following items were adapted from the UTAUT. Key constructs included:
  - Performance Expectancy (PE): The belief that using AI will enhance job performance.
  - Effort Expectancy (EE): The degree to which respondents felt AI tools would be easy to use in their tasks.
  - Social Influence (SI): This assessed how much respondents felt encouraged by colleagues or societal norms to use AI.
  - Facilitating Conditions (FC): The availability of organizational support and resources to facilitate AI use.
- AI Literacy: AI literacy was assessed by using the AI Literacy Scale (AILS) developed by Schiavo et al., which gauges individuals' self-reported understanding and ability to use AI technologies effectively [6].
- AI Anxiety: AI-related anxiety was measured using the AI Anxiety Scale (AIAS) developed by Wang [17].
- Privacy and Security (PS) was measured users' trust in their data's security and privacy using the questionnaire items developed by Allahham et al. [14].
- Intention to Use AI: This section evaluated respondents' intention to adopt and use AI technologies in the future. This measure was later transformed into a numerical scale for analysis, allowing for a structured comparison of usage intentions across respondent groups.

4. Analysis

Through the data collected by online survey questionnaires with the target of 318 respondents from various Thailand's workforce, this research aimed to assess AI literacy, AI anxiety, and AI acceptance among the workforces. Through utilization the UTAUT framework as well as employing SEM, the researcher was able to test the proposed hypotheses and examine the relationships between key factors. In this study, using the data-driven approach helps in evaluation of the preparedness of the Thai workforce in adopting AI technologies in alignment with Thailand's national AI strategy (2022-2027). The findings from this study can provide critical insights that enhance AI integration into Thailand's broader digital transformation efforts.

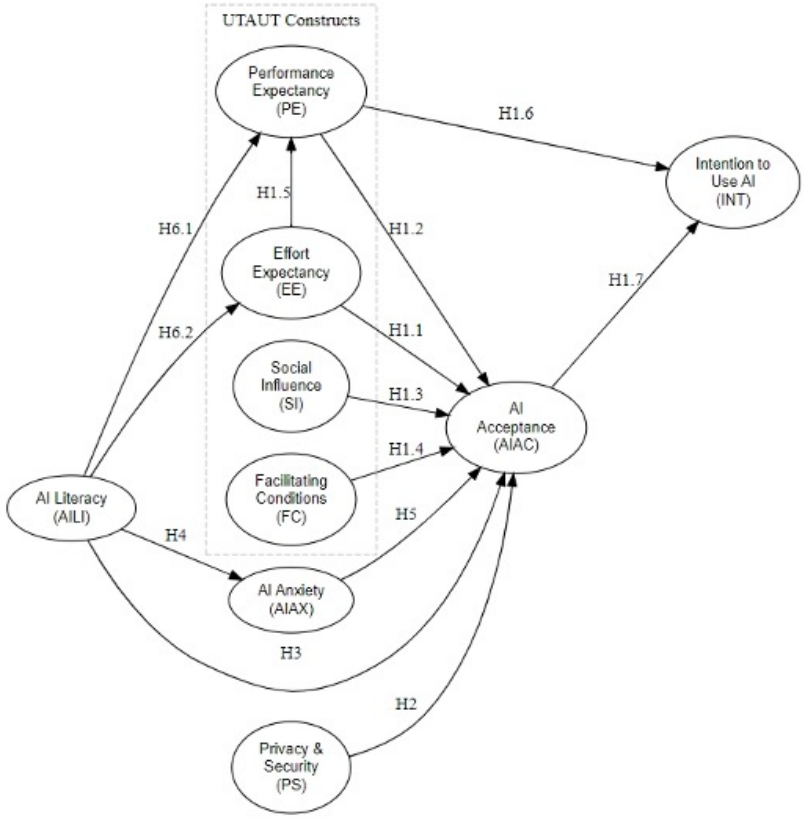

Fig. 1. Conceptual model.

4.1 Measurement model assessment

As the measurement model was evaluated by using several key criteria to order to ensure reliability and validity of the constructs, this analysis focuses on internal consistency reliability, convergent validity and discriminant validity.

4.1.1 Internal consistency reliability

The assessment revealed strong internal consistency across every construct. Composite Reliability (CR) values outpace the recommended threshold of 0.7, ranging from 0.818 to 0.986 which indicates a sturdy construct reliability. Similarly, Cronbach's Alpha values also demonstrated high internal consistency which consequently supports the reliability of the measurement scales.

4.1.2 Convergent validity

The Average Variance Extracted (AVE) values were also examined in order to appraise convergent validity. Every construct demonstrated AVE values above 0.5 threshold, as Table 2 below. These values propose strong convergent validity which can be suggested that these items effectively were measured their intended constructs and means.

Table 1. Demographic of sample.

Characteristic	Attribute	Frequency	Percentage (%)
Gender	Female	142	55.35
	Male	176	44.65
Age	Below 25	13	4.09
	25-34	123	38.68
	35-44	98	30.82
	45-54	66	20.75
	Above 55	18	5.66
Nationality	Thai	318	100
Education	Bachelor's degree	158	49.69
	Master's degree	139	43.71
	Doctoral degree	21	6.6
Occupation	Staff/ Employee	145	45.60
	Supervisor/ Team Leader	141	44.34
	Manager/ Department Head	31	9.75
	Executive	1	0.31
Experience	0-3	7	2.20
	3-5	25	7.86
	5-10	124	38.99
	10-15	118	37.11
	15+ years	44	13.84
Industry	Information Technology	47	14.78
	Consumer Products	39	12.26
	Services	26	8.18
	Industrial	34	10.69
	Medical and Health	43	13.52
	Finance	13	4.09
	Consulting	2	0.63
	Energy and Utilities	63	19.81
	Agricultural and Food Industry	41	12.89
	Other	10	3.14

Table 2. Reliability and Convergent Validity for multi-item constructs.

Constructs	Items	Cronbach's	rhoC	AVE
AI Literacy	11 items	0.985	0.986	0.868
AI Acceptance	2 items	0.736	0.883	0.791
AI Anxiety	9 items	0.974	0.978	0.830
PE	1 item	1.000	1.000	1.000
EE	1 item	1.000	1.000	1.000
FC	3 items	0.767	0.865	0.682
SI	4 items	0.783	0.859	0.607
PS	4 items	0.705	0.818	0.532
INT	2 items	0.749	0.884	0.792

Note: rhoC = composite reliability; AVE = average variance extracted.

4.2 Structural model

A PLS-SEM analysis was conducted by using SmartPLS 3.0. Through the structural model analysis, there are several significant relationships that have been revealed as follows:

- AI Literacy demonstrated the most potent effect on AI Anxiety ($\beta = -0.892, p < 0.001$), showing that there is a powerful negative relationship.
- There is a positive influence between Performance Expectancy and AI Acceptance ($\beta = 0.370, p < 0.001$).
- AI Acceptance has a notable influence on Intention to Use ($\beta = 0.615, p < 0.001$).
- The positive influence between AI Literacy and Performance Expectancy (PE) & Effort Expectancy (EE) ($\beta = 0.262, p < 0.001$), ($\beta = 0.327, p < 0.001$) respectively.

4.3 Mediating effect

A mediating relationship has been revealed between these values:

AI Anxiety mediates the relationship between AI Literacy and AI Acceptance ($beta = -0.250, p = 0.049$).

4.3.1 Hypothesis testing results

Through thorough analysis, eight out of twelve hypotheses have been supported:

- H1.1 PE influences AI Acceptance
- H1.2 EE influences AI Acceptance
- H1.4 FC influences AI Acceptance
- H1.5 PE influences PU
- H1.7 AI Acceptance influences Intention to Use AI
- H4 AI Literacy influences AI Anxiety

- H5 AI Anxiety influences AI Acceptance
- H6.1 AI Literacy influences Performance Expectancy (PE)
- H6.2 AI Literacy influences Effort Expectancy (EE)
- H7 AI Anxiety impacts the relation between AI Literacy and AI Acceptance (Mediator)

The following four hypotheses, therefore, were not supported:

- H1.3 SI influences AI Acceptance
- H1.6 PE influences Intention to Use AI
- H2 PS influences AI Acceptance
- H3 AI Literacy influences AI Acceptance.

4.4 Current AI proficiency and readiness across Thailand's industries

Through our analysis, it has been revealed that AI readiness is varied across Thailand's diverse industries, with the top three sectors by AI literacy being agriculture & food (M=3.80), consumer products (M=3.48) and information technology (M=3.35), respectively. However, although these findings warrant careful interpretation when considering the workforce's respective characteristics, the agriculture & food and consumer products sector's higher AI literacy mean scores. This may be the result of the influence from the respondent demographics, with a younger participant pool and relatively large sample representation (42% of total respondents).

Meanwhile, the multi-group analysis (MGA) has provided additional insight into this query: while the Information Technology sector has shown moderate AI literacy mean scores (M=3.35), it demonstrates a significantly stronger relationship between AI Acceptance and Intention to Use ($\beta = 0.737, p < 0.05$) compared to Agriculture & Food sector ($\beta = 0.373$) and Consumer Products sector ($\beta = 0.679$) respectively. This suggests that IT professionals are more effective in translating IT technology acceptance into practical adoption which is a crucial capacity for digital transformation initiatives across Thailand's economy [1, 2].

5. Discussion

5.1 UTAUT as a bridge between digital literacy and AI readiness

The findings from this study, through the modified UTAUT model, provide a practical framework for bridging the gap between Thailand's existing digital literacy landscape and the AI-specific competencies that are required for future economic development. This bridges the function manifested in several ways of the following:

- Diagnostic Function: The UTAUT construct has served as a diagnostic tool that revealed which aspects of the existing digital literacy translate effectively into AI contexts and which ones require supplemental development. This research has found that effort expectancy (perceived ease of use) particularly influences AI acceptance ($\beta = 0.370, p < 0.001$). This suggests that workers with strong general digital skills may still experience barriers to AI adoption if AI-specific interfaces and workflows are perceived as complex and difficult. This diagnostic insight helps in training developers to iden-

Table 3. Correlation result.

Constructs	AI Literacy	AI Anxiety	AI Acceptance	PE	EE	FC	SI	PS	INT
AI Literacy	1	.	.	.	.	.	.	.	.
AI Anxiety	-0.892	1	.	.	.	.	.	.	.
AI Acceptance	0.271	-0.276	1	.	.	.	.	.	.
PE	0.358	-0.261	0.316	1	.	.	.	.	.
EE	0.327	-0.255	0.474	0.379	1	.	.	.	.
FC	0.442	-0.411	0.314	0.293	0.285	1	.	.	.
SI	0.399	-0.385	0.325	0.36	0.365	0.548	1	.	.
PS	0.204	-0.283	0.195	0.167	0.262	0.2	0.4	1	.
INT	0.226	-0.274	0.61	0.177	0.294	0.255	0.336	0.207	1

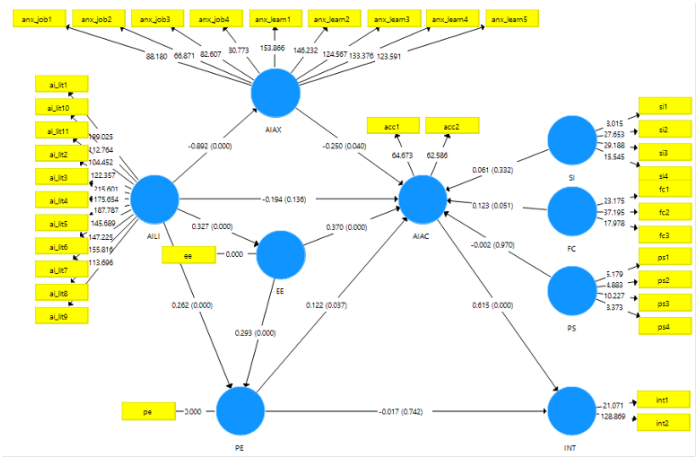

Fig. 2. Result of test of structural model.

tify which aspects of the digital literacy provides the transferable skills and foundation which requires AI-specific enhancement.

- Developmental Pathway: The relationship between AI literacy and performance expectancy ($\beta = 0.262, p < 0.001$) demonstrates how foundational knowledge creates perceived value, which in turn drives adoption. This has paved the way for a sequential model for workforce development: to build basic AI literacy skills first, which can enhance the perceived usefulness, ultimately driving the acceptance and advanced skill development. By identifying this pathway, the UTAUT analysis has provided a roadmap for progressive skills development that can be built upon existing digital competencies rather than treating AI skills as an entirely separate circumstance.

- Anxiety Mediation: Most importantly, the research has discovered that AI literacy significantly reduces AI anxiety ($\beta = -0.892, p < 0.001$), which in turn affects acceptance, revealing a critical psychological bridge in the skills transition. Digital literacy alone may not address the anxiety that impedes AI adoption; specific AI literacy interventions are needed to overcome psychological barriers. This insight from

Table 4. Structural model results.

Hypothesis	Path	Path estimation (β)	t-stats
H1.1	PE influences AI Acceptance	0.122*	2.141
H1.2	EE influences AI Acceptance	0.370**	6.348
H1.3	SI influences AI Acceptance	0.061	0.956
H1.4	FC influences AI Acceptance	0.123*	1.98
H1.5	EE influences PE	0.293**	4.351
H1.6	PE influences Intention to Use AI	-0.017	0.337
H1.7	AI Acceptance influences Intention to Use AI	0.615**	15.346
H2	PS influences AI Acceptance	-0.002	0.037
H3	AI Literacy influences AI Acceptance	-0.194	1.48
H4	AI Literacy influences AI Anxiety	-0.892**	47.891
H5	AI Anxiety influences AI Acceptance	-0.250*	2.026
H6.1	AI Literacy influences Performance Expectancy (PE)	0.262**	5.561
H6.2	AI Literacy influences Effort Expectancy (EE)	0.327**	7.355

Note: *$p < .05$; **$p < .01$.

the UTAUT analysis suggests that effective workforce development requires both technical and psychological components to successfully bridge this skill gap.

Table 5. Mediation results.

Hypothesis	Path	Direct effect	Indirect effect	Mediation
H7	AI Anxiety impacts the relation between AI Literacy and AI Accept-ance (mediator)	-0.250** (t=1.976)	2.057** (t=2.057)	Competi-tive Partial Mediation

- Cross-sectoral Application: The industry-stratified findings have demonstrated to what extent the digital-to-AI skills gap manifests differently across different sectors, with the implications for targeted development strategies. For instance, the data has suggested the variation in AI anxiety levels across different industries, further suggesting that some sectors may requires more extensive psychological preparation alongside technical training. This cross-sectoral insight enables a more precise allocation of training resources based on industry-specific bridging needs.

Through application of UTAUT, this research has provided not just theoretical understanding but also practical guidelines for policymakers and organizations seeking transformation of Thailand's digitally literate workforce into an AI-ready one. This framework has allowed for a more precise identification of skills gaps, development of sequential training interventions, and industry-specific adaptation of workforce development approaches.

5.2 Practical implications for organizations and policymakers

The research's findings have offered several practical implications for organizations implementing AI technologies and policymakers developing AI literacy initiatives in Thailand.

5.2.1 For organizations

- Targeted Training Programs: Organizations should develop targeted AI literacy programs that address both technical knowledge and psychological barriers. According to the findings, AI literacy has been proved to reduce anxiety ($\beta = -0.892, p < 0.001$), which suggests that comprehensive training should include not only technical operation but also explanations of how AI systems make decisions and their limitations, directly addressing the learning dimension of anxiety.

- User Interface Design: The significant impact of Effort Expectancy on AI Acceptance ($\beta = 0.370, p < 0.001$) indicates that organizations should prioritize intuitive, user-friendly interfaces for AI tools. Implementation strategies should emphasize and encourage gradual integration of AI features that can maximize perceived ease of use, especially for workforce segments with lower technical self-efficacy.

- Anxiety Reduction Strategies: Organizations should implement specific interventions to address Socio-Technical Blindness anxiety, which has been identified through this research as a significant barrier to acceptance. These could include transparent communication about AI safeguards, human oversight mechanisms, and ethical guidelines governing AI use within the organization.

- Performance Metrics Communication: Given the strong influence of Performance Expectancy on AI Acceptance, organizations should clearly communicate how AI technologies improve job performance using concrete metrics and examples relevant to specific roles and departments.

5.2.2 For policymakers

- National AI Literacy Program: Thailand's national AI strategy should further extend to incorporate a comprehensive AI literacy program targeting different workforce segments. Through the research's industry-stratified approach, it could be suggested that policymakers should develop sector-specific literacy initiatives rather than one-size-fits-all approaches.

- Addressing AI Anxiety: Policymakers should also develop public campaigns that specifically address the learning and job replacement dimensions of AI anxiety. These campaigns should explain AI concepts in accessible terms and address concerns about control, misuse, and malfunctioning of AI systems.

- Educational Curriculum Reform: The strong relationship between AI literacy and acceptance indicates that policymakers should integrate AI education into formal educational curricula at multiple levels, from secondary education through

higher education and professional development programs.

- Cross-Sector Collaboration Platforms: Through the research's analysis, it could be suggested that policymakers should establish platforms for cross-sector knowledge sharing, where organizations with higher AI readiness can share best practices with sectors showing lower readiness levels.

5.3 Challenges and opportunities for AI skills enhancement in Thailand

The empirical findings from the research have revealed a complex landscape of AI readiness across Thailand's workforce that can present both significant challenges and promising opportunities. As Thailand is seeking the path forward in its pursuit of the national AI strategy and broader digital transformation goals under Thailand 4.0, understanding these specific barriers and enablers is a necessity for the development of effective interventions. This section seeks to analyse the key challenges that could hinder Thailand's AI adoption journey while also identifying strategic opportunities that policymakers and industry leaders can leverage to accelerate workforce readiness.

5.3.1 Key challenges

- 1. Psychological Barriers: The pronounced negative correlation between AI Anxiety and AI Acceptance ($\beta = -0.250, p = 0.049$) underscores that psychological readiness constitutes a structural barrier to AI integration. This is particularly evident in the Service sector, where anxiety levels are notably high (M=3.51), indicating an urgent need for targeted interventions to alleviate workforce concerns.

- Generational Divide: The significance of the negative correlations between AI Anxiety and AI Acceptance ($\beta = -0.250, p = 0.049$) suggests that anxiety represents a critical psychological barrier to AI adoption, with younger age groups reporting lower anxiety (Below 25: M=2.07) with anxiety increasing as the age group increases, with the peak amongst those whose aged 55 and above (M=3.19). This trend has shown that anxiety can serve as a significant psychological barrier to AI adoption, especially among older employees. In addressing these concerns through tailored training, a more inclusive environment for AI adoption across different age groups can be fostered.

- IT Sector Readiness Gap: The moderate AI literacy scores observed within the IT sector (M=3.35) raise alarms about the foundational digital capabilities needed to lead AI transformation, posing a risk to the overall advancement of AI initiatives in Thailand.

5.3.2 Key opportunities

- 1. High Performance Expectancy: Despite variations in AI literacy levels across sectors, a strong performance expectancy (M=4.28) indicates a widespread recognition of AI's potential benefits. This awareness can serve as a motivating factor for learning initiatives aimed at upskilling the Thai's workforce across industry.

- Education-Based Anxiety Reduction: The robust negative relationship between AI Literacy and AI Anxiety ($\beta = -0.892, p < 0.000$) suggests that educational interventions can simultaneously address two barriers: enhancing literacy and reducing anxiety. This dual approach can foster a more conducive and effective environment for AI adoption.

- Cross-Generational Knowledge Transfer: The inverse relationship between age and AI literacy, combined with Thailand's cultural respect for experience, presents an opportunity for younger workers to share technical skills while learning from older colleagues within the organization.

- Strategic Facilitating Conditions Investment: The Facilitating Conditions has significantly influenced AI Acceptance ($\beta = 0.123, p < 0.05$). This highlights the importance of organizational support, technical infrastructure, and resources. In alignment with Thailand's National AI Strategy infrastructure development goals and suggests that even modest improvements in supportive conditions can yield measurable gains in acceptance. Thus, government infrastructure investment is critical to achieving shared goals across the public and private sectors.

5.4 Understanding non-significant relationships

While ten out of fourteen hypotheses were confirmed, four of the relationships did not reach statistical significance. These non-significant relationships are as of follows:

5.4.1 H1.3 Social influence (SI) on AI acceptance ($\beta = 0.061, p = 0.323$)

The lack of significance in terms of influence of social factors on AI acceptance contrasts with the traditional UTAUT application where social influence typically plays a substantial role in technology adoption [5]. This divergence could be the result of how AI technologies often involve personal productivity tools that individuals evaluate based on an individual's benefits rather than social validation. Another plausible explanation is that Thailand's cultural context may be influential in this divergence. Findings from Schiavo et al. suggested that in contexts where technology adoption is still emerging, individual assessments of utility often precede social normative influences [6]. This finding aligns with the developmental stage of AI adoption in Thailand, where the workforce may be in an early evaluation stage as driven by performance expectations rather than social conformity.

5.4.2 H1.6 Performance expectancy (PE) on intention to use AI ($\beta = -0.017, p = 0.33$)

The findings exhibited an unexpected non-significant relationship between PE and the intention to use contrasts with the core UTAUT predictions. According to the findings, Performance Expectancy significantly influences AI Acceptance ($\beta = 0.370, p < 0.001$), which in turn strongly influences Intention to Use ($\beta = 0.615, p < 0.001$). This suggests that the effect of performance expectations on behavioural intentions is fully channelled through the attitude component (acceptance), rather than directly affecting the intention itself.

5.4.3 Privacy and security (PS) on AI acceptance ($\beta = -0.002, p = 0.037$)

The non-significant relationship between Privacy and Security concerns and AI Acceptance was unexpected, particularly given that previous research has established the importance of these factors in technology adoption contexts [14]. This could be the result of AI literacy's influence over other factors such as privacy concerns. The strong relationship between AI literacy and the primary UTAUT constructs of Performance Expectancy ($\beta = 0.262, p < 0.001$) and Effort Expectancy ($\beta = 0.327, p < 0.001$) suggests that when individuals understand AI technology, performance and effort considerations may take precedence over privacy concerns. Meanwhile, Privacy and Security concerns may also be manifested differently across different AI applications. The study's generalized approach to measuring AI acceptance across different use cases may dilute application-specific privacy concerns.

5.4.4 AI literacy on AI acceptance ($\beta = -0.194, p = 1.492$)

The non-significant direct effect of AI Literacy on AI Acceptance appears counterintuitive but could be explained by examining the complete model structure. The findings have shown that AI Literacy has significant indirect effects on acceptance through multiple pathways: reducing AI Anxiety ($\beta = -0.892, p < 0.001$), which in turn affects acceptance ($\beta = -0.250, p = 0.049$), and influencing both Performance Expectancy ($\beta = 0.262, p < 0.001$) and Effort Expectancy ($\beta = 0.327, p < 0.001$).

These non-significant relationships may be reflected in the multidimensional nature of AI literacy. Technical understanding of AI may not directly translate to acceptance without first influencing perceptions of utility and reduction of anxiety. This exhibits the complex pathways through which AI literacy can influence AI acceptance, highlighting the importance of considering both direct and indirect effects when examining AI readiness factors.

6. Conclusion

In conclusion, this study has revealed that there is a distinction in the landscape of AI readiness across Thailand's workforce. This challenges conventional knowledge and assumptions about technological adoption patterns. These research findings have demonstrated that AI literacy (mean score) does not follow a predictable sectoral pattern but varies across different industries which defies common expectations. The agricultural and food sector, traditionally considered less technologically advanced, exhibited unexpectedly strong AI literacy indicators, while the information technology sector, conventionally presumed to lead in digital transformation, showed more moderate readiness levels. However, based on multi-group analysis, the information technology sector still demonstrates the most significant relationship between AI acceptance and intention to use which reflects its AI readiness.

These findings have also highlighted the importance of adopting a more people-centric approach to workforce development. Rather than implementing broad industry-based strategies, readiness assessment must be held to account for workforce composition as well as role-specific skill requirements. This goes along with the varying levels of technological exposure that exist within each sector. Policymakers and industry leaders should, therefore, exercise caution when interpreting sectoral readiness indicators and avoid the one-size-fits-

all approach regarding to capability development which contracts to previous studies that have mentioned such solutions which has generated findings as based on the specific use case of application and sector [6, 18].

As Thailand is seeking the path forward its pursuance in its national AI strategy and economic transformation goals, a balanced approach will prove to be essential - one that extends beyond infrastructure development to prioritize human capital formation. This emphasizes talent development that is particularly crucial for the information technology sector, which must serve as an enabler for AI adoption across all sectors. Without the strategic upskilling initiatives and talent retention efforts focused on AI-specific competencies, even sectors presumed to be digitally advanced may experience struggle to meet the demands of Thailand's evolving digital economy.

Building sustainable AI readiness in Thailand requires a comprehensive strategy that can address demographic disparities, develop sector-specific capabilities, and prioritize human capital as the fundamental driver to successful digital transformation as listed in Thailand's national strategy. Only through this balanced approach can Thailand fully realize the potential benefits of AI across its diverse economic landscape.

Limitation

A limitation in this study concerns the relatively limited sample size of only 318 respondents which may affect the generalizability of the findings to the broader workforce population. Although the respondents were chosen in light of sectoral diversity and demographic representation, the usage of online means of survey distribution through professional networks and social media could potentially cause sampling bias or underrepresentation of certain groups. This is in particular for the population with limited internet access or differing regional backgrounds. Therefore, caution should be exercised when deducing these results as the entirety of the Thai workforce. Future research with larger and more laminated samples are recommended to further investigate external validity and deepen the comprehensiveness of AI readiness across every segment of the population.

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