



From Digital Transformation to AI Adoption: A Three-Year Reflection on Organizational Adaptation and Sustainability in Chiang Rai Province, Thailand

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Abstract: Digital Transformation and Artificial Intelligence (AI) adoption have become essential drivers of organizational capability development and adaptation to technological change. This study examines the three-year evolutionary pathway of organizations in Chiang Rai Province, transitioning from Digital Transformation to AI Adoption, with a focus on technological capability, organizational adaptation, operational performance, and sustainability.

A comparative longitudinal research design was employed using secondary empirical data from two studies conducted during different transformation stages: digital transformation and organizational efficiency, and AI utilization for supply chain management under the BCG Economy Model. Comparative analysis and conceptual synthesis were applied to identify organizational transformation patterns.

The findings indicate that organizations initially developed digital capabilities through technology adoption, data management, process improvement, and human capability enhancement, leading to improved operational efficiency. Subsequently, organizations advanced toward AI adoption by applying AI for data analytics, prediction, decision support, and supply chain management, enhancing organizational agility and sustainable value creation.

This study proposes an integrated transformation framework: Digital Transformation Capability → AI Adoption Capability → Organizational Adaptation → Sustainable Organizational Performance. The findings provide theoretical and practical implications for organizations and policymakers in developing systematic digital and AI-driven transformation strategies.

Keywords: Digital Transformation; Artificial Intelligence Adoption; Organizational Adaptation; Supply Chain Management; Sustainability; Chiang Rai Province.

I. Introduction

Digital technologies have fundamentally transformed the way organizations operate, compete, and create value in both public and private sectors worldwide. Organizations are increasingly required to move beyond traditional management approaches toward digitally driven organizations supported by data, technology, and innovation. Digital Transformation (DT) is therefore not merely the adoption of information technologies to replace existing processes; rather, it represents a strategic organizational transformation involving structural changes, operational processes, value creation mechanisms, and human capabilities to enhance organizational adaptability in rapidly changing environments (Vial, 2019; Verhoef et al., 2021).

Digital Transformation has become particularly important for organizations operating at the regional and provincial levels, where public and private institutions must enhance their managerial capabilities and service delivery systems to respond to the demands of the digital economy. In emerging economies, provincial organizations face increasing pressure to improve operational efficiency, strengthen competitiveness, and provide sustainable value creation through the effective use of digital technologies. However, the transformation toward a digital organization is not a single-stage process; rather, it represents a continuous capability development journey in which organizations gradually build technological readiness, data capabilities, and adaptive capacity before adopting more advanced technologies such as Artificial Intelligence (AI).

Chiang Rai Province, Thailand, provides a meaningful research context for investigating this transformation pathway. Located in the northernmost part of Thailand, Chiang Rai is a strategically important border province connected with three neighboring countries: China, Laos, and Myanmar. The province serves as a regional gateway for cross-border trade, logistics, tourism, agriculture, and service industries. Furthermore, Chiang Rai has been designated as a significant economic development area, with three special economic zones supporting regional investment, trade facilitation, and economic connectivity. These characteristics make Chiang Rai a unique context where organizations must continuously enhance their technological capabilities and innovation capacity to respond to increasing economic competition and cross-border digital transformation.



Therefore, understanding how organizations in Chiang Rai evolve from digital transformation toward AI adoption provides valuable insights into digital transformation processes in regional contexts.

Previous research conducted in Chiang Rai Province has provided empirical evidence regarding the early stage of organizational digital transformation. Chaiphawang (2024) examined the relationship between digital transformation and organizational efficiency in Chiang Rai Province and found that organizations had begun adopting digital technologies through improvements in information systems, data management, and work processes. The findings indicated that digital transformation was positively associated with organizational efficiency, suggesting that the development of digital capabilities, technological infrastructure, and human capabilities represents an essential foundation for organizational improvement. However, the study also indicated that organizations were still in the development stage of digital transformation, focusing primarily on building readiness rather than utilizing advanced intelligent technologies.

In recent years, Artificial Intelligence (AI) has emerged as a critical advanced technology that enables organizations to transform digital resources into strategic capabilities. AI provides organizations with the ability to analyze large-scale data, predict future trends, support decision-making processes, and improve complex operational activities. Particularly in supply chain management, AI can enhance responsiveness, accuracy, transparency, and decision-making efficiency by enabling organizations to utilize real-time information and intelligent analytics.

Following approximately three years of digital transformation development, subsequent research in Chiang Rai Province demonstrated a transition toward AI adoption. Chaiphawang et al. (2026) investigated AI utilization for supply chain management under the causal framework of the BCG Economy Model and found that organizations had increasingly adopted AI capabilities for data analytics, prediction, decision support, and supply chain integration. The findings revealed that AI adoption contributed to improved supply chain competency and supported organizational outcomes related to economic, social, and environmental sustainability. These findings suggest that AI adoption represents an advanced stage of organizational transformation built upon previously established digital capabilities.

The transition from Digital Transformation to AI Adoption can be explained through the perspective of Dynamic Capabilities Theory. Teece (2007) proposed that organizations must develop the ability to sense environmental changes, seize emerging technological opportunities, and reconfigure internal resources to maintain competitive advantage and long-term sustainability. Accordingly, digital transformation should not be viewed as the final objective of technological adoption but as a foundational capability that enables organizations to develop more advanced capabilities, including AI-driven decision-making and intelligent operations.

Although previous studies have extensively examined Digital Transformation and AI adoption separately, limited attention has been given to understanding the evolutionary pathway through which organizations develop technological capabilities over time. In particular, empirical evidence regarding how organizations transition from digital transformation toward AI adoption within the same regional context remains limited. Most existing studies focus on cross-sectional relationships between technological adoption and organizational outcomes, while less attention has been paid to the temporal development process through which organizations accumulate capabilities and gradually transform their operational models.

Therefore, this study aims to examine the three-year evolutionary pathway of organizations in Chiang Rai Province, Thailand, by comparing the transition from Digital Transformation to AI Adoption and analyzing its implications for organizational adaptation, operational performance, and sustainable development. This study proposes an integrated transformation framework:

Digital Transformation Capability → AI Adoption Capability → Organizational Adaptation → Sustainable Organizational Performance

The contributions of this study are threefold. First, this study extends existing digital transformation research by providing longitudinal insights into how organizations progressively develop capabilities from digital readiness toward AI-driven operations. Second, this study contributes empirical evidence from a provincial context in Thailand, expanding understanding of digital transformation beyond large enterprises and metropolitan areas. Third, this study provides practical implications for organizational leaders and policymakers in designing systematic strategies for digital and AI-driven transformation to enhance competitiveness and sustainable development.

II. Literature Review

2.1 Digital Transformation Capability

Digital Transformation has become a critical strategic capability that enables organizations to respond to rapid technological changes and evolving competitive environments. Unlike traditional technology adoption, digital transformation represents a comprehensive organizational change process involving technological



infrastructure, business processes, organizational structures, and human capabilities. Vial (2019) defined digital transformation as a process in which digital technologies trigger disruptions that influence organizational responses and strategic changes, ultimately leading to the creation of new value propositions and improved organizational performance.

Similarly, Verhoef et al. (2021) argued that digital transformation is a multidisciplinary phenomenon involving multiple stages of organizational development, ranging from digitalization of existing processes to the transformation of business models. Organizations must develop digital capabilities, including data management capabilities, technological readiness, and employee digital skills, before they can effectively utilize advanced technologies. Therefore, digital transformation should be viewed as a continuous capability-building process rather than a one-time technological investment.

In the context of regional organizations, digital transformation plays an important role in improving operational efficiency and service capabilities. Organizations operating in provincial areas often face challenges related to limited resources, technological readiness, and workforce capabilities. Developing digital capabilities enables these organizations to improve internal processes, enhance information accessibility, and support data-driven decision-making.

Empirical evidence from Chiang Rai Province supports this perspective. Chaiphawang (2024) found that organizations in Chiang Rai had begun their digital transformation journey through technology adoption, data management improvement, and process transformation. The study demonstrated that digital transformation was positively associated with organizational efficiency, indicating that digital capability development serves as a fundamental mechanism for improving organizational performance.

However, digital transformation alone does not represent the final stage of organizational development. Instead, it provides the foundation for organizations to progress toward more advanced technological capabilities, particularly Artificial Intelligence (AI) adoption.

2.2 Artificial Intelligence Adoption Capability

Artificial Intelligence (AI) has emerged as a transformative technology that enables organizations to move from digital information management toward intelligent decision-making. AI adoption refers to an organization's capability to integrate artificial intelligence technologies into operational processes, including data analytics, prediction, automation, and decision support.

Previous studies have highlighted that AI adoption requires more than technological investment. Organizations need appropriate data infrastructure, analytical capabilities, and managerial readiness to effectively utilize AI technologies. Wamba et al. (2017) demonstrated that big data analytics capability contributes to improved organizational performance by enabling firms to transform large volumes of data into valuable knowledge for strategic decision-making.

Furthermore, Mikalef et al. (2019) emphasized that big data analytics capability enhances innovation performance through the development of dynamic capabilities. Organizations that possess strong analytical capabilities are better able to identify opportunities, respond to environmental changes, and create new forms of value. These findings suggest that AI adoption represents an advanced organizational capability that depends on previously developed digital foundations.

In supply chain management, AI has become increasingly important due to its ability to improve forecasting accuracy, optimize resource allocation, enhance visibility, and support real-time decision-making. Dubey et al. (2020) found that artificial intelligence and big data analytics contribute significantly to operational performance, particularly under conditions of environmental uncertainty and complexity.

Recent evidence from Chiang Rai Province also indicates a transition toward AI-driven organizational development. Chaiphawang et al. (2026) found that organizations increasingly utilized AI for supply chain management, including data analytics, prediction, decision support, and supply chain integration. The findings indicated that AI adoption enhanced supply chain competency and supported organizational outcomes aligned with the BCG Economy Model.

Therefore, AI adoption can be considered a higher-level capability that transforms digital resources into strategic organizational advantages.

2.3 Dynamic Capabilities and Organizational Adaptation

The transition from Digital Transformation to AI Adoption can be explained through the perspective of Dynamic Capabilities Theory. Teece (2007) proposed that organizations operating in rapidly changing environments must develop capabilities to sense emerging opportunities, seize technological advantages, and reconfigure internal resources to maintain competitiveness.

Dynamic capabilities provide a theoretical explanation of why some organizations successfully transform digital technologies into sustainable performance outcomes, while others fail despite having access to similar



technologies. Digital transformation creates the foundation for organizational adaptation, while AI adoption enhances the ability to process information, predict changes, and make strategic decisions.

From this perspective, organizational adaptation represents the mechanism through which technological capabilities influence organizational outcomes. Organizations that successfully integrate digital technologies and AI are more capable of improving operational flexibility, innovation capability, and supply chain resilience.

In the context of Chiang Rai Province, the transformation pathway from digital transformation to AI adoption reflects the development of dynamic capabilities. Initially, organizations focused on establishing digital readiness and improving operational efficiency. Subsequently, they advanced toward AI-driven operations, enabling more intelligent decision-making and sustainable value creation.

2.4 Sustainable Organizational Performance and Research Framework

Sustainability has become an important outcome of digital transformation as organizations increasingly seek to balance economic performance, social responsibility, and environmental impacts. Digital technologies and AI provide opportunities for organizations to improve resource utilization, reduce operational inefficiencies, and support sustainable decision-making.

The integration of digital technologies into organizational processes contributes to sustainability by improving transparency, efficiency, and resource management. In supply chain contexts, advanced digital technologies enable organizations to enhance coordination, reduce waste, and improve responsiveness to environmental changes.

Within the BCG Economy Model framework, digital transformation and AI adoption can support sustainable development through three dimensions: economic value creation, circular resource utilization, and environmental sustainability. AI-driven analytics enable organizations to optimize processes, reduce resource consumption, and develop more sustainable operational models.

Based on the reviewed literature, this study proposes that organizational transformation occurs through a sequential capability development process:

Digital Transformation Capability → AI Adoption Capability → Organizational Adaptation → Sustainable Organizational Performance

This framework extends previous research by emphasizing the temporal evolution of organizational capabilities. While previous studies have examined digital transformation and AI adoption separately, limited research has investigated how organizations progressively develop from digital transformation toward AI adoption within the same regional context over time. Therefore, this study contributes to the literature by providing empirical evidence of organizational evolution from a provincial context in Thailand.

III. Methodology

This study employs a quantitative, comparative research design to analyze the three-year technological evolution of organizations within Chiang Rai Province across two distinct sequential periods: the foundational digital transformation era (Phase 1: 2023/2024) and the modern artificial intelligence (AI) adoption era (Phase 2: 2025/2026). The target population encompasses executives, business owners, and operational managers from public and private sector organizations operating across key regional economic sectors, specifically organic agriculture, eco-tourism, hospitality, and cross-border logistics. To ensure proportional regional representation, a multi-stage stratified random sampling method was applied. Sample size determination was executed using the standard Yamane formula during the foundational phase to establish a robust provincial baseline, whereas the modern integration phase relied on statistical power requirements for structural modeling, strictly aligning with the early factor loading thresholds established by Comrey and Lee.

Data collection was carried out through highly structured, five-point Likert scale questionnaires, which were validated for content quality, data integrity, and internal consistency. To ensure reliability prior to full deployment, pilot tests were executed during both research windows, yielding a Cronbach's alpha coefficient greater than 0.80 across all latent constructs. The measurement instruments evolved alongside the technological landscape; Phase 1 evaluated organizational digital maturity across three core areas—the technology track, the data content track, and the work process track—mapped against a multi-dimensional Balanced Scorecard (BSC) framework. Conversely, Phase 2 captured advanced automated capabilities by measuring AI utilization rates across critical Supply Chain Operations Reference (SCOR) processes, aligning final performance metrics directly with Bio-Circular-Green (BCG) economic outcomes, such as eco-efficiency and green carbon reductions.

The statistical data analysis framework utilizes both descriptive and advanced inferential modeling to isolate causal pathways and verify cross-era changes. Structural datasets were first processed to compute descriptive statistics, including means and standard deviations, to determine the highest and lowest performing operational attributes. Hypothesis testing was then conducted using multiple linear regression and multi-stage path analysis to map the exact predictive strength of technological investments over the three-year period. In



Phase 1, basic digital transformation tracks were regressed against overall organizational efficiency to calculate total predictive power (R^2). In Phase 2, the analytical model was expanded into a structural mediator framework to test whether supply chain competency functions as a critical mechanism that transmits the direct effects of AI utilization onto final sustainable BCG outcomes.

IV. Results and Discussion

4.1 Evolutionary pathway from Digital Transformation to AI Adoption

The comparative analysis revealed that organizations in Chiang Rai Province, Thailand, have experienced a progressive transformation pathway from digital capability development toward artificial intelligence (AI)-driven organizational capability. The findings indicate that digital transformation was not an isolated technological implementation but rather a foundational process that enabled organizations to accumulate technological, managerial, and human capabilities before adopting more advanced intelligent technologies.

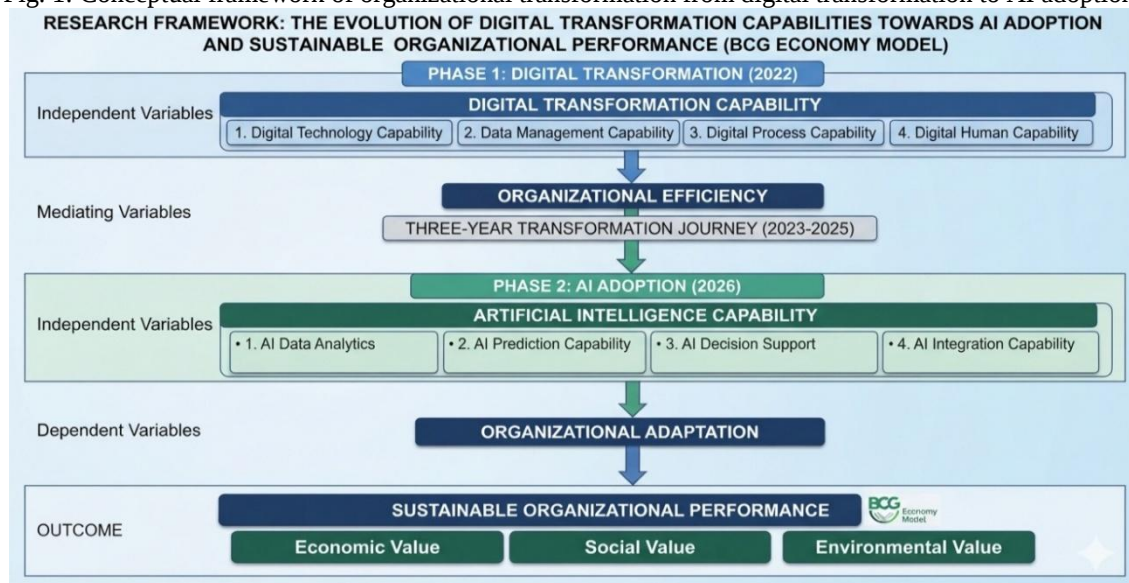
The transformation pathway identified in this study consists of four interconnected stages: Digital Transformation Capability → AI Adoption Capability → Organizational Adaptation → Sustainable Organizational Performance, as illustrated in Fig. 1. This pathway demonstrates that organizational transformation occurs through a sequential capability development process rather than an immediate transition toward AI adoption.

During the initial stage, organizations focused on establishing digital readiness through technology adoption, data management improvement, process transformation, and employee capability development. The findings are consistent with Chaiphawang (2024), which reported that organizations in Chiang Rai Province were in the early stage of digital transformation, emphasizing the development of digital infrastructure and operational improvement. The study also confirmed that digital transformation positively influenced organizational efficiency, indicating that digital capabilities provide an important foundation for improving organizational performance.

After approximately three years, organizations gradually progressed toward AI adoption. The second-stage findings from Chaiphawang et al. (2026) indicate that organizations increasingly utilized AI technologies for data analytics, prediction, decision support, and supply chain management. This transition reflects a movement from using digital technologies primarily for process improvement toward using intelligent technologies for strategic decision-making and value creation.

The evolutionary transformation pathway of organizations in Chiang Rai Province is presented in Fig. 1.

Fig. 1: Conceptual framework of organizational transformation from digital transformation to AI adoption



4.2 Comparison of organizational transformation stages

Table 1 presents a comparison between the Digital Transformation phase and the AI Adoption phase. The findings demonstrate that organizational transformation has shifted from technology-oriented development toward intelligence-driven capability enhancement.



During the Digital Transformation phase, organizations mainly focused on improving internal operational processes, establishing information systems, and enhancing data management capabilities. The primary objective was to increase operational efficiency and create organizational readiness for future technological development.

In contrast, the AI Adoption phase represents a more advanced stage of transformation, where organizations utilize artificial intelligence to analyze complex information, predict future situations, support decision-making, and improve supply chain performance. This indicates that organizations have moved beyond digitalization toward data-driven and intelligent operations.

Table 1: Comparison of organizational transformation stages in Chiang Rai Province

Dimension	Digital Transformation Phase (2024)	AI Adoption Phase (2026)
Main technology	Digital technology and information systems	Artificial Intelligence and intelligent analytics
Primary objective	Improving operational processes and efficiency	Enhancing intelligent decision-making and strategic capability
Data utilization	Data collection, management, and information sharing	Data analytics, prediction, and AI-driven decision support
Organizational capability	Digital readiness and process improvement	AI capability and organizational intelligence
Operational focus	Internal process efficiency	Supply chain optimization and value creation
Main outcome	Improved organizational efficiency	Enhanced organizational competency and sustainability

The findings in Table 1 support previous studies emphasizing that digital transformation should be considered a continuous organizational capability development process. Vial (2019) argued that digital transformation involves fundamental changes in organizational structures, processes, and value creation mechanisms rather than simple technology adoption. Similarly, Verhoef et al. (2021) suggested that organizations typically progress through multiple transformation stages, beginning with digitalization and eventually moving toward advanced technologies such as artificial intelligence.

Therefore, the transformation observed in Chiang Rai Province reflects a similar developmental pattern, where digital transformation serves as the foundation for subsequent AI adoption.

4.3 Development of organizational capabilities and adaptation

The findings indicate that the transition from digital transformation to AI adoption has enhanced organizational adaptation capabilities. As shown in Table 2, organizations developed different capabilities at each transformation stage.

In the Digital Transformation phase, organizations primarily developed technological infrastructure, digital processes, data management practices, and employee digital competencies. These capabilities improved organizational readiness and operational efficiency.

In the AI Adoption phase, organizations developed more advanced capabilities, including AI analytics capability, predictive capability, intelligent decision support, and supply chain integration. These capabilities enabled organizations to respond more effectively to uncertainty and environmental changes.

Table 2: Evolution of organizational capabilities from digital transformation to AI adoption

Transformation Stage	Key Capabilities Developed	Organizational Outcomes
Digital Transformation	Technology infrastructure, digital processes, data management, employee digital skills	Improved operational efficiency and organizational readiness
AI Adoption	AI analytics, predictive capability, intelligent decision support	Enhanced agility, supply chain competency, and strategic decision-making
Sustainable Transformation	Data-driven management, resource optimization, innovation capability	Economic, social, and environmental value creation

The findings support the Dynamic Capabilities Theory proposed by Teece (2007), which explains that organizations must continuously develop the ability to sense technological opportunities, seize emerging capabilities, and reconfigure internal resources in response to environmental changes.



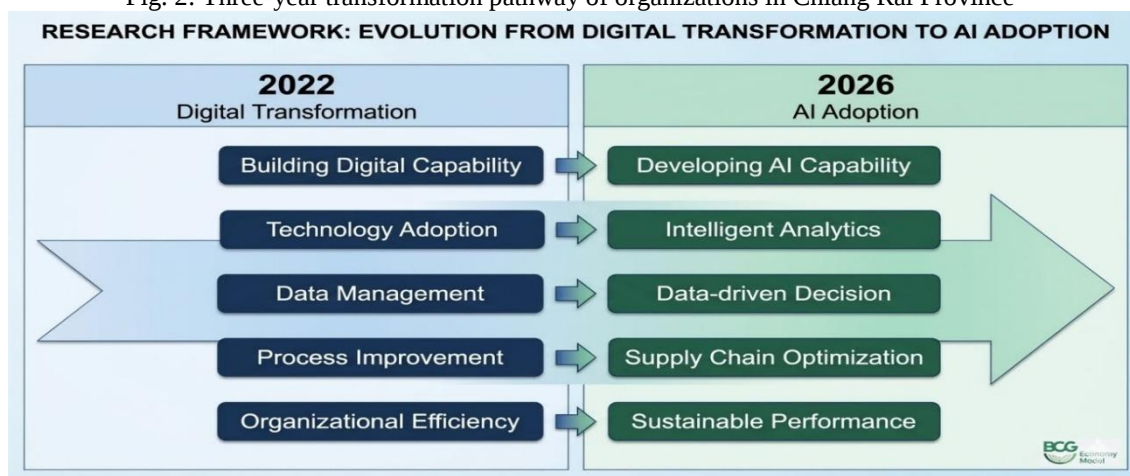
In this study, digital transformation represents the initial capability-building stage, while AI adoption represents an advanced capability that enables organizations to transform data into strategic knowledge. This finding is consistent with Mikalef et al. (2019), who found that data analytics capabilities enhance innovation and organizational performance through the development of dynamic capabilities.

Furthermore, Wamba et al. (2017) demonstrated that big data analytics capability improves firm performance by enabling organizations to generate valuable insights from large-scale data. Therefore, the transition toward AI adoption observed in Chiang Rai Province reflects the development of data-driven organizational capabilities.

4.4 Implications for sustainable organizational performance

The findings further indicate that AI adoption contributes not only to operational improvement but also to sustainable organizational development. Figure 2 illustrates the three-year transformation pathway identified in this study.

Fig. 2: Three-year transformation pathway of organizations in Chiang Rai Province



The transition toward AI adoption enables organizations to enhance sustainability through improved resource utilization, operational optimization, and data-driven decision-making. Particularly, AI applications in supply chain management contribute to improved efficiency, transparency, and responsiveness, which are essential elements for sustainable organizational development.

The findings are consistent with Dubey et al. (2020), who demonstrated that artificial intelligence and big data analytics enhance operational performance, particularly under conditions of environmental uncertainty. Additionally, the findings support Chaiphawang et al. (2026), which showed that AI utilization in Chiang Rai Province contributed to supply chain competency and supported organizational outcomes under the BCG Economy Model framework.

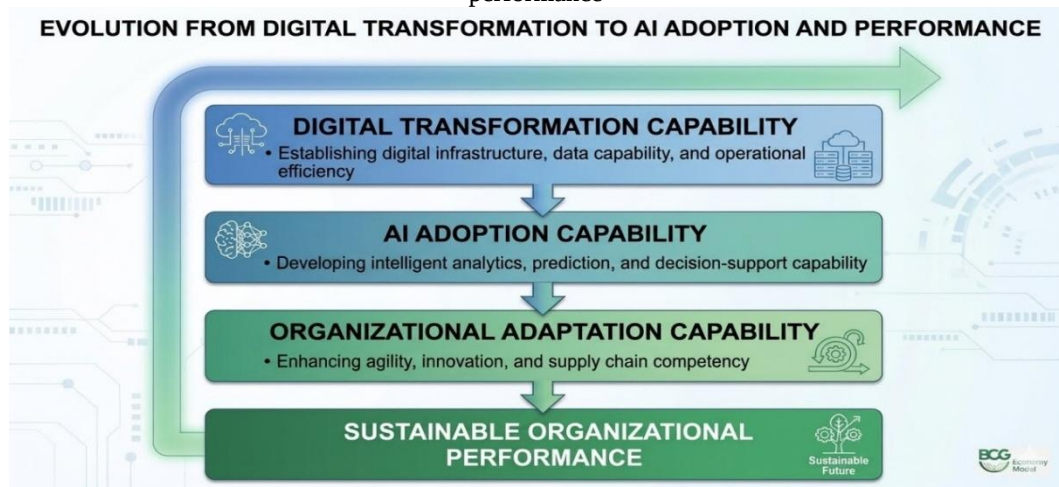
From a sustainability perspective, AI adoption enables organizations to create value across three dimensions: economic, social, and environmental. Economically, AI improves efficiency and competitiveness. Socially, it enhances service quality and organizational learning. Environmentally, it supports resource optimization and waste reduction.

4.5 Summary of research findings

Based on the comparative longitudinal analysis, this study identifies that organizational transformation in Chiang Rai Province follows a progressive capability development pathway.



Fig. 3: Evolutionary pathway from digital transformation to AI adoption and sustainable organizational performance



The findings demonstrate that AI adoption should not be considered an independent technological initiative but rather an advanced organizational capability built upon previous digital transformation efforts. This study contributes to the literature by providing empirical evidence of how organizations evolve from digital transformation toward AI-driven sustainability within a regional context.

V. Conclusion

This study examined the evolutionary pathway of organizations in Chiang Rai Province, Thailand, from Digital Transformation toward Artificial Intelligence (AI) Adoption through a three-year comparative longitudinal perspective. The findings demonstrate that organizational transformation is not an immediate technological transition but a continuous capability development process. Organizations initially developed digital capabilities through technology adoption, data management, process improvement, and human capability development. These foundational capabilities subsequently enabled organizations to adopt AI technologies for advanced analytics, prediction, decision support, and supply chain management.

The main contribution of this study is the identification of an evolutionary transformation pathway explaining how organizations progress from digital readiness toward intelligent and sustainable operations. Unlike previous studies that mainly examine Digital Transformation or AI adoption as separate phenomena, this study highlights the sequential relationship between these capabilities and proposes an integrated framework: Digital Transformation Capability → AI Adoption Capability → Organizational Adaptation → Sustainable Organizational Performance. This framework extends existing digital transformation literature by emphasizing the temporal development of organizational capabilities and providing empirical evidence from a provincial context in Thailand.

From a practical perspective, the findings suggest that organizations should not consider AI adoption as an isolated technological investment. Instead, organizations should first establish strong digital foundations, including data infrastructure, digital processes, and employee capabilities, before implementing AI-driven solutions. For policymakers and regional development agencies, the findings provide guidance for designing digital transformation strategies that support local organizations, particularly in border economic areas such as Chiang Rai Province, where technological capability is essential for enhancing competitiveness, regional connectivity, and sustainable economic development.

Despite its contributions, this study has several limitations. First, the study was based on secondary empirical data derived from two research studies conducted at different transformation stages; therefore, changes in individual organizational behaviors could not be directly tracked over time. Second, the research context was limited to organizations in Chiang Rai Province, Thailand, which may restrict the generalizability of the findings to other regions or countries with different economic and technological conditions. Third, this study focused primarily on organizational capability development and did not examine specific AI technologies, governance issues, ethical considerations, or employee acceptance factors.

Future research should extend this study by conducting longitudinal studies that follow the same organizations over longer periods to examine continuous transformation dynamics. Further studies may also investigate the role of AI governance, digital leadership, organizational culture, and workforce readiness as factors influencing successful AI-driven transformation. Comparative studies across different provinces or



countries would also provide broader insights into how regional contexts shape the pathway from Digital Transformation to AI Adoption and sustainable organizational performance.

VI. Acknowledgements

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