

Development of Digital Knowledge Management Model for Agricultural Cooperatives in the Northeastern Region

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ABSTRACT

In an era where digital technology plays a crucial role in the operations of all sectors, knowledge management has become an essential tool for enhancing organizational potential and competitiveness. This research aims to analyze the influence of causal factors affecting digital knowledge management competency in agricultural cooperatives in Northeastern Thailand, test the structural relationships between causal factors impacting digital knowledge management competency, and develop an appropriate digital knowledge management model for agricultural cooperatives in the region. The study employs a mixed-methods approach, collecting quantitative data from managers of 209 agricultural cooperatives in Northeastern Thailand and qualitative data through in-depth interviews with managers from five outstanding cooperatives. Data analysis was conducted using Partial Least Squares Structural Equation Modeling (PLS-SEM) techniques alongside Thematic Analysis.

The findings reveal that inter-organizational network management and learning organization significantly influence organizational innovation factors. Meanwhile, inter-organizational network management and digital knowledge absorptive capacity influence the digital knowledge management competency of agricultural cooperatives in Northeastern Thailand. Organizations with high levels of innovation demonstrate more efficient digital knowledge management. Innovation serves as a mediating variable that enhances digital infrastructure, human resource potential, processes, and organizational culture. Furthermore, the study identifies four key factors that should be considered in developing an appropriate digital knowledge management model for agricultural cooperatives in Northeastern Thailand: enhancing digital readiness, developing efficient knowledge management processes, addressing challenges in digital transformation, and responding to diverse needs and expectations.

Keywords: Digital Knowledge Management, Agricultural Cooperatives, Organizational Innovation, Inter-organizational Network Management, Digital Knowledge Absorptive Capacity, Learning Organization

INTRODUCTION

In the rapidly changing and highly competitive Digital Economy era, organizations are faced with the challenge of adapting in order to survive and achieve sustainable growth. This is particularly true in the agricultural sector, which plays a vital role in Thailand's economy. The application of digital technology in knowledge management (KM) has become a key strategy for organizations to enhance their potential and increase their competitiveness [1], [2]. As key players in the development of Thailand's agricultural sector, agricultural cooperatives must adapt and develop suitable models of digital knowledge management to improve operational efficiency and promote sustainable development.

Currently, agricultural cooperatives in Thailand are facing numerous challenges in management, marketing, production, and service delivery to members [3]. These challenges are particularly acute in the Northeastern region, which holds the largest agricultural area in the country but still struggles with poverty and socio-economic inequality.

Developing an effective digital knowledge management model is thus a crucial strategy to enhance the performance and competitiveness of agricultural cooperatives in this region.

Digital Knowledge Management refers to the process of creating, collecting, storing, sharing, and utilizing knowledge through the use of digital technologies [4]. This enables organizations to manage knowledge more efficiently. However, developing an appropriate digital KM model for agricultural cooperatives in the Northeast remains an area requiring further research, as each cooperative operates under different contexts and conditions in terms of resources, capabilities, and operational environments.

The Resource-Based View (RBV) theory [12] serves as an important theoretical framework, suggesting that organizations can gain a competitive advantage through resources that are valuable, rare, inimitable, and non-substitutable. Meanwhile, the Contingency Approach posits that there is no one-size-fits-all management method; effectiveness depends on internal and external environmental factors [13].

A review of the literature reveals that key factors influencing digital knowledge management in organizations include inter-organizational network management, digital knowledge absorption capability, learning organizations, and organizational innovation [8], [9], [10], [11]. However, there remains a research gap regarding the relationship between these factors and the digital KM performance of agricultural cooperatives in Thailand, particularly in the Northeastern region.

At present, agricultural cooperatives in the Northeast face difficulties in adopting digital technology for knowledge management due to several constraints, such as a lack of digital literacy and skills, insufficient investment capital for technology, and lack of support from stakeholders [30]. These limitations hinder cooperatives from fully utilizing digital knowledge and technology. Therefore, the development of a suitable digital knowledge management model is essential to enhance the capabilities and competitiveness of agricultural cooperatives in the region.

This research focuses on analyzing the causal factors influencing the performance of digital knowledge management in agricultural cooperatives in the Northeast, testing the structural relationships among these causal factors, and developing an appropriate digital knowledge management model for agricultural cooperatives in the region. The research findings are expected to contribute both theoretically and practically to the development of agricultural cooperatives in the Northeastern region and other parts of Thailand.

OBJECTIVES

Analyze the influence of causal factors affecting digital knowledge management competency in agricultural cooperatives in Northeastern Thailand. Test the structural relationships between causal factors impacting digital knowledge management competency. and develop an appropriate digital knowledge management model for agricultural cooperatives in Northeastern Thailand.

LITERATURE REVIEW

Digital knowledge management has become a crucial aspect of organizational management in the digital era, particularly for agricultural cooperatives facing rapid economic, social, and technological changes. The ability of cooperatives to manage knowledge in response to these changes has become a critical factor for survival and sustainable development. This literature review covers key concepts and theories related to digital knowledge management to establish a foundation for developing appropriate models for cooperatives in Northeastern Thailand.

The Resource-Based View (RBV) theory posits that organizations can create sustainable competitive advantages by leveraging resources with specific characteristics: valuable, rare, inimitable, and non-substitutable [12]. For agricultural cooperatives, the most critical resources are knowledge, personnel experience, and collaborative networks. When properly managed through digital systems, these become significant driving forces for the organization. Simultaneously, the Contingency Approach suggests that no single management approach is universally optimal for all organizations. The design of knowledge management systems must align with each cooperative's specific context, such as organizational size, technological readiness, personnel skills, and organizational culture [13].

A key factor influencing digital knowledge management competency is Inter-Organizational Network Management, which involves collaborating with external entities such as government agencies, educational institutions, and business partners to exchange resources, knowledge, and technology. This concept is supported by [14], who emphasize the role of trust-building, effective communication, and joint strategy formulation in driving networks.

Another crucial concept is Absorptive Capacity, which describes an organization's ability to identify, interpret, apply, and create value from external knowledge [9], [15]. In an era of complex and rapidly changing information, organizations with strong digital knowledge absorption capabilities can efficiently develop new knowledge and foster innovation.

The Learning Organization concept, as presented by [10], posits that continuous learning at all organizational levels—individual, team, and policy—is fundamental for sustainable organizational development. Creating an organizational culture that promotes learning, knowledge sharing, and openness to change can help cooperatives adapt and grow amidst economic and technological uncertainties.

Organizational Innovation, defined as an organization's ability to create new products, services, or processes, is a critical outcome of robust knowledge management systems [16]. Organizations capable of transforming knowledge into innovations that address member and stakeholder needs will have long-term competitive advantages.

This literature review indicates that effective digital knowledge management in agricultural cooperatives in Northeastern Thailand requires integrating multiple components, including human resources, technology, organizational culture, and external collaborative networks. All these elements must be implemented within a flexible framework that aligns with each cooperative's specific context.

CONCEPTUAL FRAMEWORK

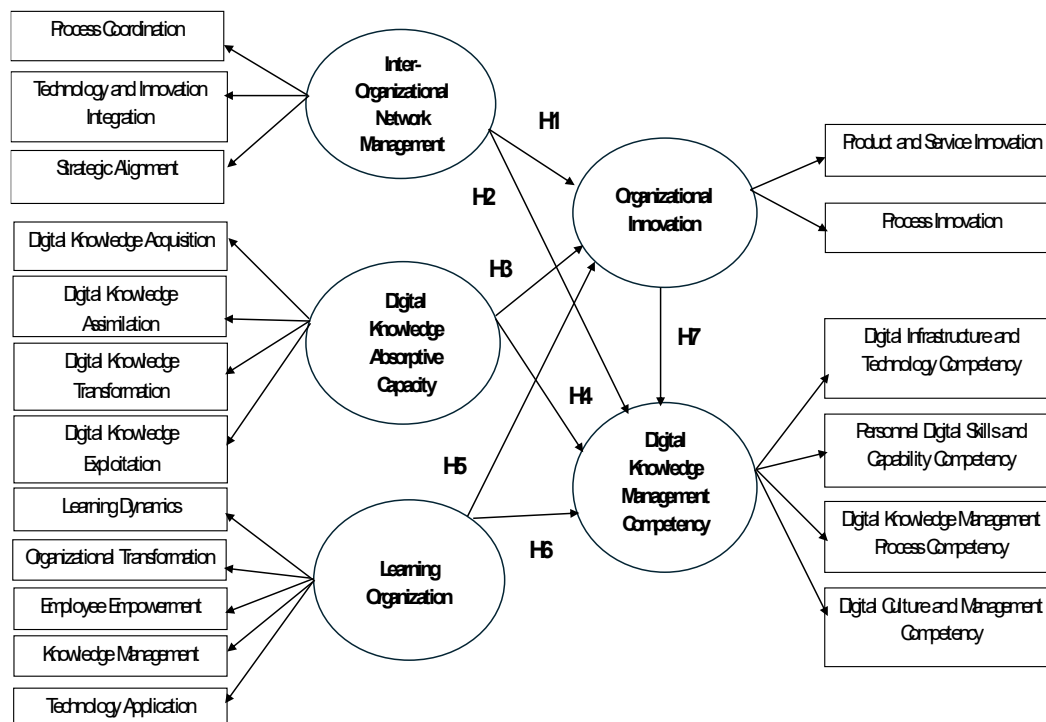


Fig. 1. Conceptual framework of the research

METHODS

This study employed a mixed-methods research design, incorporating both quantitative and qualitative approaches. Data collection was conducted through online questionnaires and in-depth interviews with five managers from agricultural cooperatives in the Northeastern region of Thailand. These cooperatives were selected based on their national-level awards for outstanding management practices from the Cooperative Promotion Department.

The quantitative data analysis utilized Structural Equation Modeling (SEM) techniques, specifically Partial Least Squares (PLS-SEM). This approach is particularly suitable for analyzing multiple latent variables and elucidating the relationships between various factors. The questionnaire was developed based on the conceptual framework and a comprehensive literature review. It encompassed key constructs including inter-organizational network management, digital knowledge absorptive capacity, learning organization characteristics, organizational innovation, and digital knowledge management competency. Following the quantitative analysis, qualitative research was conducted through in-depth interviews with five purposively sampled managers from high-performing agricultural cooperatives. These semi-structured interviews allowed participants to reflect on their concepts, experiences, and practical approaches within their organizations. The interview data were analyzed using Thematic Analysis, a systematic method for identifying, organizing, and offering insight into patterns of meaning across a dataset. This process facilitated the development of a digital knowledge management model tailored to agricultural cooperatives in Northeastern Thailand.

RESULTS

Structural Equation Modeling Analysis

The analysis using Partial Least Squares Structural Equation Modeling (PLS-SEM) revealed that the developed model effectively explains the relationships between independent, mediating, and dependent variables. The model's explanatory power (R^2) for organizational innovation and digital knowledge management competency was 0.770 and 0.833, respectively, indicating that the model accounts for over 77% and 83% of the variance in these dependent variables. These R^2 values are considered high. Furthermore, the predictive accuracy of the path model (Q^2), obtained through blindfolding analysis, ranged from 0.502 to 0.589, exceeding the minimum threshold of 0.25. This demonstrates the model's good predictive quality. The study found that digital knowledge management competency had an R^2 value of 0.833 and an adjusted R^2 of 0.830 ($p < 0.001$). This construct was influenced by inter-organizational network management, learning organization, and organizational innovation, accounting for 83.30% of its variance. Organizational innovation had an R^2 value of 0.770 and an adjusted R^2 of 0.767 ($p < 0.001$), influenced by digital knowledge absorptive capacity, inter-organizational network management, and learning organization, explaining 77.00% of its variance (Fig 2).

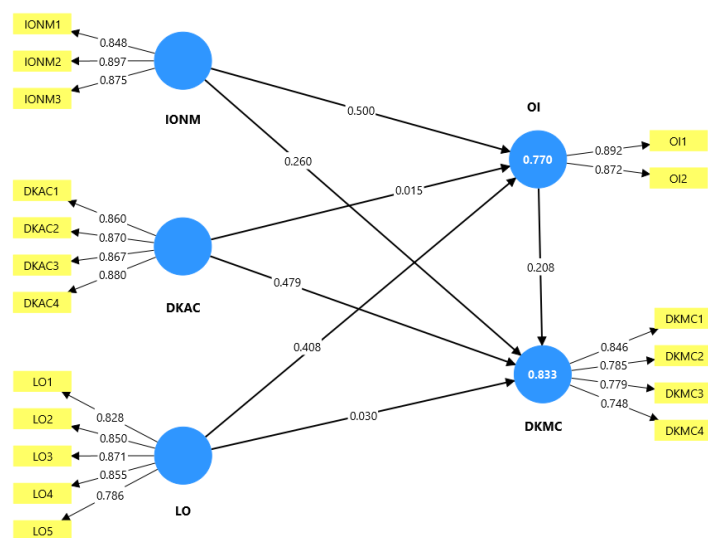


Fig. 2. Full Mediation Effect Model

Note: The Values Displayed Within the Latent Variables Represent the Coefficient of Determination (R^2)

Analysis of Direct, Indirect, and Total Effects

When considering the path coefficients, the results indicate that Digital Knowledge Absorptive Capacity (DKAC) has a direct positive influence on Digital Knowledge Management Competency (DKMC) ($\beta=0.479$, $t=7.413$, $p=0.000$), but does not have an indirect influence on DKMC through Organizational Innovation (OI) ($\beta=0.003$, $t=0.150$, $p=0.880$). Additionally, DKAC does not have either a direct or indirect effect on Organizational Innovation (OI) ($\beta=0.015$, $t=0.155$, $p=0.877$). Inter-Organization Network Management (IONM) has a direct positive influence on DKMC ($\beta=0.260$, $t=4.789$, $p=0.000$) and an indirect positive influence on DKMC through OI ($\beta=0.104$, $t=3.409$, $p=0.001$). IONM also has a direct positive influence on OI ($\beta=0.500$, $t=8.889$, $p=0.000$). Learning Organization (LO) does not have a direct influence on DKMC ($\beta=0.030$, $t=0.412$, $p=0.680$), but it does have an indirect positive influence on DKMC through OI ($\beta=0.085$, $t=3.439$, $p=0.001$). LO also has a direct positive influence on OI ($\beta=0.408$, $t=5.249$, $p=0.000$). Finally, Organizational Innovation (OI) has a direct positive influence on DKMC ($\beta=0.208$, $t=3.996$, $p=0.000$). (Table 1)

Table 1. Testing of Direct, Indirect, and Total Effects

Relationship between Independent and Dependent Variables	Direct Effect	Indirect Effect	Total Effect
DKAC -> DKMC	0.479***	0.003 ^{ns}	0.482***
DKAC -> OI	0.015 ^{ns}	-	0.015 ^{ns}
IONM -> DKMC	0.260***	0.104***	0.364***
IONM -> OI	0.500***	-	0.500***
LO -> DKMC	0.030 ^{ns}	0.085***	0.115 ^{ns}
LO -> OI	0.408***	-	0.408***
OI -> DKMC	0.208***	-	0.208***

Note: *** $p < 0.01$, ns= not statistically significant

Hypothesis Testing

The analysis of data using the Partial Least Squares Structural Equation Modeling (PLS-SEM) technique was conducted to test the hypotheses regarding the causal influences of various factors on Organizational Innovation and Digital Knowledge Management Competency within agricultural cooperatives in the Northeastern region. The results can be explained as follows: Inter-organizational Network Management (IONM) demonstrated a statistically significant positive influence on Organizational Innovation (OI), with a path coefficient (β) = 0.500, $t = 6.542$, and $p < 0.001$. This indicates that when cooperatives establish collaborations with external organizations, they gain increased access to knowledge and resources conducive to fostering internal innovation. Additionally, IONM exhibited a significant positive influence on Digital Knowledge Management Competency (DKMC), with $\beta = 0.260$, $t = 4.789$, and $p = 0.000$, suggesting that external collaborations not only support innovation but also enhance the capacity to collect and apply digital knowledge within the organization (Table 2).

Digital Knowledge Absorptive Capacity (DKAC) showed a significant positive influence on DKMC, with $\beta = 0.479$, $t = 7.413$, and $p = 0.000$. This implies that an organization's ability to recognize, interpret, and apply digital knowledge contributes to more efficient digital knowledge management processes. However, DKAC did not demonstrate a significant positive influence on OI ($\beta = 0.015$, $t = 0.155$, $p = 0.877$), indicating that while some cooperatives may absorb external knowledge, the lack of internal mechanisms to translate this knowledge into practice may hinder concrete organizational innovation (Table 2).

Learning Organization (LO) exhibited a statistically significant positive influence on OI, with $\beta = 0.408$, $t = 5.187$, and $p < 0.001$. This suggests that organizations with internal learning systems that encourage knowledge sharing and continuous personal development among staff are more likely to innovate and adapt. However, LO did not show a significant direct positive influence on DKMC ($\beta = 0.030$, $t = 0.412$, $p = 0.680$). Nevertheless, an indirect effect through OI was observed, resulting in a total effect of 0.115, which, although not statistically significant, indicates a trend worth considering strategically (Table 2).

Organizational Innovation (OI) demonstrated a statistically significant positive influence on DKMC, with $\beta = 0.561$, $t = 9.104$, and $p < 0.001$. This finding suggests that the development and implementation of innovations within an organization enhance the capability to manage digital knowledge effectively, particularly in areas such as knowledge application, organizational communication, and digital knowledge retention (Table 2).

Table 2. Results of Confirmatory Factor Analysis on the Influence of Variables

Relationship between Independent and Dependent Variables	Path Coefficient	Sample Mean	Standard Deviation	t Statistics	P Values
IONM -> OI	0.500	0.498	0.056	8.899	0.000
IONM -> DKMC	0.260	0.264	0.054	4.789	0.000
DKAC -> OI	0.015	0.021	0.095	0.155	0.877
DKAC -> DKMC	0.479	0.479	0.065	7.413	0.000
LO -> OI	0.408	0.404	0.078	5.249	0.000
LO -> DKMC	0.030	0.03	0.072	0.412	0.680
OI -> DKMC	0.208	0.205	0.052	3.996	0.000

Development of a Digital Knowledge Management Model

The study aimed to develop an appropriate digital knowledge management model for agricultural cooperatives in the Northeastern region of Thailand. The findings suggest that the development of a suitable digital knowledge management model should consider four main factors: 1) enhancing digital readiness, 2) developing efficient knowledge management processes, 3) addressing challenges in digital transformation, and 4) responding to diverse needs and expectations.

For agricultural cooperatives in the Northeastern region, the IDOLs-DKMC MODEL is proposed as an appropriate framework. This model comprises four key components: 1) I - Inter-organizational Network Management: Developing collaborative networks between agricultural cooperatives and external organizations to facilitate knowledge exchange and access to resources and technologies. 2) D - Digital Knowledge Absorptive Capacity: Enhancing the organization's ability to identify, assimilate, transform, and utilize digital knowledge from both internal and external sources, which serves as a crucial foundation for developing digital knowledge management systems. 3) O - Organizational Innovation: Fostering organizational innovation in the form of new products, services, and processes, leading to the development of efficient tools and systems for digital knowledge management. 4) L - Learning Organization: Transforming agricultural cooperatives into learning organizations that promote continuous learning, knowledge sharing, and experimentation with new ideas to create an environment conducive to innovation and knowledge management (Fig 3).

The IDOLs-DKMC MODEL considers the interrelationships among these four components and is designed to align with the specific context and needs of agricultural cooperatives in the Northeastern region. The model takes into account the resource constraints and digital readiness of these cooperatives

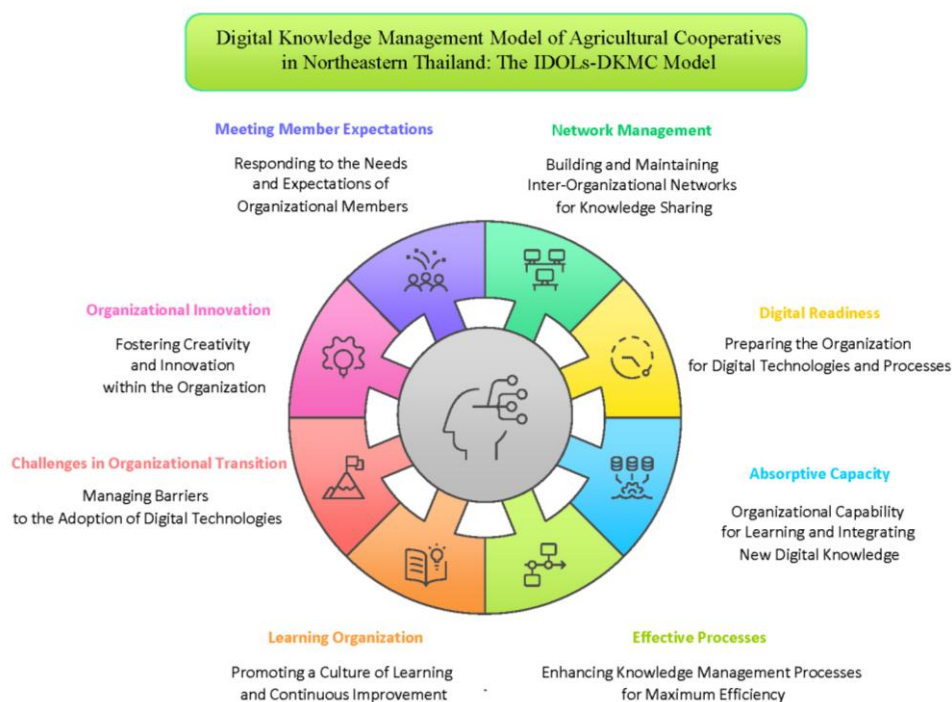


Fig. 3. The IDOLs-DKMC MODEL for Digital Knowledge Management Model of Agricultural Cooperatives in Northeastern Thailand

DISCUSSION

The relationship between inter-organizational network management and organizational innovation was found to be positively significant for agricultural cooperatives in Northeastern Thailand. Effective inter-organizational collaboration and resource sharing serve as crucial mechanisms for fostering innovation. Efficient inter-organizational network management facilitates access to new resources, knowledge, and technologies [17], [18]. Similarly, inter-organizational network management positively influences the digital knowledge management competency of these cooperatives. Organizations with strong external network connections tend to develop more effective digital knowledge management systems and enhance their ability to access and exchange digital knowledge with external entities [19], [20].

Contrary to expectations, the relationship between digital knowledge absorptive capacity and organizational innovation was not found to be positively significant for the agricultural cooperatives in Northeastern Thailand. This finding diverges from [21], who identified knowledge absorptive capacity as a critical factor in enhancing innovation potential. However, digital knowledge absorptive capacity did demonstrate a positive influence on the digital knowledge management competency of these cooperatives, aligning with previous research that identifies absorptive capacity as a fundamental element in developing efficient digital knowledge management systems [22], [23].

The study revealed a positive relationship between learning organization characteristics and organizational innovation in the agricultural cooperatives. Developing these cooperatives into learning organizations fosters an environment conducive to innovation, as innovation stems from applying knowledge and creativity to problem-solving [24], [25]. However, contrary to previous findings by [26], [27], this study did not find a positive influence of learning organization characteristics on digital knowledge management competency.

Organizational innovation was found to have a positive influence on the digital knowledge management competency of agricultural cooperatives in Northeastern Thailand. The development of organizational innovation plays a crucial role in enhancing digital knowledge management systems, leading to the creation of more efficient tools and processes [28], [29].

CONCLUSION

The study results indicate that Inter-Organization Network Management and Learning Organization significantly influence Organizational Innovation factors. Concurrently, Inter-Organization Network Management and Digital Knowledge Absorptive Capacity exert influence on Digital Knowledge Management Competency factors.

The research proposes an appropriate digital knowledge management model for agricultural cooperatives in the Northeastern region through the application of the IDOLs-DKMC MODEL. This model comprises four key components: I: Inter-organizational Network Management, D: Digital Knowledge Absorptive Capacity, O: Organizational Innovation, and L: Learning Organization. These components are identified as crucial factors that enhance the digital knowledge management competencies of agricultural cooperatives within the context of the Northeastern region.

The IDOLs-DKMC MODEL integrates these interconnected elements to create a comprehensive framework for improving digital knowledge management practices in agricultural cooperatives. This model acknowledges the importance of both internal organizational factors and external network relationships in fostering innovation and knowledge absorption capabilities. By addressing these key areas, the model aims to strengthen the overall digital knowledge management competencies of agricultural cooperatives, thereby enhancing their operational efficiency and adaptive capacity in an increasingly digital environment.

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