Contents lists available at Science-Gate

International Journal of Advanced and Applied Sciences

Journal homepage: http://www.science-gate.com/IJAAS.html

Digital transformation status of savings cooperatives: Evidence from Thailand

Abdulhadee Esamah [1], Neeranat Kaewprasert Rakangthong [1], Somnuk Aujirapongpan [2, *]

[1]School of Accountancy and Finance, Walailak University, Nakhon Si Thammarat, Thailand
[2]Faculty of Management Science, Silpakorn University, Phetchaburi, Thailand

ARTICLE INFO

Article history:
Received 7 August 2025
Received in revised form
24 November 2025
Accepted 26 November 2025

Keywords:
Digital transformation
Savings cooperatives
Digital strategy
Thailand
ANOVA

ABSTRACT

This study examined the level of digital transformation among savings cooperatives in Thailand. Data were collected from 103 cooperative managers or acting managers using a structured questionnaire, and analyzed with descriptive statistics and one-way ANOVA. The results showed that the overall digital transformation level was high, and all subdimensions—digital strategy, digital technology, digital capability, and effective utilization—were also rated as high. The analysis further indicated that digital transformation did not differ significantly by years of establishment, number of members, number of employees, or average assets over the past three years. However, a significant difference was found in the digital strategy dimension when categorized by average revenue. Cooperatives with average revenue of 501 million baht or more had significantly higher digital strategy scores than those with revenue below 100 million baht, 201–300 million baht, and 301–400 million baht.

1. Introduction

The global financial sector is undergoing a structural transformation driven by the adoption of digital technologies—a process that has accelerated significantly in the wake of the COVID-19 pandemic (van Zeeland and Pierson, 2024). Digital adaptation has thus become a critical factor for survival and success in the contemporary financial landscape (Stefanelli and Manta, 2023). Savings cooperatives, as financial institutions with distinct characteristics emphasizing member participation and social responsibility (Sturn, 2024), have been impacted by this dynamic and face a pressing need to adapt to maintain competitiveness and relevance in a rapidly evolving market (Zhu and Jin, 2023).

In the Thai context, savings cooperatives play a vital role as both economic and social mechanisms. They serve as accessible sources of funding and savings, particularly for salaried employees (Pojanavatee and Kingshott, 2025). However, the rapid evolution of digital technology has exposed these cooperatives to increasing competition from both formal and informal financial service providers, who are often able to respond more swiftly and precisely to consumer needs (Wanyonyi and Ngaba, 2021). A delay in digital adaptation may result in the loss of existing members and failure to attract younger generations who are more familiar with digital services and less interested in traditional face-to-face service models (Ogindo and Njoka, 2023). Therefore, digital adoption is a strategic imperative for improving service efficiency and meeting the expectations of both current and emerging member segments—especially in facilitating access for elderly members who may face challenges in navigating digital platforms (Kebede et al., 2022). The digital transition thus emerges as a key survival strategy for Thai savings cooperatives amid a rapidly shifting financial environment (Kamau et al., 2024).

Digital transformation refers to a strategic process that involves comprehensive improvements to the business model, operational processes, and organizational culture to create new value for members effectively. Its key components include digital strategy, digital technology, digital capabilities, and appropriate usage. Moreover, the digital transformation of each cooperative does not occur in isolation but is significantly influenced by cooperative characteristics (Minzar and Mishra, 2024), such as the number of years since establishment, the number of members, the number

* Corresponding Author.
Email Address: somnuk.aujirapongpan@gmail.com (S. Aujirapongpan)
https://doi.org/10.21833/ijaas.2025.12.016
Corresponding author's ORCID profile:
https://orcid.org/0000-0001-6275-9053

of employees, total assets, and revenue. Despite growing interest in digital transformation within the financial sector, research focusing specifically on the context of savings cooperatives in Thailand remains limited (Esamah et al., 2023). Prior studies have often explored the adoption of specific technologies in isolation, lacking a comprehensive quantitative analysis of the overall level of digital transformation. Moreover, there is a knowledge gap concerning the relationship between cooperative characteristics (e.g., years of establishment, number of members, number of employees, assets, and revenue) and digital transformation dimensions (e.g., digital strategy, digital technology, digital capability, and effective utilization). This study aims to address that gap by examining the differences in digital transformation levels among savings cooperatives in Thailand, categorized by their organizational characteristics.

2. Literature review

This study explores the status of digital transformation among savings cooperatives in Thailand and the relationship with cooperative characteristics, drawing on key concepts and theories from relevant literature.

2.1. Concepts related to digital transformation

Digital transformation is widely recognized as a strategic organizational process involving the adoption of digital technologies to reconfigure value propositions and organizational identity to enhance overall performance (Fernandez-Vidal et al., 2022; Kraus et al., 2022; Vial, 2021). In the financial sector, this transformation typically encompasses four major components. First, digital strategy refers to a strategic plan that guides the exploration, assessment, and investment in digital technologies, integrating them into core business functions and reshaping organizational strategies to align with the digital era (Haq and Huo, 2023; Ribeiro-Navarrete et al., 2025). Second, digital technology involves the use of information systems, infrastructure, platforms, and digital innovations that streamline operations and improve user experiences (Khin and Ho, 2019; Kreuzer et al., 2022). Third, digital capabilities refer to internal organizational competencies—rooted in digital knowledge, beliefs, skills, experience, and expertise of personnel—as well as their confidence in utilizing digital tools effectively (Khin and Ho, 2019; Velyako and Musa, 2024). Fourth, appropriate usage highlights the practical application of digital technologies that match organizational needs, are reliable, cost-effective, and widely adopted across the organization (Ciruela-Lorenzo et al., 2020; Verstegen et al., 2019). In the context of Thailand, Esamah et al. (2023) found that while some savings cooperatives have begun embracing digital transformation, the extent and effectiveness of adoption remain uneven, often influenced by internal readiness and leadership vision.

2.2. Characteristics of cooperatives

The characteristics of cooperatives refer to a set of quantitative indicators used to analyze and assess the status, size, growth, and overall performance of a cooperative. These characteristics reflect a cooperative's experience, organizational scale, structure, and financial standing. In this study, five key characteristics are considered: (1) years since establishment, (2) number of employees, (3) number of members, (4) total assets, and (5) revenue. Items (2) to (5) are measured as three-year averages. Taken together, these characteristics provide a basis for differentiating and understanding cooperatives in ways that may influence their level of digital transformation. Cooperatives with varying structural attributes may face different limitations or opportunities in adapting to the digital era. For example, Ribeiro-Navarrete et al. (2023) found that the number of employees had no significant impact on the adoption of digital technologies for commercial purposes, while younger cooperatives tended to utilize such technologies less frequently than their older counterparts.

2.3. Differences in cooperative characteristics and digital transformation

Examining cooperative characteristics enables the differentiation and understanding of variations among cooperatives, which may influence the level of digital transformation. Cooperatives with different characteristics may encounter distinct constraints or opportunities in their digital transformation efforts. (1) Years since establishment (cooperative age) and digital transformation level: Findings in prior studies are mixed. Ribeiro-Navarrete et al. (2023) found that younger cooperatives adopt digital technologies for commercial purposes to a lesser extent than older cooperatives. Similarly, Ribeiro-Navarrete et al. (2023) reported that older organizations tend to have higher levels of digital technology usage. In contrast, Santos et al. (2024) found no relationship between cooperative age and digital transformation. (2) Number of members and digital transformation level: The results show a consistent direction. Santos et al. (2024) found that the number of members does not affect the level of digital transformation. (3) Number of employees and digital transformation level: Findings are again mixed. Ribeiro-Navarrete et al. (2023) reported no significant effect of the number of employees on the use of digital technologies for commercial purposes. However, Santos et al. (2024) found that cooperatives with more employees have higher levels of digital technology adoption, a result also noted by Ribeiro-Navarrete et al. (2023). (4) Assets and digital transformation level: Findings indicate a consistent direction. The availability of IT infrastructure is one of the key factors influencing the adoption of digital technologies in organizational transformation. (5) Revenue and digital transformation level: Findings also show a consistent direction. Ermaya et al.

(2023) found that cooperatives with limited financial resources face significant barriers in making the necessary initial investments in digital infrastructure and platforms.

2.4. Theoretical framework

Understanding digital transformation requires the integration of multiple theoretical perspectives to analyze the dimensions of organizational change and the strategic responses of institutions. This study incorporates three theoretical frameworks to construct a comprehensive foundation for analyzing digital transformation within savings cooperatives, positioning such transformation as both a proactive and reactive strategy to maintain competitiveness in a rapidly evolving financial landscape. First, Lewin's Change Theory offers a foundational model consisting of three stages: unfreezing (dismantling existing behaviors), change (implementing new practices), and refreezing (stabilizing new behaviors) (Lewin, 1947). This model supports the planning of long-term transformation. Second, the Socio-Technical Systems Theory emphasizes the balance between social and technological subsystems, ensuring that human-technology interactions are managed efficiently (Trist and Bamforth, 1951). This perspective highlights the importance of designing systems that align with both organizational processes and employee needs. Third, Diffusion of Innovations Theory provides insights into how new technologies are adopted across different user groups, enabling tailored communication and support strategies (Rogers, 2003). Together, these theories offer a holistic lens through which to understand, design, and implement effective digital transformation strategies in cooperative settings.

3. Research methodology

This research was conducted through a systematic process involving the selection of a research design, identification of the population, determination of the sample group, sampling procedures, and the use of a structured questionnaire for data collection. The collected data were subsequently analyzed using appropriate statistical techniques to draw research-based conclusions, as outlined below.

This study employed a combination of documentary research, focusing on the collection and analysis of information from existing literature to establish the research context and theoretical foundations, and comparative research, which emphasizes identifying similarities or differences across various groups or variables.

The study population consisted of savings cooperatives in Thailand registered under the Cooperative Act B.E. 2542 in 1999 and its amendments, as of December 31, 2023, excluding cooperative unions and inactive cooperatives. A total of 1,373 cooperatives were identified. The sample size was determined using Yamane's (1973) formula, with a 0.05 margin of error, resulting in a required sample of 310 cooperatives. The actual respondents were cooperative managers or acting managers. Purposive sampling was used, selecting only savings cooperatives that had implemented digital technologies (e.g., platforms). A total of 103 valid responses were received, yielding a response rate of 33.25%.

This quantitative study employed a structured questionnaire divided into two parts. Part 1 consisted of checklist items designed to capture cooperative characteristics. Part 2 used a 5-point Likert scale to measure respondents' opinions regarding digital transformation. The scale ranged from "strongly disagree" to "strongly agree." The questionnaire was developed based on a comprehensive literature review. Content validity was verified, with an item-objective congruence (IOC) index of 0.600 or higher. Reliability was assessed using Cronbach's alpha, which achieved a coefficient of 0.955—exceeding the minimum acceptable threshold of 0.700.

Questionnaires were distributed to the selected sample both via the official government postal service and online (email). Follow-up telephone calls were made to encourage participation and ensure the timely return of completed questionnaires.

Data analysis was performed using IBM SPSS Statistics Version 30. Descriptive statistics, including frequency and percentage, were used to summarize cooperative characteristics (e.g., years since establishment, number of members, number of employees, total assets, and revenue). For items assessing digital transformation, means and standard deviations were calculated. Interpretation of mean scores followed the scale: 1.00–1.50 (lowest), 1.51–2.50 (low), 2.51–3.50 (moderate), 3.51–4.50 (high), and 4.51–5.00 (highest).

To examine differences in digital transformation levels based on cooperative characteristics, one-way ANOVA (F-test) was conducted. Where significant differences were found, Fisher's Least Significant Difference (LSD) test was used for post hoc comparisons.

4. Research findings

The presentation of the research findings is divided into four main sections: (1) general characteristics of the cooperatives, (2) levels of digital transformation among savings cooperatives, (3) comparative analysis of digital transformation levels by cooperative characteristics, and (4) pairwise comparisons of digital strategy levels based on average annual income over the past three years. This structure aims to provide both an overview and in-depth details regarding the status of digital transformation among savings cooperatives in Thailand.

The sampled 103 savings cooperatives demonstrated diverse organizational characteristics, as illustrated in Table 1. Most cooperatives showed

long-term operational stability, with 32.0% having been established for over 50 years and 29.1% operating for 41–50 years. In terms of organizational size, the majority were classified as small to medium-sized cooperatives. Specifically, 41.7% had fewer than 5,000 members on average over the past three years, while 33.0% employed fewer than 10 staff members on average. These figures suggest a potentially flexible management style or a participatory structure involving a limited member base. However, from an economic perspective, many of these cooperatives exhibited strong financial foundations. Over half (53.4%) reported average total assets exceeding 5,001 million baht. Average annual income over the past three years showed wide variation, with 25.2% earning less than 100 million baht and 26.2% earning more than 500 million baht. This indicates varying levels of business operations and economic capacity within the sample.

The analysis revealed that the overall mean score for digital transformation was 4.385 (SD = 0.560), which is considered a "high" level. When examining the individual components, all aspects were also rated at a high level. Digital Technology recorded the highest average score at 4.479 (SD = 0.571), while Digital Capabilities had the lowest average among the subcomponents at 4.291 (SD = 0.700). These findings suggest that, overall, the sampled organizations are experiencing a relatively strong level of digital transformation (Table 2).

Table 1: General characteristics of the cooperatives

Cooperative characteristic	Category	Frequency	Percentage
Years since establishment	Less than 10 years	6	5.8
	10–20 years	2	1.9
	21–30 years	7	6.8
	31–40 years	25	24.3
	41–50 years	30	29.1
	More than 50 years	33	32.0
Average number of members in the past 3 years	Less than 5,000	43	41.7
	5,000–10,000	29	28.2
	10,001–15,000	14	13.6
	15,001–20,000	6	5.8
	20,001–25,000	2	1.9
	More than 25,000	9	8.7
Average asset value in the past 3 years	Less than 1,000 million THB	17	16.5
	1,000–2,000 million THB	12	11.7
	2,001–3,000 million THB	11	10.7
	3,001–4,000 million THB	4	3.9
	4,001–5,000 million THB	4	3.9
	More than 5,000 million THB	55	53.4
Average revenue in the past 3 years	Less than 100 million THB	26	25.2
	100–200 million THB	19	18.4
	201–300 million THB	12	11.7
	301–400 million THB	11	10.7
	401–500 million THB	8	7.8
	More than 501 million THB	27	26.2
	Total	103	100.0

Table 2: Levels of digital transformation in savings cooperatives

Variable/component	Mean	Standard deviation	Level
Digital organizational transformation (overall)	4.385	0.560	High
Digital strategy	4.476	0.577	High
Digital technology	4.479	0.571	High
Digital capability	4.291	0.700	High
Appropriate utilization	4.294	0.604	High

The results show that only the digital strategy demonstrates a statistically significant difference when compared by average revenue ($p < .05$), while the other components do not exhibit significant variation across the cooperative characteristics analyzed. Therefore, a pairwise comparison of digital strategy by average revenue over the past three years was conducted using the Least Significant Difference (LSD) method to further identify which revenue groups differ significantly (Table 3).

Table 3: Comparison of digital transformation levels by cooperative characteristics

Digital transformation component	Cooperative (age)	Average (members)	Average (employees)	Average (asset size)	Average (revenue)
Digital organizational transformation	1.067 (0.367)	1.201 (0.315)	0.954 (0.450)	1.582 (0.172)	2.114 (0.070)
Digital strategy	1.064 (0.385)	1.594 (0.169)	1.015 (0.413)	0.994 (0.426)	2.601 (0.030*)
Digital technology	1.167 (0.331)	1.129 (0.350)	1.357 (0.247)	1.873 (0.106)	1.934 (0.096)
Digital capability	1.167 (0.331)	0.745 (0.592)	0.654 (0.659)	1.477 (0.225)	1.283 (0.277)
Appropriate utilization	0.839 (0.525)	1.201 (0.314)	0.906 (0.481)	2.052 (0.078)	1.958 (0.092)

Values shown as F-value (P-value); *: Significant at the 0.05 level

The pairwise comparison results indicated that savings cooperatives with annual revenue of 501 million baht or more had a significantly higher mean score for Digital Strategy compared to the following groups: cooperatives with revenue less than 100 million baht (mean difference = 0.433), those with revenue between 201–300 million baht (mean difference = 0.519), and those with revenue between 301–400 million baht (mean difference = 0.438). These findings demonstrate that the highest revenue cooperatives possess significantly stronger digital strategies than certain lower-revenue groups (Table 4).

5. Discussion

This study uncovers a central paradox: the digital transformation of Thai savings cooperatives is quantitatively successful but qualitatively fragile. Counter to conventional wisdom, factors like organizational size and age have proven irrelevant to this initial progress. This discussion argues that the reason lies in external, 'equalizing' pressures that have forced widespread technology acquisition while bypassing the slower, more complex work of human development. This has created a profound Strategy-Execution Gap, revealing that the true bottleneck to sustainable change is not the technology itself, but the challenge of social and cultural integration.

While the findings point to a high degree of digital transformation among Thai savings cooperatives, showcasing their adaptability, this conclusion must be framed by its methodological limitations. The study's reliance on purposive sampling, which targeted cooperatives already using digital platforms, likely created an upward skew in the results, suggesting a higher adoption rate than may be the reality (Etikan et al., 2016). This potential for overestimation is further compounded by two other key considerations: the possibility of Respondent Bias, where participants may have presented an overly favorable view of their own organizations (Krumpal, 2013), and the researcher's own potential for Confirmation Bias during data interpretation. Consequently, the findings are more likely representative of a digitally advanced subgroup rather than the entire cooperative sector. The transparent discussion of these limitations throughout the analysis is a deliberate attempt to situate the Confirmation Bias within an academically acceptable framework and to ensure a responsible interpretation of the data (Creswell, 2009).

The research highlights a critical imbalance in the digital transformation of savings cooperatives, specifically the chasm between the high level of technology adoption and the comparatively low digital capabilities of personnel. This gap suggests the current transformation may be superficial rather than structurally sustainable. The technological push appears driven largely by external pressures—such as the post-COVID-19 financial landscape (Xia et al., 2022), competitive necessity (Wanyonyi and Ngaba, 2021), the demands of a new generation of members (Duarte et al., 2016), and institutional loan support. These factors have compelled cooperatives to rapidly acquire technology, often through licensing, in a move characteristic of the Unfreezing stage in Lewin's change theory (Lewin, 1947). However, the lagging development of employee skills has created a stark disconnect between the new technical systems and the existing social systems, a classic challenge described in Socio-Technical Systems Theory (Trist and Bamforth, 1951). This human-centric gap suggests that while cooperatives have been successfully unfrozen, they have largely failed to transition into the Changing stage, where the effective integration of new systems is meant to occur.

The personnel's struggle to internalize new digital skills and embed them within the organizational culture points to a failure in what Lewin (1947) describes as the Refreezing stage—the crucial step of cementing new behaviors into sustainable practice. This gap between available technology and human readiness creates a significant bottleneck in practical application, a phenomenon consistent with Diffusion of Innovations Theory (Rogers, 2003). This theory posits that even after an organization formally adopts an innovation, its actual diffusion is constrained by the preparedness of its users.

Table 4: Pairwise comparison of digital strategy by average revenue over the past three years

Average annual revenue over the past 3 years	Mean	Digital strategy					
		1	2	3	4	5	6
		4.308	4.596	4.222	4.303	4.458	4.741
1. Less than 100 million Baht	4.308	-	0.289	0.085	0.005	0.151	0.433*
2. 100–200 million Baht	4.596		-	0.374	0.293	0.138	0.144
3. 201–300 million Baht	4.222			-	0.081	0.236	0.519*
4. 301–400 million Baht	4.303				-	0.155	0.438*
5. 401–500 million Baht	4.458					-	0.282
6. More than 501 million Baht	4.741						-

*: Statistically significant at the 0.05 level

In summary, the digital transformation of the sampled cooperatives is a story of quantitative success undermined by qualitative fragility. The heavy emphasis on acquiring technology, at the expense of developing people, means the change has not been fully internalized by the workforce. In essence, the process was effectively 'Unfrozen' and the 'Changed' state was equipped with new systems, but the critical Refrozen stage, where change becomes embedded in individuals, has not been reached. This reveals the human capability gap not as a simple weakness, but as the pivotal factor that

will define the long-term outcome of their digital journey

Counterintuitively, this research finds that a cooperative's structural characteristics, such as age and size, as measured by membership, staff, assets, and average income, show no significant statistical relationship with its overall level of digital transformation (Ribeiro-Navarrete et al., 2023; Santos et al., 2024). This lack of correlation extends to the specific components of digital technology, capability, and appropriate use, with the sole exception of a link found between average income and digital strategy (Ermaya et al., 2023). This outcome directly challenges the conventional wisdom that larger, more established organizations are inherently better positioned for adaptation (Wu et al., 2024). A deeper analysis suggests a more complex dynamic at play within the Thai cooperative context, which can be explained by two primary factors: a state of Equivalence across institutions and a pronounced Strategy-Execution Gap.

The finding that digital transformation levels do not significantly vary by cooperative age or size can be attributed to a phenomenon of Equalization, driven by macro-level factors like government policy that act as an Equalizing Mechanism. This external pressure effectively creates a universal Unfreezing state, compelling all cooperatives to adapt, a concept aligned with Lewin's (1947) Change Theory. Similarly, this aligns with Diffusion of Innovations Theory (Rogers, 2003), which posits that when investment barriers are removed, the initial decision to adopt technology becomes decoupled from an organization's internal resources. However, a more critical perspective offered by Socio-Technical Systems Theory (Trist and Bamforth, 1951) suggests this equalization effect may be temporary. While it may level the playing field for the initial Technical System Acquisition, structural factors—such as age, which influences culture, and size, which reflects complexity—are highly likely to re-emerge as critical variables during the far more challenging Social System Adaptation phase of long-term technology integration and genuine capability development.

Perhaps the most critical finding is the emergence of a 'Strategy-Execution Gap.' This is evidenced by the fact that while varying income levels correlate with different digital strategies, they do not significantly impact the tangible outcomes of technology adoption, digital capability, or appropriate use. This disjuncture can be analyzed through several theoretical lenses. From the perspective of Socio-Technical Systems Theory (Trist and Bamforth, 1951), this gap illustrates that while financial resources can procure an advanced Technical System, they cannot directly purchase an adapted Social System, as building capability and culture is a complex, time-intensive process. This aligns with a failure in the 'Refreezing' stage of Lewin's (1947) Change Theory, where a well-defined strategy fails to embed new behaviors sustainably. Further illuminating this, Diffusion of Innovations Theory (Rogers, 2003) clarifies that while a strong strategy may lead to a successful organizational Adoption Decision, the process bottlenecks at the individual Implementation stage. In essence, cooperatives can successfully buy the technology but fail to diffuse the knowledge and skills needed for its widespread, effective use among their personnel.

In conclusion, the lack of a statistically significant relationship between most cooperative-specific characteristics and their digital transformation outcomes should not be interpreted as being irrelevant. Rather, it points to a more complex dynamic. First, it suggests that the initial digital transformation landscape for Thai cooperatives is largely shaped by overriding macro-level factors, which temporarily masks the influence of individual organizational differences. Second, and perhaps more critically, it exposes a deep-seated, systemic challenge: the difficulty of translating 'strategies on paper' into tangible 'operational capabilities.' This is powerfully underscored by the reality that even the most resource-rich and strategically aligned cooperatives still grapple with the social and cultural dimensions of change, confirming that the human element remains the most formidable hurdle.

Despite efforts to reach a broad sample of cooperative savings institutions, data collection faced notable constraints. A limited response rate, lack of centralized records, and institutional sensitivity around digital technology created barriers to participation. These challenges not only reduced the representativeness of the sample but also reflected deeper structural and regulatory limitations in accessing reliable, organization-level data, underscoring the need for cautious interpretation of the findings.

Although the study initially targeted a sample of 310 cooperative savings institutions, only 103 valid responses were received, resulting in a response rate of 33.25%. This limited participation significantly constrains the generalizability of the findings to the broader population of cooperative savings institutions in Thailand, particularly those undergoing digital transformation. The absence of a reliable national database identifying which cooperatives utilize platforms and/or web applications further complicates the sampling process. As a result, purposive sampling was employed to ensure alignment with the conceptual framework, especially regarding the Digital Transformation variable, which specifically focuses on the use of such technologies.

The restricted sample size reflects not only the limitations in data accessibility but also the structural challenges in identifying qualified respondents. While the selected sample was filtered to include cooperatives with digital technology adoption, the low response rate introduces potential non-response bias and limits the statistical power of the analysis. Therefore, the findings should be interpreted with caution, acknowledging that they may not fully represent the diversity of digital practices across all cooperative savings institutions in Thailand.

In addition to sampling limitations, many cooperative savings institutions declined to participate due to concerns over data sensitivity and regulatory constraints. Several respondents indicated that they were not authorized by their boards to disclose information related to digital technology usage. Given that Thai cooperatives operate under specific legal frameworks, topics involving digital transformation are often perceived as confidential or strategically sensitive. These institutional barriers contributed to the low response rate and reflected broader limitations in accessing in-depth, organization-level data on digital adoption.

For policymakers and Regulators, instead of focusing solely on financial support, government agencies should equip cooperatives with the strategic tools they need to succeed. This means developing practical "playbooks" or strategic templates that guide lower-revenue co-ops in their digital planning, as they are the ones who lag in strategy development. A government-facilitated network, where financially successful cooperatives can mentor their smaller peers, would also accelerate progress. Crucially, existing low-interest loan programs should be updated to mandate that a portion of funds be used for human capital development, investing in people's skills, not just purchasing technology, to bridge the critical "Strategy-Execution Gap" identified in the research.

For academic research, Future academic inquiry should dig deeper into the nuances revealed by this study. Qualitative research is needed to explore the "why" behind the findings—specifically, the cultural, leadership, and operational factors that made structural characteristics like age and size statistically insignificant. A long-term longitudinal study could track cooperatives to see if the "Equalization" observed is temporary and if organizational characteristics become more influential over time. Most importantly, research should expand its focus from management's perspective to the cooperative members themselves, investigating whether the high level of digital transformation translates into a genuinely improved experience and added value for the people the cooperatives are meant to serve.

For practitioners, Cooperatives must proactively close the gap between acquiring technology and using it effectively. Training should go beyond simple software tutorials and focus on integrating new digital tools into daily workflows and member service processes, thereby balancing the "social" and "technical" aspects of the organization. A key step is to create a culture of continuous learning and empower internal "Digital Champions"—tech-savvy employees who can guide their colleagues and drive adoption from within. This ensures that the digital transformation is not just a top-down mandate but becomes a deeply embedded, sustainable part of the cooperative's culture, addressing the fact that digital capability was the lowest-rated component in the study.

6. Conclusion

This study investigated the state of digital transformation among savings cooperatives in Thailand and found that, overall, such transformation is being implemented at a high level. While most cooperative characteristics showed no statistically significant association with the level of digital transformation, the average revenue over the past three years did have a significant effect on digital strategy. Specifically, cooperatives with higher revenue demonstrated more advanced and distinct digital strategies.

Acknowledgment

The authors are deeply grateful to all cooperative participants who generously dedicated their time to this research. Their valuable contributions were instrumental to the success of this study.

Compliance with ethical standards

Ethical considerations

The authors declared that the participants were assured that their participation was voluntary and that they could withdraw from the study at any time. The data collected from the participants was kept confidential and anonymous, and the data was only used for research purposes. The authors further declared that the study complied with ethical guidelines set forth by the Institutional Review Board of the human research ethics committee (WUEC-25-026-01).

Conflict of interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

References

Ciruela-Lorenzo AM, Del-Aguila-Obra AR, Padilla-Meléndez A, and Plaza-Angulo JJ (2020). Digitalization of Agri-cooperatives in the smart agriculture context: Proposal of a digital diagnosis tool. Sustainability, 12(4): 1325. https://doi.org/10.3390/su12041325

Creswell JW (2009). Research designs: Qualitative, quantitative, and mixed methods approaches. 3rd Edition, SAGE Publications, Thousand Oaks, USA.

Duarte AF, Moreira VR, Ferraresi AA, and Gerhard A (2016). Evaluating credit union members' perception of service quality through service innovation. RAI Revista de Administração e Inovação, 13(4): 242-250. https://doi.org/10.1016/j.rai.2016.06.007

Ermaya K, Ermaya HNL, Azhar S, and Mulyana I (2023). The unique strategy in digital cooperatives to increase benefit for members. International Journal of Business, Economics, and Social Development, 4(4): 246-252. https://doi.org/10.46336/ijbesd.v4i4.430

Esamah A, Aujirapongpan S, Rakangthong NK, and Imjai N (2023). Agile leadership and digital transformation in savings cooperative limited: Impact on sustainable performance

amidst COVID-19. Journal of Human, Earth, and Future, 4(1): 36-53. https://doi.org/10.28991/HEF-2023-04-01-04

Etikan I, Musa SA, and Alkassim RS (2016). Comparison of convenience sampling and purposive sampling. American Journal of Theoretical and Applied Statistics, 5(1): 1-4. https://doi.org/10.11648/j.ajtas.20160501.11

Fernandez-Vidal J, Perotti FA, Gonzalez R, and Gasco J (2022). Managing digital transformation: The view from the top. Journal of Business Research, 152: 29-41. https://doi.org/10.1016/j.jbusres.2022.07.020

Haq IU and Huo C (2023). Digital strategy and environmental performance: the mediating role of digitalization in SMEs. Digital Economy and Sustainable Development, 1: 9. https://doi.org/10.1007/s44265-023-00010-5 **PMCid:PMC10232346**

Kamau JN, Mathuva DM, and Ndiritu SW (2024). Digital transformation: a study of how SACCO members in Kenya experience financial inclusion through digital financial services. Forum Scientiae Oeconomia, 12(1): 139-150.

Kebede AS, Ozolins LL, Holst H, and Galvin K (2022). Digital engagement of older adults: Scoping review. Journal of Medical Internet Research, 24(12): e40192. https://doi.org/10.2196/40192 **PMid:36477006 PMCid:PMC9773036**

Khin S and Ho TC (2019). Digital technology, digital capability and organizational performance: A mediating role of digital innovation. International Journal of Innovation Science, 11(2): 177-195. https://doi.org/10.1108/IJIS-08-2018-0083

Kraus S, Durst S, Ferreira JJ, Veiga P, Kailer N, and Weinmann A (2022). Digital transformation in business and management research: An overview of the current status quo. International Journal of Information Management, 63: 102466. https://doi.org/10.1016/j.ijinfomgt.2021.102466

Kreuzer T, Lindenthal AK, Oberländer AM, and Röglinger M (2022). The effects of digital technology on opportunity recognition. Business & Information Systems Engineering, 64: 47-67. https://doi.org/10.1007/s12599-021-00733-9 **PMCid:PMC8811742**

Krumpal I (2013). Determinants of social desirability bias in sensitive surveys: A literature review. Quality & Quantity, 47: 2025-2047. https://doi.org/10.1007/s11135-011-9640-9

Lewin K (1947). Frontiers in group dynamics: Concept, method and reality in social science; social equilibria and social change. Human Relations, 1(1): 5-41. https://doi.org/10.1177/001872674700100103

Minzar M and Mishra MK (2024). Digital transformation in cooperatives: Opportunities and challenges. IOSR Journal of Business and Management, 26(10): 23-31. https://doi.org/10.9790/487X-2610132331

Ogindo EA and Njoka C (2023). Digital transformation and financial performance of deposit-taking savings and credit co-operatives in Nairobi City County, Kenya. Journal of Finance and Accounting, 3(2): 45-56. https://doi.org/10.70619/vol3iss2pp45-56

Pojanavatee S and Kingshott R (2025). Liquidity and leverage on the financial performance of savings and credit cooperatives in the emerging Thailand market. Journal of Indian Business Research, 17(1): 66-82. https://doi.org/10.1108/JIBR-10-2024-0221

Ribeiro-Navarrete B, López-Cabarcos MÁ, Piñeiro-Chousa J, and Simón-Moya V (2025). The moment is now! From digital transformation to environmental performance. Venture Capital, 27(1): 43-78. https://doi.org/10.1080/13691066.2023.2249231

Ribeiro-Navarrete B, Martín JMM, Guaita-Martínez JM, and Simón-Moya V (2023). Analysing cooperatives' digital maturity using a synthetic indicator. International Journal of Information Management, 72: 102678. https://doi.org/10.1016/j.ijinfomgt.2023.102678

Rogers EM (2003). Diffusion of innovations. 5th Edition, Free Press, New York, USA.

Santos FJ, Guzman C, and Ahumada P (2024). Assessing the digital transformation in agri-food cooperatives and its determinants. Journal of Rural Studies, 105: 103168. https://doi.org/10.1016/j.jrurstud.2023.103168

Stefanelli V and Manta F (2023). Digital financial services and open banking innovation: Are banks becoming 'invisible'? Global Business Review. https://doi.org/10.1177/09721509231151491

Sturn R (2024). Digital transformation and solidarity in cooperatives. In: Ambühl M, Brusoni S, Niedworok A, and Gutmann M (Eds.) Cooperatives in an uncertain world: 93-110. Springer, Cham, Switzerland. https://doi.org/10.1007/978-3-031-56200-6_6

Trist EL and Bamforth KW (1951). Some social and psychological consequences of the longwall method of coal-getting: An examination of the psychological situation and defences of a work group in relation to the social structure and technological content of the work system. Human Relations, 4(1): 3-38. https://doi.org/10.1177/001872675100400101

van Zeeland I and Pierson J (2024). Changing the whole game: effects of the COVID-19 pandemic's accelerated digitalization on European bank staff's data protection capabilities. Financial Innovation, 10: 29. https://doi.org/10.1186/s40854-023-00533-y

Velyako V and Musa S (2024). The relationship between digital organizational culture, digital capability, digital innovation, organizational resilience, and competitive advantage. Journal of the Knowledge Economy, 15: 11956-11975. https://doi.org/10.1007/s13132-023-01575-4

Verstegen L, Houkes W, and Reymen I (2019). Configuring collective digital-technology usage in dynamic and complex design practices. Research Policy, 48(8): 103696. https://doi.org/10.1016/j.respol.2018.10.020

Vial G (2021). Understanding digital transformation: A review and a research agenda. In: Hinterhuber A, Vescovi T, and Checchinato F (Eds.) Managing digital transformation: 13-66. 1st Edition, Routledge, London, UK.

Wanyonyi KS and Ngaba D (2021). Digital financial services and financial performance of savings and credit cooperative societies in Kakamega County, Kenya. International Journal of Current Aspects in Finance, Banking and Accounting, 3(1): 9-20. https://doi.org/10.35942/ijcfa.v3i1.177

Wu CH, Chou CW, Chien CF, and Lin YS (2024). Digital transformation in manufacturing industries: Effects of firm size, product innovation, and production type. Technological Forecasting and Social Change, 207: 123624. https://doi.org/10.1016/j.techfore.2024.123624

Xia Y, Qiao Z, and Xie G (2022). Corporate resilience to the COVID-19 pandemic: The role of digital finance. Pacific-Basin Finance Journal, 74: 101791. https://doi.org/10.1016/j.pacfin.2022.101791 **PMCid:PMC9159783**

Yamane T (1973). Statistics: An introductory analysis. Harper & Row, New York, USA.

Zhu Y and Jin S (2023). COVID-19, digital transformation of banks, and operational capabilities of commercial banks. Sustainability, 15(11): 8783. https://doi.org/10.3390/su15118783