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Digital Transformation and Financial Literacy as Drivers of Innovation and Financial Agility: Evidence from Family-Owned Businesses in Southeast Asia

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ABSTRACT

This study investigates how digital transformation (DT) and financial literacy (FL) influence innovation capability (IC) and financial management effectiveness (FME) in family-owned small and medium enterprises (SMEs) across five Southeast Asian countries. Grounded in the resource-based view, the model positioned organizational learning (OL) and strategic agility (SA) as mediators linking DT and FL to performance outcomes. Data were collected through a cross-sectional survey of 300 respondents and analyzed using structural equation modeling (SEM). The findings reveal that DT primarily enhances OL, while FL exerts a stronger influence on SA. Both OL and SA significantly drive IC, which in turn positively affects FME and firms' competitiveness (FC). Additionally, FL is revealed to be a meaningful predictor of DT, suggesting that financially literate leaders are more likely to adopt and implement digital tools effectively. This study also uncovers cross-country differences in path strengths, reflecting how institutional context shapes capability development. While all core hypotheses are supported, this study is limited by its cross-sectional design, reliance on self-developed measurement items, and partial regional scope. This study contributes to the literature on SMEs' internal capacity-building by highlighting the complementary roles of digital and financial competencies in enhancing innovation and strategic outcomes within family-owned business context.

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I. INTRODUCTION

Family-owned businesses are a vital part of the landscape of small and medium-sized enterprises (SMEs) in Southeast Asia. Based on the ASEAN SME Policy Index 2024, SMEs, including microenterprises, account for more than 95% of all enterprises across nearly all ASEAN Member States and contribute significantly to employment and economic output. In the Philippines, SMEs accounted for 99.6% of all businesses and provided 65.1% of total employment in 2022, although they contributed only 35.7% to GDP. In Malaysia, SMEs account for 96.9% of all firms, contributing 38.2% to GDP and 17.3% to total exports. Although official data that presents family-owned SMEs specifically is limited, regional evidence suggests that a large share of SMEs in Southeast Asia are family-run, particularly in traditional sectors, such as food and beverage, retail, and small-scale manufacturing. These enterprises are essential, not only for sustaining jobs and household incomes, but also for promoting inclusive economic growth and preserving cultural and entrepreneurial values across generations.

Previous studies highlighted the positive effects of Digital Transformation on firms' performance (Guo & Xu, 2021) and the essential role of Financial Literacy in enhancing managerial decision-making and risk mitigation (Senaya, 2025). However, these streams of literature often treated digital and financial capabilities separately, despite their growing interdependence in today's business environment. In practice, digital initiatives often require suitable financial planning, while the effective use of financial resources increasingly depends on digital tools, such as FinTech, cloud-based accounting systems, and digital performance analytics. This synergy is particularly critical for family-owned businesses in Southeast Asia, which may face resource constraints, informal governance structures, and generational divides in capability adoption. Investigating both digital and financial capabilities together could provide a more holistic understanding of how family-owned firms build resilience, innovate, and convert strategic investments into tangible financial and competitive outcomes. Despite this, existing studies on family-owned businesses often relied on single-country evidence or treat innovation as an immediate result of digitalization, overlooking the organizational mechanisms and complementary capabilities needed to turn innovation into long-term performance gains.

Therefore, to address these gaps, this study investigates how Digital Transformation and Financial Literacy jointly enhance Innovation Capability and Financial Management Effectiveness through the mediating roles of Organizational Learning and Strategic Agility. By integrating concepts from the Dynamic Capabilities Theory (Bleady et al., 2018; Teece, 2023) and Organizational Learning Theory (Basten & Haamann, 2018; Crossan et al., 1995), this study provides a comprehensive framework to explain how family-owned businesses in Southeast Asia can leverage internal capabilities to improve both financial and strategic outcomes. By adopting a multi-country approach, this study provides insights into the varying impact of digital and financial competencies across diverse institutional and cultural contexts in Southeast Asia.

II. ANALYTICAL FRAMEWORK

A. Digital Transformation

Digital transformation (DT), which has emerged as a key enabler of organizational change in the Fourth Industrial Revolution (Industry 4.0), is broadly defined as the integration of digital technologies across business processes to drive efficiency, innovation, and competitiveness (Guo & Xu, 2021). In the context of family-owned businesses, especially in Southeast Asia, digital transformation not only refers to technological adoption, but also cultural shifts and reconfiguration of legacy processes (Soluk & Kammerlander, 2021).

Despite digital transformation's potential, its adoption and implementation within family-owned firms are often hampered by contextual and structural challenges. Family-owned firms in emerging economies often exhibit lower levels of digital literacy due to path dependency, family-centered goals, and risk aversion (Sukamdani, 2023). However, previous studies showed that digital tools, such as ERP, AI-enabled financial dashboards, and cloud accounting, can help in reducing information asymmetry and promoting better financial decision-making (Wang et al., 2025).

Digital transformation also enhances dynamic capabilities by facilitating the sensing and seizing of market opportunities (Teece, 2023). Specifically, DT can foster organizational learning by creating real-time data flows and

collaborative platforms (Dörner & Rundel, 2021). Moreover, DT enables strategic agility by shortening feedback loops and enabling flexible resource deployment in uncertain environments (Bounfour et al., 2023). Thus, based on these theoretical reasonings, the following hypotheses are proposed:

H1: Digital Transformation positively influences Organizational Learning.
H2: Digital Transformation positively influences Strategic Agility.

B. Financial Literacy

Financial literacy (FL) is the capability to comprehend and apply financial knowledge to make informed decisions in real-world business settings (Song et al., 2023). In the ASEAN region, family-owned businesses often suffer from financial illiteracy, especially in first-generation ownership (Noor et al., 2024). However, as businesses grow and successors with formal education take over the leader positions, financial literacy tends to improve (Albastiki & Hamdan, 2019).

Recent studies by Nguyen and Ngo (2021) and Yakob et al. (2021) highlighted that SMEs in Southeast Asia with higher levels of financial literacy exhibit more professionalized financial practices and are more inclined to adopt modern financial technologies. In this way, financially literate managers are better equipped to assess risks, interpret financial data, and support an organizational learning culture (Brown et al., 2006).

Additionally, financial literacy enhances strategic agility, as financially informed leaders can reallocate resources swiftly, manage financial risks, and invest in innovation under uncertainty (Taylor, 2024). Thus, based on these theoretical reasonings, the following hypotheses are proposed:

H3: Financial Literacy positively influences Organizational Learning.
H4: Financial Literacy positively influences Strategic Agility.

C. Financial Literacy and Digital Transformation

Financial literacy, defined as the ability to understand and effectively harness financial skills, such as budgeting, investing, and financial decision-making (Yang et al., 2023), has increasingly been recognized as a foundational enabler of digital transformation. In the business context, especially small and family-owned enterprises, financial literacy influences managerial capacity to evaluate, adopt, and utilize digital technologies for strategic purposes. Morgan and Trinh (2019) highlighted that in ASEAN countries, higher levels of financial literacy are positively associated with greater adoption of digital financial services, such as mobile banking, e-invoicing, and cloud accounting. This suggests that financially literate firms are better positioned to understand the cost-benefit trade-offs, investment risks, and operational implications of digital transformation.

Furthermore, OECD (2022) emphasized that digital transformation, particularly in financial and operational functions, requires users to interpret and respond to financial data generated through digital dashboards, ERP systems, or FinTech platforms. Firms with limited financial literacy may lack the capability to fully leverage digital tools, leading to underutilization or failed transformation initiatives. In contrast, financially literate managers can better integrate digital systems into planning, budgeting, and performance monitoring processes, thereby driving strategic innovation and improving decision-making agility (Frimpong et al., 2022).

In the specific context of family-owned businesses in Southeast Asia, which often operate through informal structures and generational leadership, financial literacy serves as a cognitive resource that mitigates risk aversion and path dependency, both of which are well-known barriers for digital transformation (Çallı & Çallı, 2021). Therefore, financial literacy not only facilitates better financial decisions, but also serves as a catalyst for adopting and institutionalizing digital transformation across organizational levels. Thus, based on these theoretical reasonings, the following hypothesis is proposed:

H5: Financial Literacy has a positive and significant effect on Digital Transformation in family-owned businesses.

D. Organizational Learning

Organizational learning (OL) is essential for enabling firms in adapting themselves to environmental changes and integrate external knowledge (Argote & Miron-Spektor, 2011). In family-owned businesses, OL mitigates the challenges of over-reliance on tacit founder knowledge (Zahra, 2012) by institutionalizing learning processes, such as training, knowledge sharing, and experimentation.

García-Morales et al. (2006) argued that OL is a critical antecedent of innovation capability, as learning facilitates the development of new routines and business models. In the Southeast Asian context, where market turbulence and digital disruption are frequent, learning-oriented family-owned firms tend to outperform competitors (Sukamdani, 2023). Moreover, digital tools further enhance OL by enabling faster access to market intelligence and analytics (Luo, 2021). Thus, based on these theoretical reasonings, the following hypothesis is proposed:

H6: Organizational Learning positively influences Innovation Capability.

E. Strategic Agility

Strategic agility is a firm's ability to respond swiftly to environmental volatility by adjusting strategies, processes, and resource allocation (Bounfour et al., 2023). In contrast to traditional, hierarchical family-owned firms—which are often slow in respond to the changes, agile family-owned businesses demonstrate better flexibility and responsiveness to market dynamics (Thrassou et al., 2018).

Agility also plays a vital role in enhancing innovation capability, particularly regarding how firms experiment with new product launches, redesign business models, or introduce financial innovations (AlTaweel & Al-Hawary, 2021). The perspective of dynamic capabilities (Teece, 2023) positions agility as a higher-order capability that fosters innovative actions under uncertainty. Thus, based on these theoretical reasonings, the following hypothesis is proposed:

H7: Strategic Agility positively influences Innovation Capability.

F. Innovation Capability

Innovation capability (IC) is a firm's capacity to create and implement new ideas, products, services, or processes (Al Azzani et al., 2024). In family-owned businesses, innovation is often stifled by risk aversion, socio-emotional wealth preservation, and reliance on historical success patterns (Ahmad et al., 2021).

However, recent studies suggested that when family-owned firms successfully combine learning cultures and agility with digital tools, they are better positioned to develop innovation capabilities (Tripathi, 2024). For Southeast Asia's SMEs, innovation capability has becomed critical, both for competing with larger corporations and surviving in fast-evolving markets (Aisyah & Saputra, 2021).

A strong innovation capability has downstream effects on both financial management effectiveness and firms' competitiveness. Innovating financial processes (e.g., automated reporting, AI-driven forecasting) enhances efficiency and control, while product and service innovation improves customer value and competitive positioning (Migdadi, 2022). Thus, based on these theoretical reasonings, the following hypotheses are proposed:

H8: Innovation Capability positively influences Financial Management Effectiveness.
H9: Innovation Capability positively influences Firms' Competitiveness.

G. Financial Management Effectiveness

Financial management effectiveness (FME) refers to how well a firm manages financial processes, such as budgeting, liquidity, reporting, and investment (Ahmad, 2024). Innovation-driven financial management enables firms to optimize operations by reducing costs, improving data accuracy, and supporting more agile decision-making (da Fonte, 2023).

Improved financial management contributes to overall firms' competitiveness by freeing up resources for strategic initiatives, strengthening financial resilience, and boosting credibility with external stakeholders (Graña-Alvarez et al., 2024). Thus, based on these theoretical reasonings, the following hypothesis is proposed:

H10: Financial Management Effectiveness positively influences Firms' Competitiveness.

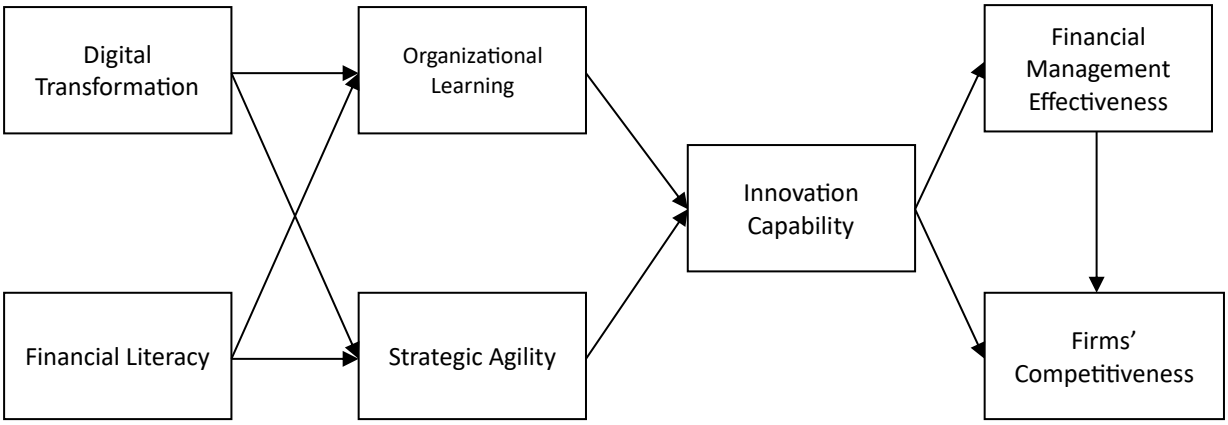

Figure 1. Research Framework

III. METHODOLOGY

This study adopts a quantitative research design using a cross-sectional survey approach to examine the structural relationships among digital transformation (DT), financial literacy (FL), organizational learning (OL), strategic agility (SA), innovation capability (IC), financial management effectiveness (FME), and firms' competitiveness (FC) within family-owned small and medium-sized enterprises (SMEs) in Southeast Asia. The study is grounded in a positivist paradigm, which is considered appropriate for hypothesis testing and examining causal relationships among many latent constructs.

The target respondents of this study comprised family-owned SMEs operating in five ASEAN countries: Indonesia, Vietnam, Thailand, Malaysia, and the Philippines. These countries were purposefully selected by taking into account their significant SME sectors, diverse levels of digital and financial infrastructure, and economic representation within the region. Meanwhile, other ASEAN countries, such as Singapore, Cambodia, and Laos, were excluded due to limitations in data accessibility, language constraints, and the absence of comparable SME ecosystems.

Purposive sampling was used to select SMEs that met the following inclusion criteria: (1) the firm has been operating for a minimum time span of five years, (2) it is family-owned with active multi-generational involvement in management or strategic decision-making, and (3) it has undergone or initiated digital transformation strategies. Respondents targeted were owners, financial managers, or next-generation leaders directly involved in digital and financial decision-making.

A total of 380 responses were collected through both online and offline survey distributed between March and June 2024. After data screening, consisting of checks for completeness, straight lining, and inconsistent responses, 300 valid responses were retained for further analysis. While the final number falls below the ideal threshold for large-scale SEM models, the sample were deemed acceptable for Partial Least Squares Structural Equation Modeling (PLS-SEM), which is considered robust for exploratory studies with complex models and moderate sample sizes. The emphasis was placed on data validity and integrity rather than merely data quantity.

The survey instrument was developed using measurement items adapted from established literature and theoretical constructs. Where validated scales were unavailable or contextually mismatched, the items were self-developed based on relevant conceptual dimensions so that they aligned with the Southeast Asian's SME context. All items were measured using a seven-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree).

To ensure the clarity, contextual appropriateness, and content validity of each item, a pilot test was conducted in advance with 10 academics and 10 family-owned business owners. Their feedback was used to refine item wording and improve comprehensibility. The finalized questionnaire was translated into Bahasa Indonesia, Vietnamese, Thai, Malaysian, and Tagalog, then back-translated following Edunov et al. (2018)'s recommendations to ensure linguistic equivalence and cultural relevance.

Table 1. Measurement Items

Construct	Item	Source
Digital Transformation	Our family-owned business has implemented digital technologies across key business functions (e.g., operations, marketing, or finance).	Adapted from Bounfour et al. (2023)
	Compared to similar family-owned businesses, we have adopted digital tools (e.g., ERP, cloud accounting, digital dashboards) earlier.	
	We have a clear digital strategy that guides our technology adoption and use.	
	We have continuously invested in upgrading digital infrastructure to improve efficiency and decision-making.	
	Digital systems and tools are well-integrated into our daily routines and support collaboration across generations.	
	Our employees, including family members, are trained and encouraged to utilize digital technologies in their work.	
Financial Literacy	I am aware of the costs and benefits of accessing credit.	Adapted from Graña-Alvarez et al. (2024)
	I can correctly calculate the interest rates on my loan payments.	
	I have used my skills to ascertain the financial trends of the firm.	
	I have skills in terms of minimizing losses by reducing bad debts.	
	I am confident in interpreting financial reports and using them to support business decisions.	
Organizational Learning	Our organization provides continuous opportunities for employees to learn and develop their skills.	Adapted from Tripathi (2024)
	Employees are encouraged to engage in open dialogue and inquiry to improve our practices.	
	Teamwork is used as a platform for collective learning and shared problem-solving.	
	We have systems in place to capture, document, and share lessons learned across the organization.	
	Employees at all levels are empowered to experiment and take initiative to improve work processes.	
	We actively seek feedback from customers, competitors, and the external environment to guide learning.	
Strategic Agility	Our business actively explores new opportunities that arise from changes in the market or business environment.	Adapted from Arsawan et al. (2022)
	We are able to recognize and quickly respond to external changes, such as customer needs, regulations, or competition.	
	Our decision-making process is fast and flexible when dealing with unexpected challenges.	
	We can reallocate our people, time, or budget swiftly when the business situation changes.	
	We regularly review and adjust our business strategies to stay competitive in a dynamic environment.	
Innovation Capability	We regularly introduce new or improved products or services to meet customers' needs.	Adapted from Migdadi (2022)
	We have developed or improved internal processes to increase efficiency or reduce costs.	
	We apply new marketing methods to promote our products or expand into new markets.	
	We have made changes to the way we organize work or manage people to improve business performance.	
	Our business encourages new ideas that lead to improvements in products, processes, or marketing.	
	We collaborate with suppliers, customers, or partners to develop innovative solutions.	
Financial Management Effectiveness	Our business generates reliable cash flow from daily operations to support financial stability.	Kourtis et al. (2021)
	We consistently achieve revenues that reflect actual sales performance rather than accounting adjustments.	
	We regularly monitor receivables to ensure revenue reliability and avoid artificial sales inflation.	
	Our financial practices avoid manipulations and promote transparency in financial reporting.	
	We reinvest financial gains to support growth and long-term sustainability.	
Firms' Competitiveness	Compared to the majority of our competitors, our firm has a stronger market position.	Adapted from Barney (1991)
	We offer unique products or services that are difficult for competitors to replicate.	
	Our internal capabilities give us a long-term advantage over other firms in our industry.	
	Compared to our main competitors, we consistently achieve better customers' satisfaction.	
	We are well-prepared to maintain competitiveness even as market conditions change.	

The data were analyzed using PLS-SEM via SmartPLS 4.0 software. This method, commonly used in social science studies involving SMEs, was selected owing to its suitability in estimating

complex models with latent constructs, non-normal data distributions, and moderate sample sizes,

The analysis began with descriptive statistics to summarize respondents' characteristics. The reliability and validity of the measurement model was assessed using Cronbach's alpha, Composite Reliability (CR), and Average Variance Extracted (AVE). Discriminant validity was assessed using the Fornell-Larcker criterion and the Heterotrait-Monotrait ratio (HTMT). Next, the structural model was evaluated using the bootstrapping method with 5,000 resamples to examine path coefficients and their significance.

In addition, R^2 values were calculated to assess predictive relevance. To mitigate common method bias (CMB), procedural remedies—such as respondent anonymity, randomized item ordering, and varied response scales—were employed. Furthermore, a Harman's single-factor test was conducted post hoc to statistically assess the presence of CMB.

IV. RESULTS

A. Descriptive Statistics

Table 2 summarizes the respondents' demographic profile. The sample was composed of 300 respondents belong to family-owned businesses in five Southeast Asian countries. Respondents in Indonesia account for the highest proportion (33.3%), followed by those of Vietnam (26.7%) and Thailand (20.0%). Malaysia and the Philippines account for 13.3% and 6.7% of all respondents, respectively.

Regarding generational involvement, a significant proportion of respondents (46.7%) stated that their firms involve both first and second generations in management, indicating a trend of succession planning and intergenerational collaboration within family-owned businesses. Following, a notable proportion of respondents (31.7%) stated that their firms still operates under first-generation leadership. Lastly, second-generation-only leadership accounts for 21.6% of all respondents.

In terms of firms' size, the majority of businesses employ fewer than 50 people (40.0%), which is consistent with the SME-dominated landscape in Southeast Asia. Firms with 50–100 employees account for 35.0% of all respondents, and larger family-owned businesses with more than 100 employees account for 25.0% of all respondents.

The industry breakdown shows that manufacturing (30.0%) and services, such as tourism and logistics (28.3%), dominate the sample, followed by food and beverage sector (25.0%), while 16.7% fall under other sectors, such as retail or agriculture. In terms of respondents' position, business owners (36.7%) occupy the largest proportion, followed by finance managers (31.7%) and next-generation successors (31.7%), reflecting a balanced mix of current leadership and upcoming family-owned business leaders.

In conclusion, this respondents' demographic profile has enhanced the generalizability of this study in examining different types of family-owned businesses and industries in the Southeast Asian context.

Table 2. Respondents' Demographic Profile

Category	*Subcategory*	*Frequency (n)*	*Percentage (%)*
Country	Indonesia	100	33.3
	Vietnam	80	26.7
	Thailand	60	20.0
	Malaysia	40	13.3
	The Philippines	20	6.7
Generation Involvement	First Generation Only	95	31.7
	First and Second Generation	140	46.7
	Second Generation Only	65	21.6
Firm's Size (Number of Employees)	Less than 50	120	40.0
	50–100	105	35.0
	More than 100	75	25.0
Industry Sector	Manufacturing	90	30.0
	Services (Tourism, Logistics, etc.)	85	28.3
	Food and Beverage	75	25.0
	Other	50	16.7
Respondent's Position	Owner	110	36.7
	Finance Manager	95	31.7
	Successor (Next-Generation Family Leader)	95	31.7

Table 3. Descriptive Statistics of Each Construct

Construct	Mean	Standard Deviation	Min	Max
Digital Transformation	5.23	1.02	2	7
Financial Literacy	5.45	0.96	3	7
Organizational Learning	5.31	0.89	3	7
Strategic Agility	5.18	1.01	2	7
Innovation Capability	5.27	0.95	2	7
Financial Management Effectiveness	5.39	0.91	3	7
Firms' Competitiveness	5.42	0.93	3	7

Table 3 presents the descriptive statistics of the constructs used in this study. The results show that the mean values of all constructs range from 5.18 to 5.45 in a seven-point Likert scale, indicating that the majority of respondents tend to agree with the statements related to Digital Transformation, Financial Literacy, Organizational Learning, Strategic Agility, Innovation Capability, Financial Management Effectiveness, and Firms' Competitiveness. Specifically, Financial Literacy (M = 5.45, SD = 0.96) and Firms' Competitiveness (M = 5.42, SD = 0.93) show the highest mean values, suggesting that respondents generally perceive themselves as financially knowledgeable and believe their firms are competitive in the market. On the other hand, Strategic Agility (M = 5.18, SD = 1.01) shows the lowest mean, suggesting that while firms are adopting digital tools, they may still encounter challenges to rapidly reconfigure resources and strategies. Standard deviations of all constructs support this argument, as they range from 0.89 to 1.02, indicating moderate variability in the responses.

B. Measurement Model Assessment

The measurement model was evaluated to assess the reliability and validity of the constructs. As shown in the measurement model results (Table 4), the loading values of all items range from 0.74 to 0.85, exceeding the recommended threshold of 0.70 (Hair et al., 2024). This indicates that each item has loaded strongly onto its corresponding construct.

Table 4. Reliability and Convergent Validity of the Measurement Model

Construct	*Item*	*Loading*	*Cronbach's Alpha*	*CR*	*AVE*
Digital Transformation	DT1	0.82	0.87	0.90	0.63
	DT2	0.85			
	DT3	0.78			
	DT4	0.81			
	DT5	0.76			
	DT6	0.79			
Financial Literacy	FL1	0.80	0.85	0.88	0.60
	FL2	0.77			
	FL3	0.75			
	FL4	0.83			
	FL5	0.78			
Organizational Learning	OL1	0.81	0.86	0.89	0.59
	OL2	0.79			
	OL3	0.74			
	OL4	0.80			
	OL5	0.76			
	OL6	0.77			
Strategic Agility	SA1	0.83	0.84	0.88	0.60
	SA2	0.81			
	SA3	0.78			
	SA4	0.75			
	SA5	0.79			
Innovation Capability	IC1	0.84	0.88	0.91	0.64
	IC2	0.83			
	IC3	0.79			
	IC4	0.77			
	IC5	0.80			
	IC6	0.81			
Financial Management Effectiveness	FME1	0.82	0.85	0.89	0.62
	FME2	0.83			
	FME3	0.78			
	FME4	0.76			
	FME5	0.79			
Firms' Competitiveness	FC1	0.81	0.86	0.90	0.64
	FC2	0.83			
	FC3	0.80			
	FC4	0.79			
	FC5	0.82			

The internal consistency reliability of each construct is confirmed as all Cronbach's alpha values of all constructs are above 0.70, with the lowest being 0.84 for Strategic Agility and the highest being 0.88 for Innovation Capability. This suggests that the items for each construct are consistent in measuring the intended latent construct.

Furthermore, Composite Reliability (CR) values of all constructs range from 0.88 to 0.91, exceeding the recommended threshold of 0.70 (Hair et al., 2024), thus confirming strong construct reliability.

Convergent validity of the measurement model is supported by Average Variance Extracted (AVE) values of all constructs, which exceed the recommended threshold of 0.50 (Hair et al., 2019). The AVE values range from 0.59 for Organizational Learning to 0.64 for Innovation Capability and Firms' Competitiveness, indicating that more than 50% of the items' variance is captured by their corresponding constructs.

These results collectively demonstrate that the measurement model exhibits satisfactory reliability and convergent validity, allowing for further analysis of the structural model.

Discriminant validity of each construct was assessed using two common methods: the Fornell-Larcker criterion and the Heterotrait-Monotrait (HTMT) ratio. The internal consistency reliability of each construct is confirmed as all Cronbach's alpha values of all constructs are above 0.70, with the lowest being 0.84 for Strategic Agility and the highest being 0.88 for Innovation Capability. This suggests that the items for each construct are consistent in measuring the intended latent construct.

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Table 5. Discriminant Validity of Each Construct based on the Fornell-Larcker Criterion

Construct	*DT*	*FL*	*OL*	*SA*	*IC*	*FME*	*FC*
Digital Transformation (DT)	**0.79**						
Financial Literacy (FL)	0.52	**0.77**					
Organizational Learning (OL)	0.58	0.54	**0.77**				
Strategic Agility (SA)	0.55	0.57	0.60	**0.77**			
Innovation Capability (IC)	0.62	0.59	0.65	0.63	**0.80**		
Financial Management Effectiveness (FME)	0.55	0.58	0.62	0.59	0.66	**0.79**	
Firms' Competitiveness (FC)	0.51	0.57	0.61	0.60	0.69	0.71	**0.80**

The Fornell-Larcker criterion results, as shown in Table 5, indicate that the square root of the Average Variance Extracted (AVE) of each construct (represented in bold diagonally) is greater than its correlations with all other constructs (off-diagonal values). For instance, the square root of the AVE for Innovation Capability is 0.80, exceeding its highest correlation with any other construct (0.69 with Firm Competitiveness). This confirms that each construct shares more variance with its own items than with other constructs, thereby meeting the threshold recommended by Fornell and Larcker (1981)

Table 6. Discriminant Validity of Each Construct based on the HTMT Ratio

Construct	*DT*	*FL*	*OL*	*SA*	*IC*	*FME*	*FC*
Digital Transformation (DT)	-						
Financial Literacy (FL)	0.62	-					
Organizational Learning (OL)	0.68	0.66	-				
Strategic Agility (SA)	0.63	0.66	0.70	-			
Innovation Capability (IC)	0.72	0.69	0.74	0.72	-		
Financial Management Effectiveness (FME)	0.66	0.69	0.72	0.69	0.75	-	
Firms' Competitiveness (FC)	0.62	0.68	0.71	0.70	0.78	0.77	-

Additionally, the HTMT ratio results in Table 6 further confirm the discriminant validity of each construct. All HTMT values are below the recommended threshold of 0.85 (Henseler et al., 2016). For example, the highest HTMT value is 0.78 between Innovation Capability and Firms' Competitiveness, which is still within the acceptable range. Overall, the findings displayed in Table 5 and 6 indicate that the constructs used in this study are empirically distinct from each other and that multicollinearity is unlikely to bias the structural model's estimates.

Taken together, the results from both the Fornell-Larcker and HTMT assessments confirm that discriminant validity of all constructs in the measurement model has been established.

C. Structural Model Assessment and Hypothesis Testing

Based on the statistical findings shown in Figure 2 and Tables 7, 8, and 9, this study has provided robust support for the hypothesized model, confirming both the significance of the proposed paths and the explanatory power of key constructs in the framework.

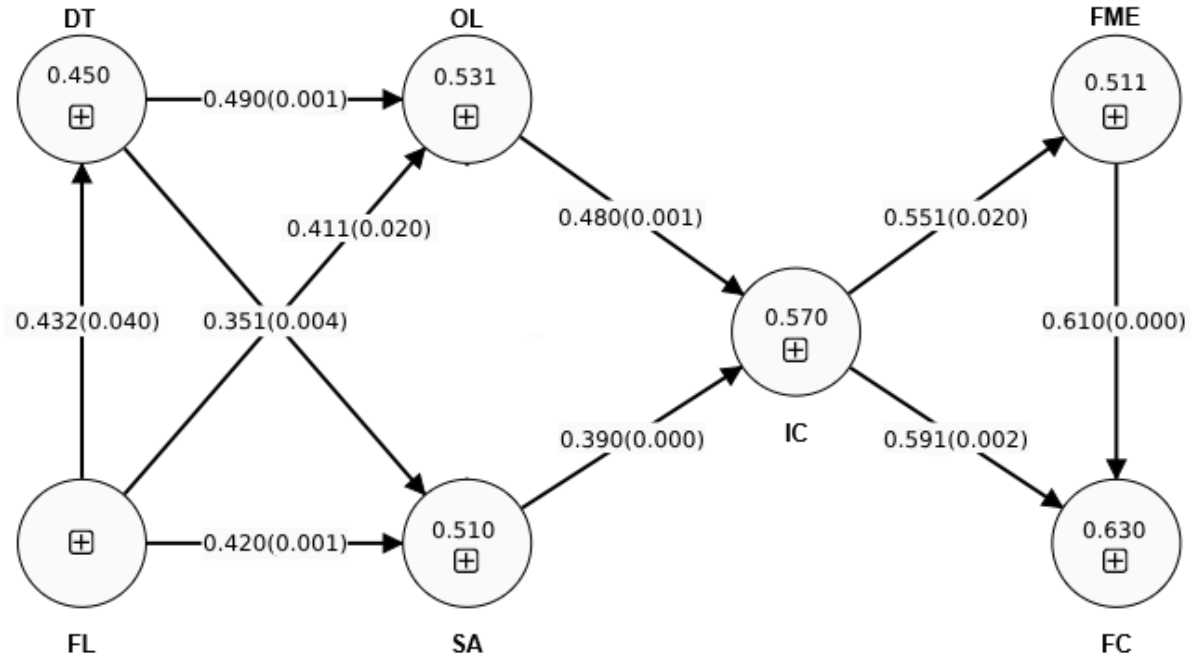

Figure 2. Path Coefficient and p-Value of Each Hypothesis

As shown in Figure 2 and Table 7, all hypothesized direct relationships (H1 to H10) are statistically supported by significant path coefficients (β ranging from 0.35 to 0.61), t-values above the threshold of 1.96, and p-values below 0.05. Notably, Digital Transformation (DT) demonstrates a strong influence on both Organizational Learning (OL) (β = 0.49, p = 0.001) and Strategic Agility (SA) (β = 0.35, p = 0.004), supporting H1 and H2. Similarly, Financial Literacy (FL) is significantly associated with both OL (β = 0.41, p = 0.020) and SA (β = 0.42, p = 0.001), supporting H3 and H4. Likewise, the newly proposed relationship, H5: FL → DT, is also supported (β = 0.43, t = 7.45, p = 0.040), indicating that financial capability plays a meaningful role in enabling digital transformation among family-owned firms.

Table 7. Structural Model's Path Coefficient and Hypothesis Testing Results

Hypothesis	*β*	*t-Value*	*p-Value*	*Conclusion*
H1: DT → OL	0.490	8.33	0.001	Supported
H2: DT → SA	0.351	5.27	0.004	Supported
H3: FL → OL	0.411	7.12	0.020	Supported
H4: FL → SA	0.420	6.89	0.001	Supported
H5: FL → DT	0.432	7.45	0.040	Supported
H6: OL → IC	0.480	7.02	0.001	Supported
H7: SA → IC	0.390	6.41	0.000	Supported
H8: IC → FME	0.551	8.76	0.020	Supported
H9: IC → FC	0.591	7.95	0.002	Supported
H10: FME → FC	0.610	9.02	0.000	Supported

Furthermore, downstream constructs, such as Innovation Capability (IC), Financial Management Effectiveness (FME), and Firms' Competitiveness (FC), are significantly explained by the mediating constructs. Both OL and SA positively influence IC, with β = 0.48 and 0.39 respectively, supporting H6 and H7. In turn, IC strongly affects both FME (β = 0.55, p = 0.020) and FC (β = 0.59, p = 0.002), supporting H8 and H9. Finally, FME exerts a substantial effect on FC (β = 0.61, p = 0.000), providing support for H10.

Table 8. Multi-Group Analysis (MGA) Results

Path	Indonesia	Vietnam	Malaysia	Thailand	The Philippines	p-Value
DT → OL	0.50	0.48	0.47	**0.52**	0.49	0.031
DT → SA	0.35	0.30	**0.36**	0.32	0.34	0.076
FL → OL	**0.42**	0.40	0.38	0.35	0.41	0.059
FL → SA	0.38	**0.45**	0.40	0.41	0.43	0.048
FL → DT	**0.39**	0.37	0.35	0.36	0.38	0.013
OL → IC	0.47	0.49	0.46	**0.50**	0.48	0.006
SA → IC	**0.40**	0.38	0.39	0.36	0.37	0.069
IC → FME	0.55	**0.57**	0.53	0.54	0.56	0.048
IC → FC	0.58	0.60	0.57	0.59	**0.61**	0.057
FME → FC	0.60	0.62	0.61	0.59	**0.63**	0.003

To further examine how these relationships vary across national contexts, Table 8 presents Multi-Group Analysis (MGA) results comparing the path coefficients across five Southeast Asian countries: Indonesia, Vietnam, Malaysia, Thailand, and the Philippines. While the majority of these relationships exhibit general consistency across countries, the DT → OL path shows a statistically significant difference between certain countries (p = 0.031), with Thailand showing the highest impact (β = 0.52) and Malaysia the lowest (β = 0.47). Similarly, the FL → SA and IC → FC paths also display borderline differences (p-values = 0.048 and 0.057, respectively), suggesting that the contextual relevance of financial competence and innovation capability in shaping firms' competitiveness may vary depending on national characteristics, such as the levels of digital literacy or financial ecosystem development.

Table 9. Model's Fitness and R^2 Values

Index of Model's Fitness	*Value*	*Threshold*
SRMR (Standardized Root Mean Square Residual)	0.06	< 0.08 (good fit)
R^2 of Organizational Learning	0.53	Moderate
R^2 of Digital Transformation	0.45	Moderate
R^2 of Strategic Agility	0.51	Moderate
R^2 of Innovation Capability	0.57	Moderate
R^2 of Financial Management Effectiveness	0.51	Moderate
R^2 of Firms' Competitiveness	0.63	Substantial

Complementing these results, Table 9 reports the model's goodness-of-fit and predictive power. The SRMR value (0.06) falls below the threshold of 0.08 (Henseler et al., 2016), indicating a good model's fitness. The R^2 values of the endogenous constructs range from 0.45 to 0.63. According to Hair et al. (2024), R^2 value above 0.50 is considered moderate, while that of above 0.60 is considered substantial. Specifically, the R^2 value of Digital Transformation (0.45) suggests that financial literacy explains a moderate proportion of the

variance in digital transformation. Meanwhile, the R^2 value of Firms' Competitiveness (0.63) indicates a strong predictive capacity of the model's final outcome. Furthermore, the results of Harman's single-factor test show that the first factor accounts for less than 50% of the total variance, indicating that common method variance (CMV) is not a significant concern in the model used in this study.

V. DISCUSSION

This study examines the integrated roles of digital transformation (DT) and financial literacy (FL) in shaping organizational learning (OL), strategic agility (SA), and innovation capability (IC) within family-owned businesses across five Southeast Asian economies. By simultaneously considering both digital and financial capabilities, this study has provided a more holistic understanding of internal capacity-building. This type of approach extends beyond much of the existing literature, which has exhibited tendency to examine digital and financial capabilities separately.

This study's findings align with previous studies highlighting DT as a foundational enabler of dynamic capabilities. For instance, Zhang et al. (2025) argued that digital transformation accelerates organizational responsiveness by reshaping internal knowledge flows and improving access to real-time data. This study confirms such effects in the family-owned business context, where digital tools support OL and facilitate knowledge sharing across generations. However, in contrast to Zhang et al. (2025), who focused primarily on digital leaders and large firms, this study reveals that even resource-constrained family SMEs in Southeast Asia could also benefit substantially from digital transformation when the digital adoption is strategically adjusted to learning goals.

In terms of financial literacy, this study builds on Kumar et al. (2023)'s findings, who stated that individual financial capability enhances decision-making and risk mitigation. Our findings expand this view by demonstrating the organizational-level impact of FL in family-owned firms, particularly in promoting SA. This suggests that financially literate leaders are more capable of reallocating resources flexibly and adapting business strategies under uncertainty. These capabilities are especially relevant to succeed within volatile and emerging markets. This study thereby has offered a broader application of financial literacy beyond the individual scope, extending it to a collective, strategic function for enhancing organizational capability.

Furthermore, this study introduces a novel empirical relationship, namely FL as a predictor of DT, which has not been widely tested in prior studies. While Ciacci et al. (2024) emphasized that digital tools enhance strategic and operational flexibility, they did not examine the foundational role of financial knowledge in enabling digital adoption. This study has filled this gap, revealing that financially literate leaders are more likely to invest in, understand, and utilize digital technologies more effectively. In this way, FL not only serves as a cognitive skill, but also as a precursor to technological capability.

The dual mediating roles of OL and SA also reflect and extend Saha et al. (2020)'s findings, who treated these two factors as independent enablers of innovation. Our results confirm their importance, but go further by demonstrating how DT and FL converge on both learning and agility elements rather than acting through isolated routes. This integrative model offers a more complete depiction of how internal knowledge and responsiveness interact to drive innovation capability.

From a regional standpoint, this study adds further theoretical nuance by showing how the same capabilities function differently across countries. For example, the strong impact of DT on OL in Thailand and Indonesia suggests that national investments in digital infrastructure and policy may reinforce firm-level learning outcomes that are consistent with country-level institutional theory. Conversely, the stronger FL-SA relationship in Vietnam suggests that financial systems, education, or cultural factors may influence how financial knowledge is translated into adaptive strategies. These findings provide empirical support for the idea that capability deployment is context-sensitive, and that firms' performance outcomes are shaped not merely by institutional environments, but also by internal resources.

Finally, the comparison between firms with strong levels of both DT and FL versus those excelling in only one area indicates that capability complementarity leads to superior outcomes. This observation echoes the logic of the resource-based view, where bundles of synergistic capabilities outperform isolated strengths. In doing so, this study has formed a

layered understanding of capability orchestration in the family-owned business context, particularly in Southeast Asia, where rapid economic transformation and intergenerational transitions co-occur.

A. Theoretical Implications

This study has contributed to the existing literature by extending Dynamic Capabilities Theory (Teece, 2023) and Organizational Learning Theory (Tripathi, 2024) in the context of Southeast Asian family-owned businesses. This study has also emphasized that Innovation Capability is not merely driven by digital transformation efforts, but also by the firm's internal knowledge processes and strategic flexibility. Furthermore, by incorporating Financial Literacy as an antecedent, this study has broadened the understanding about the non-technical capabilities that drive innovation and financial success.

The dual mediating roles of Organizational Learning and Strategic Agility also provide new insights of how family-owned businesses balance tradition and modernization, a unique challenge commonly faced by the family-owned business sector in emerging markets.

B. Practical Implications

This study's findings offer several actionable insights for practitioners, particularly family-owned business owners and next-generation leaders, as well as for policymakers aiming to foster inclusive growth and innovation in the Southeast Asian region.

For family-owned businesses, this study's results suggest that success in today's digital economy depends not only on technological adoption, but also on the cultivation of high level financial literacy and organizational learning orientation. Financial literacy enables owners and future leaders to better assess investment risks, understand the long-term value of digital tools, and make strategic informed decisions. Beyond basic bookkeeping, best practices in financial literacy for family-owned firms include regular financial training workshops, joint financial planning across generations, and the adoption of user-friendly digital financial tools that support transparency and collaborative decision-making.

A compelling example of financial and digital synergy is the successful adoption of QRIS (Quick Response Code Indonesian Standard) in Indonesia. Introduced by *Bank Indonesia*, QRIS unifies various digital payment platforms into a single standard, making it easier for MSMEs, including family-owned businesses, to accept cashless payments. Its rapid uptake across urban and rural areas has demonstrated how financial education, combined with a simple digital infrastructure, can accelerate financial inclusion. QRIS has also encouraged many traditional businesses to open formal accounts, monitor transactions digitally, and gain access to financial services, ultimately boosting businesses' credibility and growth potential. This example underscores the notion that when the accessible financial technologies go hand in hand with foundational financial knowledge, they can empower even small family-owned enterprises to thrive within today's digital economy.

For next-generation leaders, integrating financial literacy with digital skills is especially crucial. They are well-positioned to serve as digital experts while also professionalizing financial management practices. For this reason, firms should consider structured succession training programs that blend digital and financial skill development, such as scenario-based simulations, mentoring, and intergenerational finance committees.

At the policy level, Southeast Asian governments and business associations should design targeted programs to enhance financial literacy among family-owned business leaders, particularly for those operating in underserved regions. Public-private partnerships can play a catalytic role in delivering community-based training, subsidized access to digital accounting tools, and incentives for adopting formalized financial reporting systems. In addition, digital literacy programs should move beyond technical skills to include modules on financial decision-making in digital contexts, ensuring that business owners do not merely adopt technology, but also know how to use it strategically.

In summary, this study highlights the importance of developing and reinforcing both digital and financial capabilities within family-owned firms. Practical measures that treat these two capabilities as complementary dimensions rather than separate entities are well-prepared to accelerate innovation, improve financial management, and position family-owned businesses for long-term competitiveness in Southeast Asia's fast-evolving economic landscape.

VI. CONCLUSION

This study explores the influence of digital transformation and financial literacy on innovation capability and financial management effectiveness among family-owned SMEs across five Southeast Asian countries. By integrating these capabilities into a unified framework, this study's results have enriched our understanding of how internal resources, particularly organizational learning and strategic agility, mediate the path to achieve firms' competitiveness. This study's findings have reinforced the notions that digital transformation primarily enhances learning capacity, while financial literacy plays a central role in enabling strategic responsiveness.

An additional contribution of this study is the inclusion of financial literacy as a predictor of digital transformation, highlighting how financially capable leaders are more likely to adopt and utilize digital tools. This newly proposed relationship, although not being treated as a core focus in this study, has enriched the model used, thereby offering valuable direction for future studies.

Nonetheless, several limitations of this study need to be acknowledged. First, although the method encompassed five Southeast Asian countries, it did not include advanced economies within the region, such as Singapore, or less-developed ASEAN members, such as Cambodia or Laos. This restricts the findings' generalizability across broader scope within ASEAN, where institutional and economic contexts among each country may differ significantly. Second, this study employed a cross-sectional design, which limits the possibility to draw causal inferences. As a solution, longitudinal studies would be more suitable to examine how digital transformation and financial literacy evolve over time and affect firms' performance in the long run.

Third, while this study focused on family-owned businesses, the legal classifications and cultural interpretations of what constitutes a "family-owned firm" actually vary across different national contexts. This may cause disparity regarding how respondents perceive ownership structure, generational involvement, or leadership succession, which could influence response outcomes.

Lastly, although the majority of the constructs in this study were grounded in prior theoretical frameworks, several measurement items, particularly those related to digital transformation, financial literacy, and strategic agility, were self-developed based on conceptual dimensions rather than being adopted from validated scales. In fact, it was considered necessary to adjust these items to the contextual specificity of the Southeast Asian's SMEs and family-owned business environment. However, it may raise concerns about measurement reliability and external validity. For this reason, future studies are encouraged to further refine and validate this approach through factor analysis, expert panels, or replication in other cultural or organizational contexts.

In general, future studies could expand the geographic scope of this topic by including additional ASEAN countries or performing comparative analyses between developed and emerging markets within the region. Researchers are also encouraged to explore generational differences by further disaggregating the data to compare first-generation-led and second generation-led businesses.

Moreover, future studies could also adopt a mixed-methods approach, incorporating qualitative interviews with family-owned firm leaders to uncover deeper insights about cultural influences on digital adoption and innovation. Finally, integrating institutional or regulatory variables (e.g., government digitalization policies or financial inclusion initiatives) may enrich the understanding of how external environments shape internal capabilities.

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