American Journal of Multidisciplinary Research & Development (AJMRD)
*Volume 08, Issue 06 (**June - 2026**), PP 19-24*
ISSN: 2360-821X
www.ajmrd.com

Research Paper **Open Access**

ANALYSIS OF DIGITAL TRANSFORMATION IMPLEMENTATION AMONG AGRICULTURAL SMALL AND MEDIUM ENTERPRISES IN DONG NAI PROVINCE

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Abstract: Digital transformation has become a critical strategy for improving competitiveness and operational efficiency in small and medium-sized enterprises (SMEs), particularly in the agricultural sector. This study aims to examine the key factors influencing digital transformation implementation among agricultural SMEs in Dong Nai Province, Vietnam. A mixed-methods approach was employed, combining qualitative interviews with experts and managers to refine measurement scales, followed by a quantitative survey of 379 employees and managers from 188 agricultural SMEs. The collected data were analyzed using Cronbach's Alpha reliability testing, Exploratory Factor Analysis (EFA), and multiple regression analysis. The results indicate that technological readiness has the strongest positive effect on digital transformation implementation. In addition, leadership competence, employee competence, government policy and support, and external pressure also significantly influence digital transformation adoption. In contrast, financial resources were not found to have a statistically significant impact. These findings highlight the importance of technological capability, managerial leadership, and institutional support in promoting digital transformation in agricultural SMEs. The study contributes to the literature by providing empirical insights into digital transformation drivers in the agricultural SME context and offers practical implications for managers and policymakers seeking to promote digital innovation in the agricultural sector.

Keywords: Digital transformation; Agricultural SMEs; Technological readiness; Leadership competence; Government support.

I. Introduction

Digital transformation has emerged as a key driver of innovation and competitiveness in the modern digital economy. Advances in technologies such as cloud computing, big data, and the Internet of Things enable organizations to redesign business processes, develop new products and services, and create innovative business models. Digital transformation refers to the integration of digital technologies into various aspects of organizational activities, resulting in fundamental changes in how firms operate and deliver value (Baker & Mark, 2014; Brennen & Kreiss, 2016). Prior research suggests that digital transformation not only involves technological adoption but also requires strategic and organizational changes that reshape markets and industries (Khan & Shahyan, 2017). Through these technologies, firms can improve operational efficiency, enhance customer experience, and generate new sources of value (Matzler et al., 2016).

Digital transformation typically evolves through stages including data digitization, process digitization, and full digitalization. Data digitization converts physical or analog information into digital formats, which provides the basis for improving operational processes and decision-making. Once data and processes are digitized, organizations can move toward full digital transformation, enabling new business models and more efficient operational systems. Consequently, digital transformation occurs at both organizational and national levels. At the micro level, it enhances firms' productivity and competitiveness, while at the macro level it contributes to the development of digital economies, digital governments, and smart ecosystems.

Vietnam has increasingly emphasized the importance of digital transformation in promoting economic growth and global competitiveness. With rapid expansion in information technology infrastructure, e-commerce platforms, and digital services, the country is actively engaging in the Fourth Industrial Revolution. The Vietnamese government has introduced national programs aimed at accelerating digital transformation and building a digital

government, digital economy, and digital society by 2030. These initiatives encourage enterprises across sectors to adopt digital technologies and strengthen their innovation capacity.

Small and medium-sized enterprises (SMEs) play a crucial role in economic development and employment creation, particularly in developing economies. According to the International Labour Organization (2019), SMEs account for a significant share of employment worldwide. However, despite their importance, many SMEs face challenges in adopting digital technologies due to limited financial resources, managerial capacity, and technological expertise. Although Industry 4.0 technologies provide opportunities to enhance productivity, reduce operational costs, and improve competitiveness, SMEs often remain slow in adopting such technologies (Benitez et al., 2020; OECD, 2021; Telukdarie et al., 2023).

Dong Nai Province offers an important context for examining digital transformation in the agricultural sector. As one of the most economically dynamic provinces in southern Vietnam, Dong Nai has a strong agricultural base, with a large proportion of its land area devoted to agricultural production. Although local authorities have introduced initiatives promoting digital agriculture, the adoption of digital technologies among agricultural enterprises remains limited. In addition, empirical studies examining the determinants of digital transformation among agricultural SMEs in Vietnam are still scarce. Therefore, this study aims to investigate the key factors influencing digital transformation implementation among agricultural SMEs in Dong Nai Province, providing both theoretical insights and practical implications for promoting digital transformation in the agricultural SME sector.

II. Theoretical Framework

1.2.1. Technology–Organization–Environment (TOE)

The Technology–Organization–Environment (TOE) framework, proposed by Tornatzky and Fleischer (1990), explains the factors influencing firms' adoption of technology through three dimensions: technological, organizational, and environmental contexts.

The technological context includes existing and emerging technologies that affect a firm's ability to adopt innovations. The organizational context involves internal factors such as organizational structure, leadership, resources, and management systems, where flexibility and managerial support facilitate innovation adoption. The environmental context refers to external factors including competitive pressure, technological infrastructure, and government policies, which may either support or hinder technology adoption.

1.2.2. Diffusion of Innovation Theory (DOI)

The Diffusion of Innovation (DOI) Theory, introduced by Rogers (1995), explains how new ideas and technologies spread within a social system. Innovation adoption depends on users' perceptions of the novelty and benefits of the innovation.

DOI categorizes adopters into five groups: Innovators, Early Adopters, Early Majority, Late Majority, and Laggards. Each group differs in its willingness to adopt innovation, requiring different strategies to encourage technology acceptance.

1.2.3. The technology acceptance model (TAM)

The Technology Acceptance Model (TAM), developed by Davis (1985), explains users' acceptance of information technology through two main factors: perceived usefulness and perceived ease of use. Perceived usefulness refers to the extent to which technology improves job performance, while perceived ease of use reflects how effortless the technology is to use. These factors influence users' attitudes and behavioral intentions toward technology adoption. External factors such as system design, training, and organizational support also indirectly affect technology acceptance by shaping users' perceptions.

III. Methodology

This study employed a mixed-methods approach combining qualitative and quantitative methods to examine the factors affecting digital transformation implementation among agricultural SMEs in Dong Nai Province, Vietnam. In the qualitative phase, interviews with experts, managers, and employees were conducted to refine the research framework and measurement scales, followed by a pilot survey of 30 respondents to ensure questionnaire clarity and reliability. The quantitative phase involved a structured survey distributed to employees and managers from 188 agricultural SMEs. Out of 500 distributed questionnaires, 379 valid responses were collected for analysis. The study applied stratified and convenience sampling methods to ensure representation across agricultural subsectors. Data were analyzed using SPSS through Cronbach's Alpha reliability testing, Exploratory Factor Analysis (EFA), and multiple regression analysis to evaluate the effects of technological readiness, leadership competence, employee competence, financial resources, government policy and support, and external pressure on digital transformation implementation.

IV. Findings

4.1. Profile of Respondent

The table presents the demographic characteristics of the 379 survey respondents. Regarding gender, females account for a higher proportion (58.8%) compared to males (41.2%). In terms of age, the 30 to under 45 age group represents the largest share (51.0%), followed by the 18–30 group (31.1%), while the 45–60 group accounts for the smallest proportion (17.9%). Concerning education level, most respondents have a college degree or lower (50.4%), followed by those with a bachelor's degree (44.1%), and a smaller proportion holding a master's degree (5.5%). Regarding work experience, the largest group has 1 to less than 5 years of experience (43.2%), followed by 5 to less than 10 years (25.9%), less than 1 year (23.7%), and more than 10 years (7.2%). Overall, the sample mainly consists of young to middle-aged employees with moderate to relatively high education levels and 1–5 years of work experience, which generally reflects the workforce characteristics of agricultural SMEs.

Table 1. Distribution of Respondents as to Their Profile

Indicator	Categorize	Quantity	Percentage
Sex	Male	156	41,2
	Female	223	58,8
Age	18 – Under 30	118	31,1
	30 to under 45	193	51,0
	45 to under 60	68	17,9
Education level	College or less	191	50,4
	Bachelor	167	44,1
	Master	41	5,5
Experience	< 1 year	90	23,7
	1 – less than 5 years	164	43,2
	5 – less than 10 years	98	25,9
	> 10 years	27	7,2

Source: Author's calculation from survey data

4.2. Regression model

The regression results in Table 2 provide empirical evidence regarding the factors influencing digital transformation implementation among agricultural SMEs in Dong Nai Province. Overall, the model indicates that technological readiness, leadership competence, employee competence, external pressure, and government policy and support have statistically significant effects on digital transformation, while financial resources do not show a significant impact. In addition, the multicollinearity diagnostics demonstrate that the model does not suffer from multicollinearity issues, as all VIF values are close to 1 and below the critical threshold of 5, and tolerance values are well above 0.1.

Among the examined variables, technological readiness (TR) has the strongest influence on digital transformation implementation ($\beta = 0.716$, $p < 0.001$). This result indicates that the availability of technological infrastructure, digital platforms, and technical capabilities plays a decisive role in enabling SMEs to adopt and implement digital transformation initiatives. In the context of agricultural SMEs, where production processes increasingly rely on digital technologies such as data management systems, smart farming tools, and digital supply chain platforms, technological readiness becomes a key enabler for successful digital transformation. This finding is consistent with prior studies highlighting technology capability as a critical determinant of digital transformation adoption in SMEs.

The results also show that government policy and support (GP) have a significant positive effect on digital transformation ($\beta = 0.098$, $p = 0.008$). This finding suggests that supportive institutional environments, including government incentives, training programs, and digital infrastructure investments, play an important role in encouraging SMEs to adopt digital technologies. In developing economies such as Vietnam, policy support can reduce the risks and costs associated with digital transformation, thereby increasing SMEs' willingness to adopt new technologies.

Similarly, leadership competence (LC) has a positive and statistically significant influence on digital transformation ($\beta = 0.083$, $p = 0.021$). This result highlights the important role of leadership in guiding digital transformation strategies within SMEs. Leaders with strong digital vision, managerial capability, and openness to technological change are more likely to promote innovation and allocate resources effectively to support digital

initiatives. This finding aligns with previous research emphasizing the role of leadership in driving organizational change and digital innovation.

In addition, external pressure (EP) is found to significantly influence digital transformation implementation (β = 0.078, p = 0.035). External pressures may arise from market competition, customer expectations, supply chain requirements, and industry trends toward digitalization. For agricultural SMEs, increasing competition and market demand for transparency, traceability, and efficiency may encourage firms to adopt digital technologies to maintain competitiveness.

The analysis also indicates that employee competence (EC) has a statistically significant effect on digital transformation (β = 0.010, p = 0.029). Although the magnitude of the effect is relatively small compared to other factors, the result suggests that employees' digital skills and technological knowledge contribute to the successful implementation of digital initiatives within SMEs. Skilled employees can facilitate the adoption of digital tools, improve operational efficiency, and support organizational learning during the digital transformation process.

In contrast, financial resources (FR) do not show a statistically significant impact on digital transformation implementation (β = 0.008, p = 0.839). This finding suggests that financial capacity alone may not be a decisive factor in determining digital transformation adoption among agricultural SMEs. One possible explanation is that many digital technologies are increasingly accessible and affordable, reducing the financial barriers to adoption. Alternatively, SMEs may prioritize technological capability, leadership vision, and external pressures over purely financial considerations when deciding to implement digital transformation initiatives.

Table 2. Regression coefficient

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	,936	,319		2,935	,004		
	TR	,709	,036	,716	19,690	,000	,977	1,024
	LC	,074	,032	,083	2,316	,021	,995	1,005
	EC	,012	,045	,010	2,268	,029	,978	1,022
	EP	,081	,038	,078	2,188	,035	,952	1,051
	GP	,093	,035	,098	2,653	,008	,955	1,048
	FR	,010	,047	,008	,204	,839	,977	1,023

a. Dependent Variable: DT

Source: Calculated from the author's survey data

V. Conclusions

This study examined the factors influencing digital transformation implementation among agricultural SMEs in Dong Nai Province, Vietnam. The findings reveal that technological readiness has the strongest positive effect on digital transformation, indicating that the availability of digital infrastructure, technological capabilities, and appropriate digital tools plays a critical role in enabling enterprises to implement digital initiatives effectively. In addition, government policy and support, leadership competence, employee competence, and external pressure were also found to significantly influence digital transformation adoption. These results suggest that digital transformation in SMEs is shaped not only by internal organizational capabilities but also by external institutional and competitive environments. In contrast, financial resources were not found to have a statistically significant impact, implying that managerial vision, technological capability, and supportive policies may be more important than financial capacity alone in driving digital transformation among agricultural SMEs.

The study contributes to the existing literature by extending empirical evidence on digital transformation within the agricultural SME sector, which remains relatively underexplored in developing economies. By integrating technological, organizational, and environmental perspectives, the research provides a more comprehensive understanding of the determinants of digital transformation implementation. From a practical perspective, the findings suggest that enterprise managers should prioritize improving technological readiness, strengthening leadership capabilities, and enhancing employees' digital skills to facilitate successful digital transformation. At the same time, policymakers should continue developing supportive policies, digital infrastructure, and training programs to encourage SMEs to adopt digital technologies and improve their long-term competitiveness and sustainability in the digital economy.

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