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DIGITAL TRANSFORMATION IMPLEMENTATION IN SMALL AND MEDIUM-SIZED AGRICULTURAL ENTERPRISES: EVIDENCE FROM DONG NAI PROVINCE, VIETNAM

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ABSTRACT

Digital transformation has become an essential strategy for improving productivity, operational efficiency, and competitiveness in small and medium-sized enterprises (SMEs), particularly in the agricultural sector. This study examines the implementation of digital transformation in small and medium-sized agricultural enterprises in Dong Nai Province, Vietnam, and identifies the key factors that influence this process. Drawing on the Diffusion of Innovation (DOI) theory and the Technology Acceptance Model (TAM), the study investigates six determinants: technological readiness, financial resources, leader competence, employee competence, external pressure, and government policy and support. A quantitative descriptive research design was employed using survey data collected from 379 employees working in agricultural SMEs in Dong Nai Province. Data were analyzed using descriptive statistics, including frequencies, percentages, means, and standard deviations. The results indicate that digital transformation implementation is generally assessed at a good level, with enterprises demonstrating notable progress in document digitization, database management, software integration, and business model adaptation. Technological readiness, leadership competence, and employee competence were identified as the most strongly rated enabling factors. However, operational efficiency improvements and long-term financial planning remain relatively limited. The findings provide practical implications for enterprise managers and policymakers seeking to strengthen digital transformation and enhance the competitiveness of agricultural SMEs in Vietnam.

Keyword: Digital transformation, agricultural SMEs, technological readiness, leadership competence, government support.

1. INTRODUCTION

Digital transformation has become an important strategy for enterprises seeking to improve productivity, operational efficiency, and competitiveness in an increasingly data-driven economy. By integrating technologies such as cloud computing, big data, the Internet of Things (IoT), artificial intelligence (AI), and enterprise resource planning (ERP) systems, firms can optimize resources, enhance decision-making, and develop new business models (Vial, 2019). In the agricultural sector, digital transformation supports production planning, product traceability, supply chain management, and market connectivity, thereby contributing to modernization and sustainable development (Wolfert et al., 2017). The significance of digital transformation and its determinants in agricultural SMEs in Vietnam is outlined in the text you provided

In Vietnam, digital transformation has been identified as a national priority, with agriculture recognized as a key sector for technological innovation. Dong Nai Province, one of the country's major agricultural and agro-industrial centers, has actively promoted digital transformation among enterprises. However, empirical evidence on the implementation of digital transformation in agricultural SMEs remains limited. To address this gap, this study examines the role of technological readiness, financial resources, leader competence, employee competence, external pressure, and government policy and support in shaping digital transformation implementation. Based on the Diffusion of Innovation (DOI) theory and the Technology Acceptance Model (TAM), the study uses survey data from 379 employees to provide practical implications for managers and

policymakers seeking to enhance digital transformation in agricultural SMEs.

2. LITERATURE REVIEW

2.1. Concept of Digital Transformation

Digital transformation (DT) refers to the process by which organizations integrate digital technologies into all aspects of their operations, resulting in fundamental changes in business processes, organizational structures, and value creation mechanisms. According to Vial (2019), digital transformation is a process that aims to improve an entity by triggering significant changes through combinations of information, computing, communication, and connectivity technologies. Similarly, Verhoef et al. (2021) define digital transformation as the strategic deployment of digital technologies to reshape business models, customer relationships, and internal processes.

For small and medium-sized enterprises (SMEs), digital transformation provides opportunities to enhance operational efficiency, reduce transaction costs, and improve responsiveness to market changes. In the agricultural sector, digital technologies such as the Internet of Things (IoT), artificial intelligence (AI), cloud computing, and blockchain enable enterprises to optimize production, monitor environmental conditions, ensure product traceability, and strengthen supply chain integration (Wolfert et al., 2017). Despite these benefits, agricultural SMEs often face considerable challenges in implementing digital transformation due to limited financial resources, insufficient technological infrastructure, shortages of skilled personnel, and institutional barriers.

In this study, digital transformation implementation is defined as the extent to which agricultural SMEs adopt and utilize digital technologies to digitize information, manage databases, integrate software systems, synchronize data, transform business models, and improve customer service and operational performance.

2.2. Theoretical Foundations

2.2.1. Diffusion of Innovation Theory (DOI)

The Diffusion of Innovation (DOI) theory, proposed by Rogers (1995), explains how innovations spread through social systems over time. The theory emphasizes that the adoption of an innovation depends on users' perceptions of its relative advantage, compatibility, complexity, trialability, and observability. Organizations are more likely to adopt innovations when they perceive substantial benefits and when the innovation aligns with existing organizational practices and capabilities.

DOI has been widely applied in studies of technological adoption and digital transformation. In the context of agricultural SMEs, the theory suggests that enterprises will be more likely to implement digital transformation when they possess adequate technological infrastructure, financial resources, and managerial support, and when external stakeholders create pressure to adopt innovative practices.

2.2.2. Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM), developed by Davis (1989), explains users' acceptance of technology through two primary perceptions: perceived usefulness and perceived ease of use. Perceived usefulness refers to the degree to which individuals believe that using a technology will improve their performance, while perceived ease of use concerns the extent to which the technology is perceived as effortless to use.

TAM has become one of the most influential models for understanding technology adoption. At the organizational level, leaders and employees are more likely to support and use digital technologies when they perceive these technologies as beneficial and easy to operate. Therefore, managerial competence and employee skills are critical determinants of successful digital transformation implementation.

3. METHODOLOGY

This study employed a quantitative descriptive research design to assess the current state of digital transformation implementation in small and medium-sized agricultural enterprises (SMEs) in Dong Nai Province, Vietnam. A structured questionnaire was developed based on previous studies on digital transformation, the Diffusion of Innovation (DOI) theory, and the Technology Acceptance Model (TAM). The questionnaire consisted of two sections: the first collected respondents' demographic characteristics, including gender, age, educational attainment, and work experience; the second measured seven

research constructs, namely Technological Readiness, Financial Resources, Leader Competence, Employee Competence, External Pressure, Government Policy and Support, and Digital Transformation Implementation. All measurement items were assessed using a five-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree).

The target population consisted of employees working in agricultural SMEs in Dong Nai Province, as these individuals are directly involved in operational and managerial activities and can provide reliable evaluations of their enterprises' digital transformation practices. A total of 500 questionnaires were distributed, of which 412 were returned. After eliminating 33 incomplete responses, 379 valid questionnaires were retained for analysis, representing an effective response rate of 90.30%. The collected data were analyzed using descriptive statistical techniques, including frequencies and percentages to summarize demographic characteristics, and means and standard deviations to evaluate the level of each research variable. Mean scores were interpreted according to five categories ranging from Very Poor to Very Good to provide a comprehensive assessment of digital transformation implementation and its associated factors.

4. RESULTS

4.1. Profile of Respondent

Table 1 shows that the sample of 379 respondents is characterized by a relatively young and well-educated workforce working in small and medium-sized agricultural enterprises in Dong Nai Province. Female respondents account for the majority (58.8%), while the largest age group is from 30 to under 45 years old (51.0%), followed by those aged 18 to under 30 (31.1%). In terms of educational attainment, more than half of the respondents have a college degree or lower (50.4%), and 44.1% hold a bachelor's degree, indicating that most employees possess at least a moderate level of formal education.

Regarding work experience, respondents with 1 to less than 5 years of experience represent the largest proportion (43.2%), followed by those with 5 to less than 10 years (25.9%) and less than one year (23.7%). Only 7.2% have more than 10 years of experience. Overall, the sample reflects a workforce that is relatively young, moderately educated, and has practical work experience, suggesting favorable conditions for the adoption and implementation of digital transformation in 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. Descriptive Statistics of Observed Variables

4.2.1. Descriptive Statistics of Technological Readiness

The descriptive statistics indicate that the surveyed enterprises exhibit a relatively high level of readiness for digital transformation. Mean scores for all observed variables range from 3.34 to 4.32, corresponding primarily to the "Good" and "Very Good" categories. This suggests that agricultural SMEs in Dong Nai Province have

established favorable conditions for digital transformation, particularly in terms of technological infrastructure, financial investment, leadership commitment, employee competence, and institutional support. Among the independent variables, Technological Readiness and Leader Competence received consistently high evaluations, reflecting the important role of internal capabilities in supporting digital initiatives.

Regarding the dependent variable, Digital Transformation Implementation is also assessed positively, with most indicators rated as Good or Very Good. Enterprises have made substantial progress in digitizing information, managing databases, integrating software systems, and transforming business models. However, the indicator related to improvements in operational efficiency (DT7) records a relatively low mean score, indicating that the practical benefits of digital transformation have not yet been fully realized. Overall, the results suggest that agricultural SMEs in Dong Nai have taken significant steps toward digital transformation, although further efforts are needed to enhance the effectiveness and operational impact of these initiatives.

Table 2. Descriptive Statistics of Technological Readiness

Code	Content	Mean	Std.Deviation	Interpretation
TR1	The enterprise has adopted automated or semi-automated technologies in the production or processing stages.	4.25	0.752	Very Good
TR2	The enterprise has established an internal network infrastructure to support digital transformation.	4.18	0.862	Good
TR3	The enterprise has effectively managed its database systems to facilitate digital transformation.	4.12	0.847	Good
TR4	The existing technological infrastructure of the enterprise meets the requirements for implementing digital transformation applications.	4.15	0.754	Good
TR5	The enterprise has developed an information security system.	3.89	0.830	Good
TR6	The enterprise has applied digital technologies in management and operational activities to support digital transformation.	3.90	0.863	Good

Source: Author's calculation from survey data

4.2.2. Descriptive Statistics of Finance Resources

The descriptive analysis indicates that the financial readiness of agricultural SMEs in Dong Nai Province is generally at a good level, with mean scores ranging from 2.75 to 4.19. Enterprises have invested substantially in hardware, software, network infrastructure, and storage systems, demonstrating a strong commitment to establishing the technological foundations necessary for digital transformation. In particular, investment in management software received the highest rating, suggesting that firms prioritize digital tools that can generate immediate operational benefits.

However, financial readiness remains uneven across different aspects. Investment in employee training and long-term financial planning for digital transformation received relatively lower scores, indicating that many enterprises still lack a strategic and sustainable approach to funding digital initiatives. Overall, while agricultural SMEs have made significant progress in building basic digital infrastructure, greater attention to human capital development and financial planning is needed to ensure successful and comprehensive digital transformation.

Table 3. Descriptive Statistics of Finance Resources

Code	Content	Mean	Std.Deviation	Interpretation
FR1	The enterprise has invested in hardware equipment to support digital transformation.	4.13	0.836	Good

FR2	The enterprise has invested in software applications for operational management to support digital transformation.	4.19	0.755	Good
FR3	The enterprise has invested in internal network infrastructure to support digital transformation.	3.95	0.944	Good
FR4	The enterprise has invested in storage services (e.g., cloud storage) to support digital transformation.	3.97	0.773	Good
FR5	The enterprise has allocated funds for training staff on IT knowledge and skills.	3.18	1.177	Good
FR6	The enterprise has developed financial plans to support investment activities in digital transformation.	2.75	1.085	Fair

Source: Author's calculation from survey data

4.2.3. Descriptive Statistics of Leader Competence

The descriptive statistics indicate that leadership competence in agricultural SMEs in Dong Nai Province is generally assessed at a good level, with mean scores ranging from 3.75 to 4.16. Leaders are perceived as actively participating in and supporting digital transformation initiatives, demonstrating positive attitudes and close attention to information security management. However, indicators related to continuous learning and the development of digital leadership competencies received comparatively lower scores. This suggests that, although leadership commitment is strong, further efforts to enhance digital knowledge and managerial capabilities are needed to ensure more effective and sustainable digital transformation.

Table 4. Descriptive Statistics of Leader Competence

Code	Content	Mean	Std.Deviation	Interpretation
LC1	Leaders directly organize and manage digital transformation activities.	4.16	0.694	Good
LC2	Leaders have a positive attitude toward the enterprise's digital transformation.	4.16	0.686	Good
LC3	Leaders are committed to developing leadership skills oriented toward digital transformation.	3.85	0.909	Good
LC4	Leaders strongly support proposals to apply technology for digitizing operational and management processes in the enterprise.	3.86	0.885	Good
LC5	Leaders continuously learn to develop competencies that meet digital transformation requirements.	3.75	1.029	Good
LC6	Leaders closely manage information security activities within the enterprise.	4.09	0.761	Good

Source: Author's calculation from survey data

4.2.4. Descriptive Statistics of Employee Competence

The descriptive statistics show that employee competence in agricultural SMEs in Dong Nai Province is rated at a good level, with mean scores ranging from 3.89 to 4.05. Employees are generally proficient in using information technology, regularly participate in digital transformation training, and demonstrate positive attitudes toward adopting digital technologies. However, information technology expertise received the lowest score, suggesting that specialized technical skills still need to be strengthened to support more advanced digital transformation initiatives.

Table 5. Descriptive Statistics of Employee Competence

Code	Content	Mean	Std.Deviation	Interpretation
EC1	Employees are proficient in using information technology applications.	4.02	0.610	Good
EC2	Employees regularly participate in training courses on digital transformation relevant to their work.	4.02	0.588	Good
EC3	Employees have a positive attitude toward digital transformation.	4.05	0.584	Good
EC4	Employees in the enterprise possess digital skills applicable to their work.	3.99	0.563	Good
EC5	Employees in the enterprise have expertise in the field of information technology.	3.89	0.750	Good

Source: Author's calculation from survey data

4.2.5. Descriptive Statistics of External Pressure on Enterprise

The descriptive statistics indicate that external pressure on agricultural SMEs in Dong Nai Province is generally perceived at a good level, with mean scores ranging from 3.41 to 3.96. Enterprises face pressure from competitors, customers, suppliers, business partners, and government regulations to adopt digital technologies. Among these factors, competitive pressure and market access requirements are particularly prominent, highlighting the important role of the external environment in motivating firms to accelerate digital transformation.

Table 6. Descriptive Statistics of External Pressure on Enterprise

Code	Content	Mean	Std.Deviation	Interpretation
EP1	The enterprise is under competitive pressure from rivals that have adopted digital technologies.	3.96	0.665	Good
EP2	Customers require the enterprise to apply digital technologies to enhance transparency and transaction speed.	3.80	0.708	Good
EP3	The enterprise faces pressure from suppliers to integrate technological systems.	3.88	0.730	Good
EP4	There is pressure from government policies regarding digital transformation and online data reporting.	3.41	1.227	Good
EP5	Business partners prioritize cooperation with enterprises that have a high level of digitalization.	3.82	0.632	Good
EP6	The enterprise faces difficulties in accessing the market without digital transformation.	3.91	0.707	Good

Source: Author's calculation from survey data

4.2.6. Descriptive Statistics of Government Policy and Support

The descriptive statistics show that government policy and support for digital transformation are evaluated at a good level, with mean scores ranging from 3.34 to 3.93. Agricultural SMEs in Dong Nai Province generally perceive government policies, financial incentives, legal frameworks, and sectoral priorities as important enablers of digital transformation. However, training and

awareness programs received the lowest score, indicating that greater efforts are needed to improve the accessibility and effectiveness of government-led capacity-building initiatives.

Table 7. Descriptive Statistics of Government Policy and Support

Code	Content	Mean	Std.Deviation	Interpretation
GP1	The government has clear policies to promote digital transformation in enterprises.	3.77	0.724	Good
GP2	Enterprises receive informational support and guidance documents on digital transformation from state agencies.	3.80	0.687	Good
GP3	The government implements training programs to raise awareness of digital transformation.	3.34	1.170	Good
GP4	Enterprises receive financial support such as preferential loans and subsidies for technology investment.	3.93	0.715	Good
GP5	The government has legal regulations that facilitate the application of digital technologies.	3.93	0.626	Good
GP6	The government prioritizes digital transformation policies in the agricultural sector.	3.89	0.727	Good

Source: Author's calculation from survey data

4.3. Descriptive Statistics of The Dependent Variables

The descriptive statistics indicate that digital transformation implementation in agricultural SMEs in Dong Nai Province is generally assessed at a good to very good level, with mean scores ranging from 2.37 to 4.32. Enterprises have made substantial progress in digitizing documents, developing databases, integrating software systems, and transforming business models. However, the improvement in operational efficiency received the lowest score, suggesting that the practical benefits of digital transformation have not yet been fully realized. Overall, the findings show that agricultural SMEs have actively adopted digital technologies, but further efforts are needed to enhance the effectiveness of these initiatives in daily operations.

Table 8. Descriptive statistics of Digital Transformation Implementation

Code	Nội dung biến quan sát	Mean	Std.Deviation	Interpretation
DT1	The enterprise has digitized information from documents and papers into digital formats (Word, Excel).	4.32	0.636	Very Good
DT2	The enterprise has analyzed digital data to generate information for production and business decision-making.	3.90	0.882	Good
DT3	The enterprise has built and managed databases for various types of information (customers, accounting, etc.).	4.25	0.761	Very Good
DT4	The enterprise has used integrated software that enables multi-directional interaction.	4.02	0.792	Good
DT5	The enterprise has synchronized data through digital transformation.	4.06	0.845	Good
DT6	The enterprise has changed its business model thanks to digital transformation.	4.27	0.651	Very Good
DT7	The enterprise has improved operational efficiency through digital transformation.	2.37	1.092	Poor

DT8	The enterprise has enhanced its customer service capabilities thanks to digital transformation.	4.09	0.833	Good

Source: Author's calculation from survey data

5. CONCLUSIONS

This study examined the implementation of digital transformation in small and medium-sized agricultural enterprises in Dong Nai Province, Vietnam, based on survey data from 379 employees. The descriptive results indicate that digital transformation is generally implemented at a good level. Enterprises have made significant progress in digitizing documents, developing databases, integrating software systems, and adapting their business models to take advantage of digital technologies.

The findings also show that technological readiness, financial resources, leader competence, employee competence, external pressure, and government policy and support are all evaluated positively and contribute to creating favorable conditions for digital transformation. Among these factors, technological infrastructure, leadership commitment, and employee capabilities are particularly important. However, improvements in operational efficiency and long-term financial planning remain relatively limited. Overall, the study suggests that agricultural SMEs in Dong Nai have established a solid foundation for digital transformation, but continued investment in human resources, strategic planning, and institutional support is necessary to achieve more effective and sustainable outcomes.

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