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The impact of digital transformation on the financial performance of listed F&B companies in Vietnam

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Abstract

Amid the rapid global digital transformation, the food and beverage (F&B) industry in Vietnam is also partaking in this trend. Digital transformation has become a decisive factor, not only helping enterprises in this sector optimize their operational processes but also enhancing customer experience and promoting sustainable growth. This research aims to analyze the impact of digital transformation on the financial performance of listed F&B companies on the Vietnam stock market. Data was collected from two sources: (i) financial reports; and (ii) surveys on the level of digital transformation at listed F&B companies. The research results show that digital transformation negatively affects the financial performance of listed F&B companies. Additionally, financial performance is also influenced by the scale of assets, financial leverage, current payment ratio, and bankruptcy risk. These results are consistent with the reality in Vietnam, as this is the period when businesses start to undergo digital transformation. This is when businesses significantly require capital without experience; hence, the effectiveness of digital transformation investment has not yet been observed. From the research results, the authors propose implications for digital transformation to help increase financial performance for listed F&B companies in Vietnam.

Keywords: Digital transformation, F&B companies, Financial performance.

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1. Introduction

The F&B industry plays a crucial role in Vietnam's economy, contributing to sustainable development and GDP growth. This market is expected to continue its strong growth in the coming years, driven by factors such as high consumption levels, increasing demand for healthy foods, and the digitalization trend in business operations. According to forecasts, the market

capitalization of the F&B industry is expected to reach VND 655 trillion in 2024, with an average annual growth rate of approximately 11% from now until 2027 [1].

Amid the rapid global digital transformation, the F&B industry in Vietnam is also partaking in this trend. Digital transformation has become a decisive factor, not only helping enterprises in this sector optimize their operational processes but also enhancing customer experience and promoting sustainable growth [2]. Particularly, with the remarkable development of technologies such as Artificial Intelligence (AI), Big Data, and E-commerce platforms, F&B companies have the capability to deeply penetrate various customer segments, reduce operational costs, and improve productivity [3].

However, in Vietnam, most F&B companies, especially those listed on the stock exchange, have yet to fully realize the potential of digital transformation. The financial efficiency gained from digitalization initiatives by listed F&B companies remains limited [2]. The lack of technological resources, high investment costs, and digital skill gaps among the management team are significant obstacles [4]. Therefore, it is essential to conduct research on the relationship between digital transformation readiness and the financial performance of listed F&B companies in Vietnam.

This paper aims to analyze the impact of digital solutions on financial performance across seven pillars, including strategic orientation, customer experience, supply chain, information systems and data management, risk management, operational processes, and organizational human resources. By doing so, this research will provide a comprehensive view of the value that digital transformation brings to F&B companies in Vietnam. Understanding this relationship not only helps F&B companies develop appropriate technology investment strategies but also contributes to the sustainable growth of the F&B sector in Vietnam amid the increasingly competitive global landscape. The research is structured into five parts, including: introduction to the research context; theoretical basis and research overview; research methods; research results and some discussions; conclusions and policy implications for enhancing the financial performance of listed F&B companies in Vietnam.

2. Literature Reviews

Digital transformation is widely acknowledged as a critical determinant influencing financial performance and competitive capabilities across various industries. Digital transformation pertains to the integration of advanced digital technologies into core business processes to enhance operational efficiency, customer engagement, and overall business outcomes. Numerous studies have demonstrated that enterprises implementing digital strategies tend to exhibit superior financial performance, particularly in revenue growth, cost reduction, and improved asset utilization [5, 6]. However, the magnitude of these benefits varies significantly depending on the digital maturity level and the specific strategies employed by each enterprise [7, 8].

In the F&B industry, where profit margins are often relatively narrow, digital tools such as data analytics, cloud computing, and customer relationship management (CRM) systems have been recognized as crucial for enhancing supply chain management and customer service [9]. Integrating these technologies enables enterprises to optimize production processes, reduce wastage, and enhance product quality, thereby directly contributing to profitability [10, 11]. Studies employing various theoretical frameworks, including the Resource-Based View (RBV) and the Technology-Organization-Environment (TOE) framework, have been utilized to examine the impact of digital transformation on financial outcomes [3].

Empirical research has applied regression models and structural equation modeling (SEM) to investigate the relationship between digital transformation and key financial indicators such as Return on Assets (ROA), Return on Equity (ROE), and profit margins [7, 12]. However, the quality and availability of data, especially in emerging markets like Vietnam, present significant limitations to the robustness of these studies [13, 14].

Several key findings have been observed regarding the impact of digital transformation in the F&B sector. First, digitalization facilitates the automation of repetitive tasks, leading to substantial cost savings and minimizing human error [7, 10, 15]. Second, it enhances customer engagement and customer service management, which, in turn, drives higher sales and increased market share [2, 3, 11, 16]. Nonetheless, the implementation of digital transformation is accompanied by significant challenges, including high initial investments and internal resistance to change within organizations [14]. Many F&B firms lack the requisite digital skills and strategic vision to successfully execute digital transformation initiatives [2].

Furthermore, the majority of existing studies have been conducted in developed economies, with limited focus on emerging markets like Vietnam. This creates a gap in understanding how contextual factors such as regulatory environment and digital infrastructure influence the efficacy of digital transformation strategies in these regions [6]. To address these research gaps, our study aims to develop industry-specific models to evaluate the impact of digital transformation on financial performance in the Vietnamese F&B sector.

3. Theoretical Basis and Hypothesis Development

3.1. Theoretical Basic

3.1.1. Concept of Digital Transformation in Enterprise

Amid the rapid advancement of the Fourth Industrial Revolution, which has widespread and profound impacts globally, digital transformation is regarded as an inevitable trend and a matter of survival for countries, organizations, enterprises, and even consumers. Digital transformation is a comprehensive and fundamental change in the way individuals and organizations live, work, and produce, driven by digital technologies [17]. Thus, from this perspective, digital transformation represents the next evolutionary stage of computerization, achieved through groundbreaking technological advancements, particularly in digital technologies.

Digital transformation has significantly altered customer behavior and expectations, leading to an increased demand for personalized products and services. Such evolving expectations require businesses to reorganize and rethink their business models and operational approaches [15]. In the past, enterprise innovations were primarily executed through new projects; however, today, innovation has adopted a completely new approach. Specifically, enterprises leverage new technologies, solutions, and data to innovate and meet customers' demands and expectations, thereby creating new value and experiences. This digital transformation process supports companies in these changes. Hence, digital transformation in enterprises can be understood as the transition from traditional models to digital enterprises through the application of new technologies, such as Big Data, IoT and Cloud Computing, to transform management methods, workflows, and corporate culture [4].

From a broader perspective, Ho and Nguyen [18] assert that "Digital transformation in enterprises is a proactive process of restructuring organizational structure and operating models based on the integration of digital technologies to become more intelligent, efficient, and adaptable to the rapidly changing business environment". Such comprehensive self-transformation into a digital enterprise is the essence of digital transformation in businesses. In agreement with this view, Google [19] emphasized that digital transformation occurs when a business leverages new technologies to redesign and redefine its relationships with customers, employees, and partners. Digital transformation in enterprises encompasses everything from modernizing applications and creating new business models to developing new products and services for customers.

Therefore, digital transformation in enterprises is not merely about integrating technology broadly across various departments and divisions; rather, it involves a strategic mindset aimed at restructuring, reforming, and upgrading the organization in a rational and efficient manner, with technology serving merely as a tool to achieve these objectives.

3.1.2. The Impact of Digital Transformation on Financial Performance

Digital transformation has emerged as a strategic imperative for organizations seeking to improve financial performance and maintain competitive advantage in the rapidly evolving digital era. Unlike traditional approaches, digital transformation encompasses a holistic integration of digital technologies, processes, and business models to drive innovation and value creation. As a result, the impact of digital transformation on financial performance can be seen in various dimensions, including revenue growth, cost optimization, and enhanced profitability [20, 21].

For instance, companies implementing advanced data analytics and customer relationship management (CRM) systems can analyze consumer behavior, predict market trends, and tailor their offerings accordingly, leading to increased sales and higher customer lifetime value [22]. In a survey conducted by Harvard Business Review, 91% of senior leaders believe that effective data and analytics strategies are essential for successful business transformation initiatives in the next two years, companies that fully embrace digital transformation are 23% more profitable than their less digitally mature competitors [23].

Digital transformation also significantly influences cost structures by enhancing operational efficiency and reducing redundant processes. Technologies such as AI, robotic process automation (RPA), and cloud computing allow firms to automate routine tasks, optimize supply chain operations, and minimize human errors, resulting in cost savings [4]. A report by McKinsey and Company [24] found that digital solutions could reduce operational costs by up to 30%, depending on the industry and the extent of digital adoption.

Additionally, digitalization enhances the speed and agility of decision-making, enabling firms to respond quickly to market changes and capitalize on emerging opportunities. This agility translates into a stronger competitive position, allowing firms to sustain profitability even in volatile market conditions [25]. The research of Ren, et al. [26] supports this view, showing that digitally mature organizations consistently outperform their peers in terms of profitability and shareholder returns.

3.2. Research Hypothesis

Nowadays, enterprises aiming to survive and grow tend to adopt a digital approach integrated into their overall business strategies [27]. Digital strategies outline the company's vision in the context of digitalization, including the necessary strategic measures to achieve this vision. Such strategies set clear digitalization goals and initiatives for short-term, mid-term, and long-term horizons, impacting product offerings, value creation, organizational structure, and corporate culture [10].

Digital transformation begins with leadership that formulates and supports the implementation of the strategy. According to Korachi and Bounabat [28], to maintain competitiveness in the digital era and address digital transformation challenges, small and medium-sized enterprises need a comprehensive digital transformation strategy to manage digital change and drive operational excellence. Based on these arguments, the study proposes the following hypothesis:

Hypothesis H1.1: Strategic orientation in an enterprise has a positive impact on digital transformation readiness.

The objective of all investment decisions, including investments in digital transformation, is to enhance the business's operational efficiency. Customers are the ones who determine the effectiveness of these efforts through the number of orders, level of support, and revenue growth of the business. Thus, the top priority for digital transformation should be customer-centric, focusing on improving the customer experience [11].

A positive customer experience determines whether customers will return to continue purchasing products or be willing to recommend the products or business to others. This directly affects the company's growth. Moreover, as consumers become more technologically savvy, they increasingly expect enhanced digital experiences. Whether shopping online or at traditional stores, consumers expect to have digital interactions [3]. From these points, the study proposes the following hypothesis:

Hypothesis H1.2: Customer experience in a business has a positive impact on digital transformation readiness.

Research by Ning and Yao [14] explored the impact of digital transformation on the sustainable competitiveness of supply chains. The authors found that digital transformation not only improves supply chain capabilities but also positively

affects sustainable competitive performance. These findings provide evidence that digital transformation is a crucial factor in creating a competitive advantage for firms in the modern business environment.

In addition, Catlin, et al. [29] highlighted that adopting digital technologies in supply chains enhances decision-making processes and improves operational efficiency. The research emphasized the importance of deploying digital solutions for processing information and data automatically, enabling supply chain managers to make timely and accurate decisions. Hence, the following hypothesis is proposed:

Hypothesis H1.3: The scale of a company's supply chain has a positive impact on digital transformation readiness.

A firm's digital transformation readiness is dependent on how operations are managed, as they provide the necessary foundation for integrating digital technologies and facilitating the transformation process. In the fields of finance and accounting, the application of digital technology can significantly enhance operational efficiency. Technologies such as Artificial Intelligence, Robotics, and cloud-based ERP systems have been used to automate processes and improve decision-making [30].

Employee-related issues can hinder digital transformation readiness in various ways. One of the major challenges is the lack of digital skills among employees, and upskilling often requires considerable effort and can be met with resistance, particularly if employees feel inadequately supported during the transformation [31]. Legal regulations to ensure compliance with new technology-related standards, especially in data management and information protection, can also pose a barrier to digital transformation readiness [32]. From these points, the study proposes:

Hypothesis H1.4: Operational management capabilities in a business have a negative impact on digital transformation readiness.

In today's business context, characterized by rapid technological advancements and fierce competition, the IT systems and data management capabilities of each enterprise have become essential. To achieve sustainable growth and maintain competitiveness, firms must continuously develop and enhance their technological capabilities to generate both internal and external business impacts [33]. Business performance and sustainability are closely linked to technological innovation, which plays a vital role in creating economic value. Furthermore, IT and data management capabilities are increasingly seen as catalysts for the digital transformation of business models, enabling companies to adapt to the ever-changing environment [26]. Thus, this study proposes the following hypothesis:

Hypothesis H1.5: IT and data management capabilities in a business have a positive impact on digital transformation readiness.

Risk management and cybersecurity significantly affect a business's digital transformation readiness. Organizations often face challenges in balancing the adoption of new technologies and ensuring information security. Implementing an effective cybersecurity and risk management strategy not only protects businesses from threats but also enhances adaptability and innovation in the digital environment. Leading global companies are employing risk-based management approaches instead of maturity-based approaches to achieve greater effectiveness in cybersecurity management [34].

Furthermore, integrating cybersecurity strategies with a company's overall business strategy is essential. Businesses must view cybersecurity not merely as a technical requirement but as a part of a comprehensive business strategy that protects corporate value and facilitates digital transformation [35]. Thus, we propose:

Hypothesis H1.6: Risk management and cybersecurity in a business have a positive impact on digital transformation readiness.

Human and organizational factors play a critical role in shaping a business's digital transformation readiness. Factors such as organizational culture, management structure, and employee readiness can either promote or hinder the transformation process. Organizational culture is a determining factor in digital transformation. A culture that fosters innovation and flexibility will more easily embrace digital changes [5]. Therefore, the final hypothesis is:

Hypothesis H1.7: Human and organizational factors have a positive impact on digital transformation readiness.

Based on the above hypotheses, the study develops the following measurement scale to assess the digital transformation readiness of F&B enterprises in Vietnam:

Table 1.
Criteria for assessing digital transformation readiness.

Pillars	Code	Component criteria
Strategic Orientation	CL1	The leadership of the enterprise understands digital transformation trends relevant to the market, customers, competitors, and regulatory bodies.
	CL2	The enterprise leadership incorporates digital transformation initiatives into the overall strategic orientation of the company.
	CL3	The company regularly focuses on and invests in technological initiatives to enhance business efficiency and management effectiveness.
	CL4	The company applies IT systems and data analytics to support strategic activities such as capital mobilization and seeking strategic investors.
Customer Experience	TN1	The enterprise utilizes digital technologies in marketing, distribution, and sales (omni-channel) to enhance the customer experience and create competitive advantages.
	TN2	The enterprise applies digital technologies in customer service to deliver differentiated customer service experiences.
	TN3	The enterprise's customer relationship management (CRM) system can connect with other systems and is easily upgradable to incorporate additional functionalities.

Pillars	Code	Component criteria
	TN4	The enterprise uses IT systems and data analytics to measure the performance of marketing, sales, and customer service activities.
	TN5	The company employs data analytics to analyze and forecast sales results, providing a basis for adjusting marketing, sales, and customer service strategies.
Supply Chain	CU1	The company uses IT systems and data analytics to compare its supply capabilities with customer demand.
	CU2	The company uses IT systems to connect information with customers, suppliers, and production units.
	CU3	The enterprise has automated and digitized its production processes.
	CU4	The company has automated key operational processes such as procurement and inventory management.
	CU5	The enterprise collects and analyzes data related to procurement, production, and sales to identify bottlenecks and develop actionable plans accordingly.
Operational Management	QL1	The finance and accounting departments support cost-benefit analysis when applying digital technologies to business and management operations.
	QL2	The company has implemented IT software in financial management, accounting, and human resources to improve management efficiency.
	QL3	The company recognizes legal risks associated with the use of new technologies, such as risks related to copyright and taxation.
Information systems and data management	CN1	The enterprise frequently updates its technology solutions from leading providers in the market.
	CN2	The company has adopted new technologies to minimize costs and improve the efficiency of its IT system.
	CN3	The current IT systems and solutions of the enterprise are capable of easy integration with new technology solutions.
	CN4	The company has plans and resources to upgrade and renew its IT systems when necessary.
	CN5	The enterprise has policies and procedures related to the collection, storage, and analysis of data to support business decision-making.
Risk management	AN1	The enterprise understands the risks involved in digital transformation (including strategic risks, as well as internal and external risks).
	AN2	The company applies IT and data analytics to identify, evaluate, and address emerging risks.
	AN3	The company conducts regular reviews and assessments of vulnerabilities in its IT systems.
	AN4	The enterprise has procedures in place to handle incidents related to information technology and cybersecurity breaches.
Organizational human resources	TC1	The enterprise's employees are capable of quickly and positively adapting to changes.
	TC2	The organizational structure of the company is flexible to accommodate transformation.
	TC3	The staff possess the necessary knowledge, skills, and experience to meet the requirements of digital transformation.
	TC4	The enterprise has programs in place to attract and recruit talents in the field of information technology.

Table 2.
Criteria for assessing digital transformation readiness.

Scoring scale based on each criterion	Pillar Evaluation	The enterprise readiness for digital transformation
Less than 10% of the maximum score for each pillar	Not Initiated (level 0)	Assign a score of 0 if less than 4 pillars have a level 1
From 10% to 20% of the maximum score for each pillar	Initiated (level 1)	Assign a score of 1 if at least four pillars have a level 1
From over 20% to 40% of the maximum score for each pillar	Beginning (level 2)	Assign a score of 2 if at least four pillars have a level 2
From over 40% to 60% of the maximum score for each pillar	Forming (level 3)	Assign a score of 3 if at least four pillars have a level 3
From over 60% to 80% of the maximum score for each pillar	Enhancing (level 4)	Assign a score of 4 if at least four pillars have a level 4
From over 80% to 100% of the maximum score for each pillar	Leading (level 5)	All pillars at level 5

There are 30 criterions to collect valid responses using a Likert scale, ranging from one (1) representing strong disagreement to five (5) representing strong agreement. The results of the assessment score of each enterprise's digital transformation readiness are determined according to Table 2.

After calculating the digital transformation readiness level of enterprises, the next step is to develop hypotheses to evaluate the impact of digital transformation on financial performance. Based on previous studies, we propose the following hypotheses:

Hypothesis H2.1: Digital transformation positively affects financial performance of enterprises.

Nowadays, companies that adopt digital technologies do not simply improve their production processes but also transform their business models, boost revenue, and reduce costs. Recent studies have demonstrated that businesses investing in digital transformation tend to achieve higher financial performance than their competitors that have not adopted it or have done so at a slower pace. For example, research by Westerman, et al. [36] has shown that businesses implementing digital transformation can achieve an average of 26% higher financial performance than traditional businesses in terms of metrics such as revenue, profit, and market value. Additionally, digital transformation helps companies reduce operating costs through automation and process optimization, potentially lowering expenses by 20-30% through the use of technologies such as cloud computing, ERP systems, and RPA [4, 37].

However, the financial benefits of digital transformation are not automatic; they depend on a well-defined implementation strategy and a shift in corporate culture. Without a clear plan or in the face of internal resistance, businesses may find themselves investing in technology without realizing the expected financial gains [7, 34]. Thus, we propose the following hypotheses:

Hypothesis H2.2: The Z-score coefficient positively affects the financial performance of enterprises

The current payment ratio has both positive and negative effects on financial performance. When current assets like cash are uncontrolled, it may lead to bankruptcy risk as the business increases liquidity excessively [38]. However, increasing inventory or receivables to pay short-term debts reduces bankruptcy risk and improves financial performance. The payment ability is positively correlated with financial performance [37, 39]. In addition, Bhunia's research also shows that if a company has low and prolonged solvency, it will negatively affect financial performance [40]. Thus, we propose the following hypotheses:

Hypothesis H2.3: Current payment ratio positively affects financial performance.

Many studies indicate that financial leverage strongly affects financial performance, both negatively and positively. A positive relationship between debt ratio and financial performance is indicated by the fact that borrowing can reduce free cash flow in the business and limit bankruptcy risk [41]. However, a negative relationship is shown when companies borrow externally at high-interest rates and cannot achieve profits to cover borrowing costs, leading to insolvency and bankruptcy [42]. Thus, we propose the following hypotheses:

Hypothesis H2.4: Financial leverage negatively affects the financial performance of enterprises.

Large companies may have economic advantages due to abundant financial resources, buying a large number of raw materials for production, and expanding business scope with high inventory levels [43]. They suggest that larger companies receive higher credit limits than others due to their size and reputation, increasing business efficiency as profits increase [40, 44]. In addition, Wani and Ahmad [45] consider company size an important factor affecting the competitiveness and financial performance of enterprises [45]. Thus, we propose the following hypotheses:

Hypothesis H2.5: Company size positively affects financial performance.

The relationship between operating time and financial performance seems to be relevant both theoretically and practically. Currently, there are two conflicting views surrounding this issue. The first perspective suggests that financial performance decreases as companies operate longer, indicating an inverse relationship between operation duration and financial performance [46]. Long-established companies may find it hard to adapt to changing business environments, lacking innovation in abilities and techniques, which can lead to declining business activities and negative financial performance [47]. The second perspective, as shown by Aggarwal and Padhan, indicates that factors influencing financial performance suggest a positive relationship between company size, duration of operations, and financial outcomes [48].

Hypothesis H2.6: Company operation duration positively affects financial performance

In summary, based on the development of the research hypotheses above, we propose the following research model.

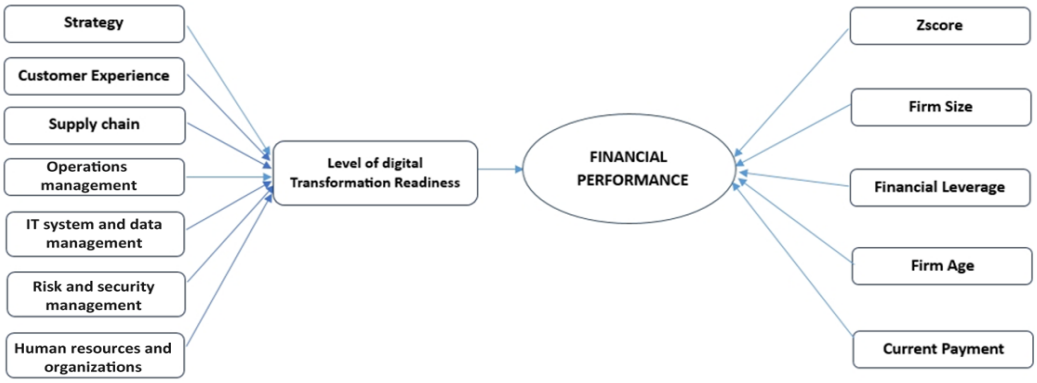

Figure 1.
Conceptual framework.

3.3. Research Model

Measure the dependent variable: According to many other authors, ROA and ROE are the most frequently used financial ratios to ascertain financial performance. ROA indicates how well an enterprise's management is utilizing its assets to create income. ROE is a profitability ratio that shows the amount of net income a company records as a percentage of the owner's equity.

Measure independent variables in the model: We also inherited the measurement of independent variables from previous studies [7, 10, 11, 44, 49, 50]. The calculation of independent variable values is performed in Table 3.

Table 3.
Variable and measured scale description.

Variable Name	Symbol	Calculation formula	Expectation
Level of digital transformation readiness	DT	Level 0 - Not Initiated Level 1 - Initiation Level 2 - Beginning Level 3 - Forming Level 4 - Enhancing Level 5 - Leading	+
Bankruptcy risk coefficient	Zscore	$Z = 1.21X_1 + 1.4\ X_2 + 3.3\ X_3 + 0.64\ X_4 + 0.999X_5$ (This is a listed manufacturing company)	+
Company size	Size	Logarithm of assets	+
Financial leverage level	Leverage	Debt /Equity	-
Company operation duration	Firm age	Company operation duration	+
Current payment ratio	CR	Short-term assets / Short-term debts	+

According to Semykina and Wooldridge [51] the regression model equation is constructed based on the fixed effect panel data model as follows:

$$ROA_{it} = \beta_1 + \beta_2 DT_{it} + \beta_3 Zscore_{it} + \beta_4 Size_{it} + \beta_5 Leverage_{it} + \beta_6 Firm\_age_{it} + \beta_7 CR_{it} + u_{it}$$

$$ROE_{it} = \beta_1 + \beta_2 DT_{it} + \beta_3 Zscore_{it} + \beta_4 Size_{it} + \beta_5 Leverage_{it} + \beta_6 Firm\_age_{it} + \beta_7 CRit + u_{it}$$

Where the subscript i, t represent the i-th observation at time t; u_{it} *is a random error*.

3.4. Data and Analysis Method

The most challenging aspect of conducting this research lies in the collection of data to evaluate the digital transformation readiness of listed F&B enterprises in Vietnam. Such information is not readily available or publicly disclosed like financial statements. Therefore, we had to gather primary data through direct expert interviews or via Google Forms from 30 F&B companies listed on the Vietnam Stock Exchange to assess the level of digital transformation within the enterprises for the years 2022 and 2023. During this process, we also received partial data support from the Enterprise Development Agency, a member unit of the Ministry of Planning and Investment.

The financial data, which constitute secondary data, were compiled from the financial statements of the listed F&B enterprises for the corresponding period.

Regarding the regression analysis model, we use the regression of panel data with pooled OLS, fixed effects model (FEM), or random effects model (REM), depending on the relevance of the models. FEM is a statistical model in which the model parameters are fixed or non-random quantities. REM, also called a variance components model, is a statistical model where the model parameters are random variables. It is a kind of hierarchical linear model, which assumes that the data being analyzed are drawn from a hierarchy of different populations whose differences relate to that hierarchy. A REM is a special case of a mixed model. The Feasible Generalized Least Squares (FGLS) model is employed to mitigate problems associated with heteroskedasticity or autocorrelation within the error terms of a given model.

4. Results and Discussion

4.1. Results of Digital Transformation Readiness Assessment

The average digital transformation readiness score of listed F&B enterprises in Vietnam for 2022 was 2.33, with three enterprises still at the initiation stage (Level 1). This indicates that the majority of listed F&B enterprises in Vietnam remained at Level 2 – "Beginning." However, there was a significant improvement in 2023, with the average score increasing to 2.5. Notably, while only one enterprise reached Level 4 – "Enhancing" in 2022, four enterprises achieved this level in 2023. These include major corporations that are leaders in the F&B sector in Vietnam, specifically Vinamilk JSC, Masan JSC, Saigon Beer – Alcohol – Beverage Corporation (Sabeco), and Hanoi Beer – Alcohol – Beverage Corporation (Habeco). This improvement can be attributed to the increased awareness of the role of digital transformation in operational management and business administration post-Covid-19, leading these companies to invest more substantially in customer management systems and production supply chain management.

4.2. Test Correlation Coefficient and Multi-Collinearity Between Variables

Table 4.
Correlation matrix and Multicollinearity among independent variables.

	DT	Z-score	Leverage	Firm age	Size	CR	VIF
DT	1.0000						1.95
Z-score	-0.0230	1.0000					2.29
Leverage	0.4361	0.2584	1.0000				1.84
Firm age	-0.4240	-0.0811	-0.3259	1.0000			1.79
Size	0.1348	0.4143	0.0843	-0.0866	1.0000		1.19
CR	0.0853	-0.0798	-0.3772	0.1987	0.0602	1.0000	1.87

From Table 4, we observe that the correlation coefficients between the independent variables in the model are all below 0.5, indicating an absence of pairwise multicollinearity. However, to determine whether the model exhibits autocorrelation, it is necessary to conduct the appropriate tests.

The variance inflation factor (VIF) test results show that the VIF values of the independent variables are all below 10, indicating no multicollinearity among the independent variables. Table 2 shows sufficient conditions to conduct regression analysis among the variables.

4.3. Model Selection and Construction Test

** Model selection test*

The study estimates the model using three methods: pooled OLS, FEM, and REM. Then, tests are conducted to choose the appropriate model.

Table 5.
Model selection test results.

		F_test	Hausman test
Results	ROA	Prob > F = 0.0000 < 0.05	Prob > chi2 = 0.2169 > 0.05
	ROE	Prob > F = 0.0000 < 0.05	Prob > chi2 = 0.6015 > 0.05
Conclusion	ROA	FEM is more suitable than OLS	REM is more suitable than FEM
	ROE	FEM is more suitable than OLS	REM is more suitable than FEM

Therefore, the random effects model (REM) is the most suitable model to explain the correlation between variables and dependent variables ROA and ROE.

** Model defects test*

Table 6.
Model defects test results.

		Heteroscedasticity test	Autocorrelation test
Results	ROA	chibar2(01) = 181.34 Prob > chibar2 = 0.0000 < 0.05	F (1, 29) = 15.617 Prob > F = 0.0004 < 0.05
	ROE	chibar2(01) = 153.61 Prob > chibar2 = 0.0000 < 0.05	F (1, 29) = 18.132 Prob > F = 0.0001 < 0.05
Conclusion	ROA	The REM model has heteroscedasticity	The REM model exhibits the presence of first-order autocorrelation.
	ROE	The REM model has heteroscedasticity	The REM model exhibits the presence of first-order autocorrelation.

4.4. Regression Model

Table 7.
The impact of independent variables in the model after applying FGLS method.

Variable	ROA			ROE		
	Coefficient	Std. err	P > |z|	Coefficient	Std. err	P > |z|
DT	-0.0103238	0.0046824	0.015	-0.0233242	0.0078551	0.001
Z-score	0.0406466	0.003671	0.000	0.0632216	0.0059766	0.000
Size	0.0134146	0.0024821	0.000	0.0249471	0.0040392	0.000
Leverage	-0.0134213	0.0047289	0.005	-0.0209547	0.0103904	0.044
Firm age	-0.0000772	0.0001474	0.600	-0.0001754	0.000245	0.474
CR	0.0201607	0.0041971	0.000	0.0427424	0.0064667	0.000
Cons_	-0.168975	0.0401734	0.000	-0.2729987	0.0644159	0.000

4.5. Discussion

The results indicate that the explanatory variable DT negatively affects ROA and ROE at a statistically significant level. Additionally, the control variables are also significant in the regression model with dependent variables ROA and ROE, respectively: Z-score, Size, Leverage, and CR; the impact directions of the factors are consistent with the initial hypotheses, with the exception of the Firm_age variable, which is not statistically significant. Specifically:

The level of digital transformation has a negative impact on ROA and ROE, with β coefficients of -0.0103238 and -0.0233242, respectively. This result is contrary to the hypothesis proposed by the authors but aligns with the reality in Vietnam recently as this is the period when businesses start forming digital transformation, requiring significant capital investment to operate business on a technological platform, and lacking experience in digital transformation implementation. Therefore, the digital transformation in this period has not yet yielded the expected results. The research result is consistent with Jardak and Hamad [12].

Bankruptcy risk, as measured by the Z-score variable, positively affects ROA and ROE, making it the most influential variable in the model regarding financial performance, with β coefficients of 0.0406466 and 0.0632216. When enterprises have a higher Z-score, indicating lower bankruptcy risk and better financial health, they will experience stable income and improved financial performance. The research results align with [37, 52].

The variable of company size (Size) positively affects the financial performance of listed F&B enterprises, with β coefficients of 0.0134146 and 0.0249471. Larger enterprises have stronger financial resources, reputation, and often lower bankruptcy risk, thus reducing financial costs and increasing profits, enhancing financial performance. The research result is consistent with [40, 46].

The current payment ratio variable (CR) has a positive β coefficient, indicating a positive relationship with ROA and ROE. When the current payment ratio is high, the company can well pay its short-term debt obligations, bringing high business efficiency. Conversely, a low current payment ratio means the company cannot timely pay its obligations to creditors and suppliers, reducing business efficiency. This research result is entirely consistent with [40, 44].

The debt-to-equity ratio variable (Leverage) negatively affects ROA and ROE of listed F&B enterprises. If enterprises tend to use more debt over a long period, excessive financial leverage may lead to increased financial risk, reduced operational efficiency, and potential bankruptcy risk. The research result is consistent with the pecking order theory of Myers [53].

5. Conclusion and Policy Implications

Digital transformation is an important process and goal for enterprises in the current digital age. The results show that digital transformation has a negative impact on financial performance because it requires significant initial investment and may not immediately yield positive results. Some enterprises have faced difficulties in adapting to new technologies, causing disruptions in production and business operations. In the future, investment in digital transformation will certainly bring significant breakthroughs in firm performance. To enhance firm performance in the context of digital transformation, the authors propose management implications:

5.1. For Enterprises

Enterprises need to establish a smart investment strategy based on a thorough assessment of benefits and costs, as well as their technology absorption capacity. Additionally, focusing on training and developing skills for employees is essential in the context of digital transformation so they can effectively use new digital tools, thereby improving productivity and firm performance. Enterprises also need to clearly understand that digital transformation is not just a technical process but also a cultural innovation process. This requires participation and commitment from all levels within the organization, from leadership to employees. Only when everyone aims for a common goal and is ready to adapt to new changes will the digital transformation process truly bring effectiveness and contribute to the long-term development of the enterprise.

5.2. For the Government

There is a need for more specific support policies for enterprises in the digital transformation process. This includes providing financing at preferential interest rates, establishing technical support and consulting centers, and particularly training human resources with information technology skills. Additionally, creating a transparent and clear legal framework will help enterprises feel more secure when investing in new technology, knowing that they will be legally protected in case of disputes or failures in the transformation process.

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