THE MODERATING EFFECT OF OPERATIONAL PERFORMANCE ON THE RELATIONSHIP BETWEEN QUALITY MANAGEMENT AND CORPORATE FINANCIAL PERFORMANCE: EVIDENCE FROM LISTED FOOD MANUFACTURING COMPANIES IN VIETNAM

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Abstract: ***This study examines the effect of quality management on the financial performance of food processing companies listed on Vietnam's stock market. Using OLS estimation and hierarchical regression, results show that firms with ISO 22000 certification perform better financially. Operational performance significantly impacts financial outcomes, with production flexibility and cost efficiency negatively affecting financial performance, while inventory turnover has a positive impact. Additionally, cost efficiency and inventory turnover moderate the relationship between quality management and financial performance, suggesting that ISO 22000-certified firms with efficient costs and faster inventory turnover achieve superior financial results.***

• Keywords: *food manufacturing companies, financial performance, operational performance, quality management.*

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1. Introduction

Financial efficiency is crucial for firms in a market economy, especially after the challenges posed by COVID-19. Identifying factors that influence financial performance helps managers take action to improve outcomes. Quality management, particularly in manufacturing, plays a critical role as it impacts both costs and revenue, directly affecting financial performance. Operational performance, as a moderating factor, further influences this relationship. This study focuses on listed food processing companies in Vietnam, where product quality is key to competitiveness. It addresses the gap in research on ISO 22000 certification and its impact on financial performance in Vietnam.

2. Literature review

Strong quality management improves financial performance by boosting sales through certifications (Cai, 2018), increasing productivity and cutting costs (Wruck & Jensen, 1994), allowing higher pricing (Dunkers, 1999), enhancing training and customer satisfaction (Ataseven, 2013), and improving cash flow and inventory turnover (Lo, 2009).

This study uses ISO 22000 certification to assess quality management in food processing companies. ISO certification was chosen because it reflects superior quality management practices, making these firms stand out. As a globally recognized standard issued by the International Organization for Standardization, ISO is widely adopted, with over 160 countries acknowledging its importance (Paryani, 2011). ISO standards have had a greater impact on quality improvement worldwide than any other certification (Foster, 2010). Studies show that implementing ISO generally enhances a company's financial performance (Corbett et al., 2008; Han et al., 2007; Jang & Lin, 2008).

In Vietnam, food firms increasingly adopt ISO 22000 certification due to its suitability and effectiveness in improving financial performance, despite the availability of various food safety certifications with different requirements.

Many studies show that adopting quality standards boosts financial performance. Deming (1986) and others found links to better outcomes, profits, and market value (Heras et al., 2002; Corbett et al., 2008; Bhandari, 1988).

The moderating role of operational performance on the relationship between quality management and firm financial performance.

Quality management theoretically provides financial benefits, but it must be combined with other factors for success, with operational efficiency being key. This efficiency encompasses aspects like production flexibility, financial efficiency,

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and inventory turnover. Together, operational performance and quality management enhance financial outcomes for firms. According to Chavez et al. (2015), operational performance involves strategic choices that improve competitiveness and customer satisfaction by delivering high-quality products promptly. We focus on production flexibility, cost efficiency, and inventory turnover as measures of operational performance (Chavez et al., 2015; Lau, A.K.W., 2018; Santos, H., 2019).

Flexibility in production

Production flexibility refers to a company's ability to shift from one product to another in response to market demand (Shou, 2018). Total quality management emphasizes designing customer-focused products to enhance satisfaction (Duh, R.-R, 2012). Meeting changing customer requirements is crucial for success, as demonstrated by Japanese auto companies in the US. In contrast, firms that struggle to predict demand may allocate resources inefficiently, risking customer loss and competitive failure (Goyal, M, 2012). Today, operational flexibility is essential for market dominance, reflecting how well companies can adjust production within time, effort, and cost constraints (Patel, P.C, 2011). This study focuses on manufacturing flexibility as defined by Cachon and Olivares, which allows firms to produce smaller batches and adapt quickly to market changes. Greater production flexibility leads to faster delivery times and can minimize price reductions, ultimately enhancing profitability (Moreno, A, 2015). It enables companies to adjust production levels and innovate while saving costs and meeting customer needs effectively.

Cost-effective

Operating costs are crucial for the performance of any enterprise, prompting firms to seek cost reductions compared to competitors (Chavez et al., 2015). For instance, BMW utilizes an advanced configuration system and modular architecture to produce customized cars within 12 days at competitive costs (Kortmann, S, 2014). Cost efficiency is a significant focus in operations management and is used to evaluate business performance (Chavez, R, 2015). It reflects a company's ability to save time and costs (Kortmann, S, 2014). This study emphasizes cost efficiency by measuring its impact on revenue in the value-creation process (Zhang, G.P, 2012). Achieving cost efficiency through methods like eliminating excess materials can lead to financial benefits, which drive companies toward their goals. Key financial metrics, such as stock returns, Tobin's q, and ROA, are closely linked to cost-based efficiencies, including bottleneck elimination and lot size reduction.

Inventory turnover speed

Quality management emphasizes that quick delivery and lean production enhance inventory turnover and reduce inventory costs (Kortmann, S, 2014). A Standard & Poor's survey identifies inventory as a critical asset for companies (Gaur, V, 2008). Higher inventory levels can lead to profit declines (Chen, H, 2005), prompting firms to seek optimal inventory management strategies (Rumyantsev, S, 2007). Inventory turnover measures how often a company's inventory converts to revenue; higher turnover indicates better performance. Excess inventory incurs higher storage and spoilage costs, negatively affecting financial results. Therefore, effective quality management combined with rapid inventory turnover can significantly improve a firm's financial performance.

3. Methodology

3.1. Research model

** Research hypothesis*

Based on the theoretical content about the relationship between quality management and financial performance of enterprises presented in the above section, we propose hypotheses about the relationship between quality management and financial performance as follows:

Hypothesis 1: Food processing enterprises with ISO 22000 certification have better financial performance

Hypothesis 2: Operational performance affects the financial performance of the enterprise

Hypothesis 3: Operational performance moderates the relationship between quality management and firm financial performance

Hypothesis 3a: Manufacturing flexibility moderates the relationship between quality management and firm financial performance

Hypothesis 3b: Cost efficiency moderates the relationship between quality management and firm financial performance

Hypothesis 3c: Total asset turnover moderates the relationship between quality management and firm financial performance

** Research models*

Based on the research hypotheses, the models proposed in the study are as follows:

$$ROA_{it} = \beta_0 + \beta_1 ISO_{it} + \beta_2 Size_{it} + \beta_3 LIQ_{it} + \beta_4 LEV_{it} + \beta_5 AT_{it} + \varepsilon_{it} \quad (1)$$

$$ROA_{it} = \beta_0 + \beta_1 ISO_{it} + \beta_2 Size_{it} + \beta_3 LIQ_{it} + \beta_4 LEV_{it} + \beta_5 AT_{it} + \beta_6 PF_{it} + \varepsilon_{it} \quad (2)$$

$$ROA_{it} = \beta_0 + \beta_1 ISO_{it} + \beta_2 Size_{it} + \beta_3 LIQ_{it} + \beta_4 LEV_{it} + \beta_5 AT_{it} + \beta_6 PF_{it} + \beta_7 PF_{it} * ISO_{it} + \varepsilon_{it} \quad (3)$$

$$ROA_{it} = \beta_0 + \beta_1 ISO_{it} + \beta_2 Size_{it} + \beta_3 LIQ_{it} + \beta_4 LEV_{it} + \beta_5 AT_{it} + \beta_6 CE_{it} + \varepsilon_{it} \quad (4)$$

$$ROA_{it} = \beta_0 + \beta_1 ISO_{it} + \beta_2 Size_{it} + \beta_3 LIQ_{it} + \beta_4 LEV_{it} + \beta_5 AT_{it} + \beta_6 CE_{it} + \beta_7 CE_{it} * ISO_{it} + \varepsilon_{it} \quad (5)$$

$$ROA_{it} = \beta_0 + \beta_1 ISO_{it} + \beta_2 Size_{it} + \beta_3 LIQ_{it} + \beta_4 LEV_{it} + \beta_5 AT_{it} + \beta_6 IT_{it} + \varepsilon_{it} \quad (6)$$

$$ROA_{it} = \beta_0 + \beta_1 ISO_{it} + \beta_2 Size_{it} + \beta_3 LIQ_{it} + \beta_4 LEV_{it} + \beta_5 AT_{it} + \beta_6 T_{it} + \beta_7 IT_{it} * ISO_{it} + \varepsilon_{it} \quad (7)$$

Where:

ROA: Return on total assets, reflecting the financial performance of the business

ISO: Independent variable - Dummy variable (takes value 1 when the enterprise has an ISO certificate 22000, takes value 0 in the opposite case)

Variables that reflect operational performance include: Cost efficiency (CE), inventory turnover (IT) and production flexibility (PF).

In addition, the model adds the following control variables: Total asset turnover, company size, financial leverage, liquidity.

The variables in the research model are described specifically in the following table:

Table 1: Variables measurement

Type of variable	Name of variable	Measurement
dependent variable		
ROA	Return on assets	Profit after tax/total assets
Independent variable		
ISO	Quality	Dummy variable (takes value 1 when the enterprise has an ISO22000 certificate, takes value 0 otherwise)
Moderator variables		
PF	Flexibility in production	$PF = \frac{\lvert I_{it} - I_{it-1} \rvert}{S_{it}}$ Where: I_{it}: Inventory of enterprise i in year t I_{it-1} : Inventory of enterprise i in year t-1 S_{it}: Total sales of company i in year t.
CE	Cost efficiency	Cost of goods sold/total sales
IT	Inventory turnover	Cost of goods sold/average inventory
Control variables		
Size	Size	Natural logarithm of total assets
LIQ	Liquidity	Current assets/Current liabilities
LEV	Leverage	Total debts/Total assets
AT	Total asset turnover	Net revenue/Average total assets for the period

3.2. Data and summary statistics

The financial data of the companies in the research sample was collected from the financial reports of food processing companies listed on the Vietnam stock market for the period 2017-2022. Data on quality management in the research sample were collected from management reports and websites of firms during this period.

Table 3 summarizes the statistical results for the model variables as follows:

- The average return on assets (ROA) for the firms in the sample is 3.23%, with a significant standard deviation of 14.6%, resulting in a range from -162.67% to 31.5%.

- Financial leverage averages 61.22%, indicating a high debt-to-equity ratio, with a standard deviation of 33.43% and values ranging from 3.36% to 91.92%, reflecting considerable variability in financial autonomy.

- The size of the firms, measured as the natural logarithm of total assets, averages 27.5 with a standard deviation of 1.56, ranging from 23.55 to 32.46.

Current solvency averages 2.089, indicating adequate liquidity, but the high standard deviation of 3.11 and a range from 0.001 to 29.4 reveal disparities in immediate payment capabilities among firms.

- The ISO dummy variable shows that 59% of firms have ISO certification, with a standard deviation of 0.492.

- Total asset turnover averages 1.498, with a standard deviation of 1.1055 and values ranging from 0.038 to 9.12, indicating significant differences in efficiency.

The production-sales match (PF) averages 0.071 with a standard deviation of 0.119, ranging from 0 to 1.218. Cost efficiency (CE) has an average of 0.869, with a range from 0.196 to 3.69. Lastly, inventory turnover (IT) averages 7.52, with a wide range from 0 to 95.88 and a standard deviation of 9.81, highlighting variability in operational efficiency across firms.

Table 2: Summary of descriptive statistics

Variables	Observation	Mean	Std	Min	Max
ROA	264	0.0323135	0.1461156	-1.626776	0.3150076
LEV	264	0.6122991	0.334301	0.0336223	0.91927
Size	264	27.50112	1.559583	23.55919	32.46804
LIQ	264	2.089369	3.107781	0.0012212	29.40705
ISO	264	0.5909091	0.4925999	0	1
TAT	264	1.498228	1.105583	0.0377378	9.124197
PF	264	0.071135	0.1188717	0	1.217684
CE	264	0.8693449	0.2511326	0.1960046	3.685656
IT	264	7.517144	9.805524	0	95.876

Data source: Stata output

3.4. Research methods

To assess the impact of quality management on financial performance, the research team employed OLS estimation. Additionally, Hierarchical Regression Analysis was used to examine how operational performance moderates this relationship. This method tests whether operational performance influences financial outcomes and moderates the connection between quality management and financial performance. In hierarchical regression, predictors are entered in blocks, with each block representing a step in the analysis, following three regression equations.

$$Y = \beta_0 + \beta_1 * X \quad (1)$$

$$Y = \beta_0 + \beta_1 * X + \beta_2 * M \quad (2)$$

$$Y = \beta_0 + \beta_1 * X + \beta_2 * M + \beta_3 * X.M \quad (3)$$

With β_0, β_i: are the regression weights

Regression equation (1) shows the impact of the independent variable on the dependent variable.

Regression equation (2) shows the impact of the independent variable on the dependent variable. In particular, the moderating variable M is included in the model and considered as an independent variable.

Regression equation (3) shows the impact of the independent variable and interaction variable (X*M) on the dependent variable if the interaction variable has a significance level of sig. < 0.05 proves that variable M acts as a moderating variable (Nguyen Dinh Tho, 2011).

4. Empirical results

4.1. Panel unit root test

The research of Gujarati (2003) indicates that if the research data is not stationary, regression results will not be accurate. In order to tackle this issue, all variables should be tested panel unit root. Because the data in this research is strongly balanced, the panel unit root test of Levin, Lin & Chu (2002) is chosen. The result shows that the data of all five variables are stationary so that data are suitable to be used in the next research steps.

4.2. Correlation analysis

Table 3: Correlation matrix between variables

	ROA	LEV	Size	LIQ	ISO	TAT	PF	CE	IT
ROA	1.0000								
LEV	-0.4210*	1.0000							
Size	0.3028*	-0.3123*	1.0000						
LIQ	0.0800	-0.1477*	-0.1634*	1.0000					
ISO	0.1405*	-0.1637*	0.3498*	-0.0883	1.0000				
TAT	0.3248*	-0.2032*	-0.1669*	0.0556	0.0419	1.0000			
PF	-0.1805*	-0.0680	-0.1199	0.0778	0.0266	-0.2360*	1.0000		
CE	-0.4373*	0.7119*	-0.3096*	-0.0413	-0.1146	-0.1059	0.1780*	1.0000	
IT	0.1702*	-0.0989	-0.1055	0.0142	-0.1951*	0.2442*	-0.1097	0.0239	1.0000

Data source: Stata output

Table 3 shows the Pearson correlation coefficient between variables. The results indicate that ROA variable has a statistically significant positive correlation with the business size, ISO, total asset turnover, inventory turnover and a negative correlation with the financial leverage, revenue growth, cash flow, the cash conversion cycle and net cash flow. At the same time, the ROA variable has a statistically significant negative correlation with the level of production flexibility and cost efficiency.

4.3. Discussion of regression results

According to the table 4, we can draw the following conclusions:

The results of testing the multicollinearity phenomenon show that the variance inflation factor (VIF) after removing the debt coefficient variable shows that the VIF of all variables in model 1 is low (less than 10), so All variables are suitable for inclusion in the regression model.

The OLS estimation results show that the F statistic value is statistically significant at the 1% level, indicating that the OLS estimation can be an appropriate estimate.

Table 4: Regression results of the relationship between quality management and financial performance of food processing companies

Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
LEV	-0.0149***	-.01605***	-0.01602***	-0.00342	-0.00628	-0.01490***	-0.01498***
	(0.00341)	(0.00344)	(0.00346)	(0.00449)	(0.00461)	(0.00343)	(0.00344)
Size	0.0272***	0.02458***	0.02457***	0.02478***	0.0219***	0.02722***	0.02731***
	(0.00579)	(0.00593)	(0.0059425)	(0.00568)	0.00575	0.00580	(0.00582)
LIQ	0.00329	0.00344	0.00347	0.00395	0.00366	0.00327	0.00331
	(0.00254)	(0.00253)	(0.00254)	(0.00248)	0.00246	0.00255	0.00255
TAT	0.0415***	0.03692	0.03681***	0.04287***	0.0436***	0.04174***	0.04135***
	(0.00735)	(0.00770)	(0.00773)	(0.00717)	(0.00711)	(0.00757)	(0.00769)
ISO	-0.00331	-0.00001	0.00191	0.00118	0.24873**	-0.00383	-0.0080
	(0.0168)	(0.01681)	(0.01939)	(0.01642)	(0.10497)	(0.01720)	(0.0223)
PF		-0.12920*	-0.1177				
		(0.06828)	(0.0893)				
PF*ISO			-0.0258				
			(0.1291)				
CE				-0.1653***	-0.1276***		
				(0.0438)	(0.04619)		
CE*ISO					-0.2867**		
					(0.12012)		
IT						0.0015*	0.0036**
						(0.00088)	(0.00175)
IT*ISO							0.00332*
							(0.00181)
Cons	-0.770***	-0.682167	-0.68245	-0.5741***	-0.5292***	-0.7684***	-0.7693***
	(0.162)	(0.16789)	(0.16822)	(0.16635)	(0.1658)	(0.16283)	(0.16315)
R2	0.3001	0.3123	0.3124	0.3401	0.3548	0.3025	0.3028

Data source: Stata output

The estimated results using the OLS model:

Financial leverage negatively affects return on total assets in food processing enterprises. Higher financial autonomy correlates with better performance; increased debt raises financial risk, impairing capital mobilization and reducing profitability. These findings align with prior research by Titman and Wessels (1988), Booth (2001), and Rajan (1995).

Enterprise size has a statistically significant positive relationship with return on total assets, indicating that larger firms enjoy higher profit rates. Companies with greater scale benefit from enhanced reputation, facilitating capital mobilization and smoother sales operations, which leads to increased profitability. These findings are consistent with previous studies by Prasetyantoko and Parmono (2008), Fenn (2008), Flamini et al. (2009), Stierwald (2009), and Yang and Chen (2009).

Total asset turnover has a statistically significant positive relationship with the rate of return on total assets. Therefore, the higher a business's total asset turnover rate, the higher its profitability and vice versa. This positive relationship was also discovered

in studies by Prasetyantoko and Parmono (2008), Hardwick (1997) and Fenn (2008).

The ISO variable in this research model does not show a statistically significant relationship with the financial performance of the business.

To test hypotheses H2–H3, the author used hierarchical regression in the study. These hypotheses suggest that companies with excellent operational performance will have the highest financial performance. Due to the existence of a relatively high correlation between variables, the variance inflation factor (VIF) analysis is carried out. According to the VIF results, multicollinearity is not a concern in regression analysis.

The hierarchical regression results:

Model 2 regression results show a significant impact of manufacturing flexibility on financial performance. The regression coefficient reaches a negative value (-0.1292065) and is significant at the 0.1 level. Therefore, flexibility in production has a negative impact on the financial performance of enterprises in the food processing industry.

Comparing the R2 values of models 2 and 3, we see that model 3 has an improved R2 compared to model 2, so model 3 has a higher explanatory power than model 1.

However, when considering the interactive relationship between production flexibility and receiving ISO quality certification (model 3) on financial performance, the regression results show that there is no relationship. Statistical significance. Thus, production flexibility does not play a moderating role in the relationship between ISO and ROA variables.

Model 4 regression results indicate that cost efficiency can significantly affect a business's financial performance (regression coefficient = -0.165376, $p < 0.05$). This result suggests that companies with better production cost efficiency can achieve more excellent financial performance benefits. This research result is also found in the research of Chavez (2015) and Ayaram (2016).

In Model 5, the moderating effect of cost efficiency on the relationship between ISO and ROA variables is confirmed with a regression coefficient of -0.286758 at the 10% significance level. Thus, when firms can save production costs, this will have a positive impact on the relationship between holding an ISO quality certificate and the financial performance of the business.

Comparing the R2 values of models 4 and 5, we see that model 5 has an improved R2 compared to model 4, so model 5 has a higher explanatory power than model 1.

Model 6 regression results show that inventory turnover has a statistically significant positive relationship with ROA (regression coefficient = 0.001525, significance level 10%). The results of this study show that companies can gain more benefits by moving their goods efficiently. In addition, the research results also show a statistically significant interactive relationship between inventory turnover speed and the relationship between ISO variables and the financial performance of the business (regression coefficient = 0 .0033227, $p < 0.1$) (Model 7).

Comparing the R2 values of models 6 and 7, we see that model 7 has an improved R2 compared to model 6, so model 7 has a higher explanatory power than model 6.

In addition, the ISO variable shows a statistically significant positive relationship with profitability on the total assets of firms in the research sample (Model 5). Therefore, it can be affirmed that food processing firms that hold ISO 22000 certification have better profitability than other firms in the industry. This research result coincides with the results of most previous studies on the relationship between quality management and the financial performance of enterprises (Ataseven, 2013; Lo, C.K.Y, 2009; Jay and Peter, 1992).

Conclusion: The research indicates that firms with ISO 22000 certification have higher financial performance than those without. Choosing the right food safety certification is crucial for firm development; neglecting this can erode consumer trust, reduce financial efficiency, and lead to loss of market share. Performance factors significantly affect financial outcomes: production flexibility and cost efficiency negatively impact financial performance, while inventory turnover has a positive effect. Cost efficiency and inventory turnover also moderate the relationship between quality management and financial performance. Additionally, financial leverage negatively affects performance, whereas firm size and total asset turnover positively influence profitability.

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