







“Evaluating the influence of environmental accounting practices on the operational efficiency of seafood businesses in Vietnam”

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EVALUATING THE INFLUENCE OF ENVIRONMENTAL ACCOUNTING PRACTICES ON THE OPERATIONAL EFFICIENCY OF SEAFOOD BUSINESSES IN VIETNAM

Abstract

This paper deals with factors affecting environmental accounting adoption and its impact on operational performance in Vietnamese seafood enterprises. The data were collected from seafood enterprises in Vietnam. Structural equation modeling was applied to explore the causal relationship between operational performance and other factors. The results show that the factors affecting the implementation of environmental accounting based on normalized weights include manager support, with the strongest impact (0.286), followed by the level of technology (0.155), qualifications of accountants (0.191), pressure from stakeholders (0.129), business characteristics (0.117), financial resources (0.113), legal regulations (0.103), and finally environmental changes (0.1). The results also show that environmental accounting implementation strongly impacts operational performance (standardized weight 0.351). The correlation relationships in the model are all statistically significant, with a 95% confidence level ($p = 0.000 < 0.05$). The paper contributes to perfecting the factors affecting the implementation of environmental accounting, clearly seeing its benefits and positive impacts on performance in seafood enterprises in Vietnam, to achieve environmental protection goals, increase economic benefits, and sustainable development.

Keywords

influence, efficiency, environmental accounting,
performance, seafood enterprises, Vietnam

JEL Classification

M40, M41, L25, E01

INTRODUCTION

Green growth is a pivotal aspect of sustainable development, characterized by the delicate balance between socio-economic advancement and environmental preservation. Therefore, integrating economic development with green growth has become a prominent concern for governments. This approach aims to foster a sustainable economy while safeguarding the environment. Vietnam, located on the periphery of the East Sea, holds a region of paramount geographical, economic, and political importance. Vietnam's maritime zone also boasts abundant natural resources and substantial economic development potential. Moreover, Vietnam possesses favorable natural conditions for marine aquaculture, freshwater aquaculture, and the establishment of fisheries-related infrastructure. Nevertheless, this transition toward a blue economy from an economy predominantly focused on resource exploitation and environmental pollution necessitates careful management. Within maritime economic development, environmental protection translates into mitigating environmental risks, fulfilling societal responsibilities, and ensuring sustainable business growth.

Jasch and Savage (2008) argue that most managers have not envisioned benefits (such as higher revenue, decreased costs, and improved profit)

from improving environmental performance, reducing environmental impact, and making informed decisions. There are many different views about environmental accounting. Nowadays, managers have a heightened awareness that funds allocated toward controlling and mitigating environmental pollution represent not an expenditure but rather an investment in tomorrow. Such an investment enhances the company's value, reputation, and brand. Consequently, to support effective business decision-making, managers require traditional financial information about revenue, costs, and profit and a greater quantity of environmental-related data. In addition, environmental management accounting can improve organizational performance when using relevant information for decision-making (Jasch, 2003).

Environmental accounting is a relatively recent concern in Vietnam, in contrast to its longstanding presence in developed nations. The inception of environmental accounting in the United States dates to 1972. However, its initial focus was primarily on national-level accounting and did not encompass methods for gathering, processing, analyzing, or disseminating environmental accounting information. At the end of 2003, it was first introduced in Vietnam through a project for small and medium-sized enterprises among ASEAN countries. Environmental accounting has become a supporting tool for managers to run better and reduce costs effectively. An enterprise's environmental accounting is essential for business administration and management and for providing information to other groups of related subjects. In the current Vietnamese accounting system, the content of environmental accounting implementation in enterprises is still a gap that has not been thoroughly studied. Its implementation does not yet have specific guidelines. Recently, seafood enterprises in Vietnam have paid more attention to applying cleaner production solutions in the processing industry, aquaculture, fishing services, and marine logistics. However, the operation of enterprises in Vietnam still has many problems related to the environment that need to be considered and resolved. Besides, the benefits brought about by the implementation of environmental accounting also need to be fully identified, measured, and calculated in terms of financial and non-financial benefits. Therefore, the adoption of environmental accounting is both essential and feasible for enhancing operational performance.

1. LITERATURE REVIEW AND HYPOTHESES

The increasing concern for social and environmental issues has driven a growing body of academic research on environmental accounting. The research literature is extensive, covering both theoretical and empirical perspectives (Mata et al., 2018). Reviewing the literature aims to provide insights into the implementation of environmental accounting, the influencing factors, and its impact on business operational performance.

1.1. Implementing environmental accounting and factors influencing environmental accounting implementation

Environmental accounting has been discussed both theoretically and in practice, especially in developed countries (Vasile & Man, 2012). Research from this period is beginning to develop and is

known as the "foundation" period of environmental accounting. Researchers are paying closer attention to this topic, and environmental reporting is beginning to show interest in adopting new guidelines for managing environmental accounting (Vasile & Man, 2012).

Larrinaga-González et al. (2001) examined the role of environmental accounting practices in Spanish companies. Using Gray et al. (1995)'s theory applied to a different context, the study concluded that current environmental reporting practices are being taken seriously. Legitimacy and political economy theories are used to explain the complexity of the environmental accounting process. This study elucidates that environmental accounting implementation increases transparency and control of the environmental agenda.

According to Yakhou and Dorweiler (2004), environmental accounting is a type of general accounting. The environmental accounting implementation process is considered to provide information for both

internal and external enterprises. However, using internal information on prices, cost control, and budgeting provided by environmental accounting is most important. Besides, the findings concluded the need to integrate environmental and business policies for business sectors, making companies more environmentally friendly, which makes implementing environmental accounting effective.

Lehman and Kuruppu (2017) addressed the research framework of environmental and social accounting. Thereby, the study examines the limitations and possibilities of implementing environmental and social accounting in the present to create changes in the future. The study's results also suggest future directions and explore the links between accounting, assessment frameworks, and information systems. It also explores possible future directions for social and environmental accounting research using different contemporary perspectives.

The literature demonstrates that managerial backing plays a crucial role in embracing administrative innovations (Gosselin et al., 2018). Specifically, managers offer leadership, training, and an open communication channel that fosters employees' commitment to embrace new administrative changes (Sisaye & Birnberg, 2012). The backing of top management serves as a potent internal motivator to engage in a particular behavior (Blass et al., 2014). Hence, companies with robust senior leadership support are more inclined to adopt environmental accounting when subjected to institutional pressures. Wang et al. (2019) suggest that implementing environmental management accounting often requires a lot of resources and support from top management, which will cause companies to implement environmental accounting and treat the environment more conveniently and completely. Having top management support makes it easier for companies to implement environmental accounting, and this support represents a robust internal driving force for executing a particular behavior (Wang et al., 2019).

Financial resources are one of the critical factors that greatly influence the implementation of environmental accounting in businesses, especially small and medium-sized enterprises (SMEs) (Jamil et al., 2015; Wachira & Wang'ombe, 2019). Rahbek Pedersen (2009) observes that a company's financial

resources constitute one of the pivotal factors influencing the degree to which a company participates in activities related to its corporate social responsibility. Furthermore, Sarbutts (2003) proposes that SMEs embrace sustainable business practices as a component of their corporate social responsibility when these activities yield clear, quantifiable, and near-to-mid-term financial advantages. Roxas and Chadee (2012) assert that, despite the willingness of small businesses to adopt or develop activities associated with environmental accounting, they still face common challenges related to securing access to financing. Roxas and Chadee (2012) assessed how financial resources influence the environmental sustainability orientation of businesses.

Nowadays, technological advancements have changed the accounting system and its processes. Accounting information systems are created to aid in managing and overseeing activities pertaining to a company's economic and financial domains (Lim, 2013). Ojra (2014) demonstrated that the implementation of strategic management accounting techniques in Palestinian companies is influenced by organizational structure, organizational size, and organizational technology. Palestinian companies are keeping up with technological developments; if accountants are aware of a higher level of information and communication technology, it will lead to more use of strategic management accounting. Therefore, the technological element in Ojra's (2014) study is considered a core element in the organization's operating system. Computer-based accounting information technology will support accounting systems and other operations.

Halbouni and Nour (2014) also concluded that information technology is one of the main drivers of management accounting innovation. Their study implies the need for increased investments in technology to modernize management accounting systems and practices and enhanced information technology training to empower management accountants with the skills required to adopt innovative accounting techniques.

Experts believe that carrying out environmental accounting accurately and effectively requires accounting staff to be qualified and knowledgeable about accounting and environmental accounting. Well-qualified accountants will provide increas-

ingly better-quality information, thereby improving management efficiency and business performance (Wooldridge & Floyd, 1990).

Jamil et al. (2015) researched environmental accounting practices in small and medium-sized manufacturing enterprises. This study identified barriers affecting environmental accounting practices in SMEs, such as managers' awareness (attitude), financial resources, employee training, qualifications of employees and managers, and legal regulations related to the environment. McChlery et al. (2005) analyzed factors affecting the financial and accounting management systems of businesses, emphasizing the role of the accounting department and the qualifications of accounting staff.

Seafood enterprises with specific production and business characteristics strongly impact the environment, such as waste pollution, wastewater, and emissions from the production process. This is also considered an environmentally sensitive industry. Therefore, the main content of business characteristics is the characteristics of business products and business lines with different production raw material sources that impact the environment.

Christ and Burritt (2013) explored accountants' perceptions of environmental management accounting concerning potential variables, including environmental strategy, organizational structure, the industry's sensitiveness to the environment, and organizational scale. Qian et al. (2011) explored the motivating factors driving the advancement of environmental management accounting. These factors encompassed various aspects of production characteristics within businesses, such as the intricacy of waste treatment activities, modifications in service design, uncertainties in waste management and recycling, and the strategic perspective of the council regarding waste management. Besides, according to experts, the typical characteristic of seafood enterprises in Vietnam is to practice aquaculture according to the standards prescribed by VietGAP/GlobalGAP/ASC/BAP and the importing country.

Corporate environmental responsibility harmonizes stakeholders' expectations and environmental performance (J. González-Benito & O. González-Benito, 2006). Diverse stakeholders ex-

ert distinct pressures on businesses, compelling them to mitigate negative impacts and enhance positive ones. These stakeholders encompass consumers, financial institutions, governments, and workers, among others, all influencing the environmental accounting practices of businesses (Wang et al., 2019). Thus, customers not only require the quality of businesses' products but also require businesses to ensure business reputation, including environmental protection (Zhou et al., 2019). Zandi and Lee (2019) also reaffirm that determining factors in environmental accounting included customer influence, government regulatory pressure, ethics, and social responsibility.

Legal regulations give businesses rights and rules when implementing environmental accounting and disclosing environmental information (DiMaggio & Powell, 1983). Adherence to legal regulations and standards is crucial for the survival and growth of organizations. Conversely, non-compliance can result in financial losses, damage to reputation, and even the revocation of a business license (Schaltegger & Wagner, 2008). Hoffman (2001) shows that regulations of the government's legal system most influence environmental performance in organizations. According to Hoffman (2001), thanks to a strict legal system, one can see changes in the environmental activities of an organization. Additionally, an organization's reasons for incorporating environmental concerns into its accounting practices may include legitimacy factors. Similarly, Wang et al. (2019) affirmed the impact of institutional pressure (government, ministries) on the implementation of environmental management accounting and that the support of top management is critical.

In Vietnam, accounting law does not have specific regulations on environmental accounting implementation. Enterprises mainly record environmental financial accounting information based on current accounting standards and accounting regimes, following Circular 200/2014/TT-BTC and Circular 133/2016/TT-BTC. The lack of these guidelines hinders the adoption of environmental accounting. In addition, Vietnam's environmental protection law and the importing country's environmental protection standards in aquaculture must be synchronized to make it easier for seafood businesses in Vietnam to adhere.

Environmental uncertainty refers to unforeseeable circumstances, such as climate change or natural disasters, or the pace of market change that necessitates a company's immediate or future response (Pondeville et al., 2013). This shift gives rise to fresh uncertainties related to the natural environment, also called perceived ecological uncertainty (Lewis & Harvey, 2001). Environmental changes pose a contemporary challenge for all businesses. They are associated with a shortage of green accounting information, where the speed of acquiring environmental data becomes a limiting factor for decision-making (Pondeville et al., 2013).

Environmental change impacts an organization's environmental strategy and accounting practices (Lewis & Harvey, 2001). Lewis and Harvey (2011) have proposed scales to measure environmental change. Qian and Burritt (2009) interviewed 12 environmental managers, each from different local agencies in New South Wales, Australia. The findings indicate that environmental accounting practices benefit from two key factors: environmental changes and environmental strategies. These factors compel waste managers to integrate environmental accounting-related information into their planning and decision-making procedures due to shifts in recycling markets and the decreasing capacity of landfills. As a result, this integration ultimately improves the overall effectiveness of waste management (Qian & Burritt, 2009).

1.2. Relationship between environmental accounting implementation and operational performance

Business performance is part of the organization's effectiveness, including financial and non-financial performance (Lebens & Euske, 2006; Santos & Brito, 2012; Taouab & Issor, 2019; Tippins & Sohi, 2003). Research results on the relationship between environmental accounting implementation and business performance have been widely published worldwide, both positive and negative. However, most studies confirm the positive effects of this implementation. Research streams focus on the impact of environmental accounting practices on environmental performance, financial performance, and corporate performance, such as po-

tential environmental benefits and corporate responsibility (Burritt et al., 2019). Several previous studies have demonstrated the positive contribution of environmental management accounting to achieving businesses' economic and environmental goals (Schaltegger et al., 2012). Environmental management accounting can benefit an organization by providing information regarding its operating activities, especially those related to the environment, leading to increased environmental activities (Chaudhry & Amir, 2020). Le et al. (2019), targeting 600 construction materials enterprises in Vietnam, showed six factors that positively affect the application of environmental management accounting, and this application also has a positive impact on the application of environmental management accounting to financial efficiency and environmental efficiency.

This study aims to identify and measure the factors influencing the implementation of environmental accounting in businesses. Additionally, it analyzes the relationship between environmental accounting implementation and operational performance to assess the extent of their impact.

Figure 1 illustrates the complete model, encompassing all nine hypotheses.

Following the literature review, the proposed hypotheses are as follows:

- H1: Management support has a positive influence on environmental accounting within Vietnamese seafood businesses.*
- H2: Financial resources have a positive influence on environmental accounting within Vietnamese seafood businesses.*
- H3: Technology level has a positive influence on environmental accounting within Vietnamese seafood businesses.*
- H4: Environmental uncertainty has a positive influence on environmental accounting within Vietnamese seafood businesses.*
- H5: Business characteristics have a positive influence on environmental accounting within Vietnamese seafood businesses.*

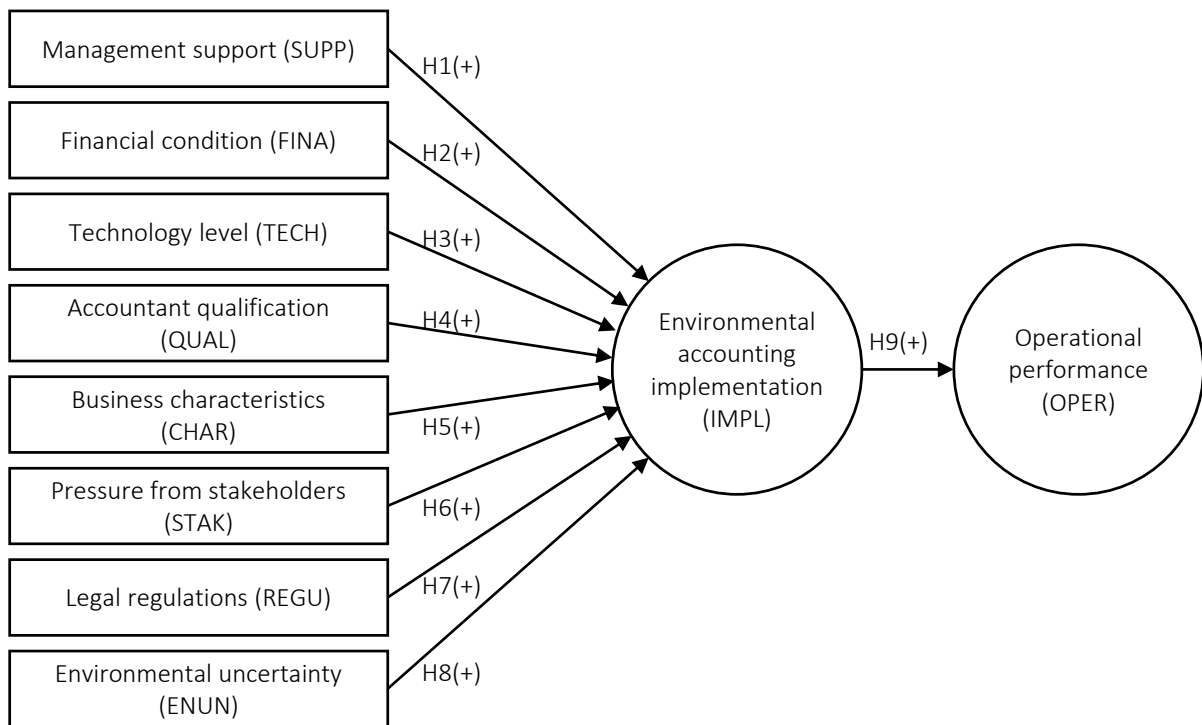


Figure 1. Conceptual model

H6: Legal regulations have a positive influence on environmental accounting within Vietnamese seafood businesses.

H7: The qualifications of accountants positively influence environmental accounting within Vietnamese seafood businesses.

H8: Stakeholders' pressure has a positive influence on environmental accounting within Vietnamese seafood businesses.

H9: Environmental accounting has a positive influence on operational performance within Vietnamese seafood businesses.

2. METHODS

The analysis is conducted through the following fundamental steps. Firstly, the study utilizes qualitative research methods to construct a theoretical model of the influencing factors affecting environmental accounting implementation. Next, quantitative research methods are employed to measure the extent of the influence of these factors on environmental accounting implementation. Finally, the paper determines the impact of environmental ac-

counting implementation on business performance using both financial and non-financial measures. After obtaining results from employing the SEM, the study provides directions and recommendations to promote the adoption of environmental accounting within seafood enterprises in Vietnam.

2.1. Sampling and questionnaire

This study interviewed 11 experts to select a sample and adjust the scale for qualitative research. These experts are people with professional experience in the fields of accounting, financial management, or equivalent positions in the business.

Formal quantitative research was conducted with 381 questionnaires. The survey subjects are representatives of seafood enterprises, i.e., chief accountants in the unit, heads or deputy heads of the department, directors and deputy directors. For the sampling method, convenient sampling is used. The survey instrument was adapted from prior studies (Table 1). All the survey questions were translated into Vietnamese with the input of experts for refinement.

The research model aims to explore three objectives: identify the factors affecting environmental

accounting implementation, examine the impact of environmental accounting implementation on performance, and offer policy implications related to environmental accounting implementation and performance.

2.2. Data analysis

The study employed a structural equation modeling (SEM) approach, encompassing the following procedural stages:

- 1) analysis of descriptive statistics;
- 2) assessment of reliability using Cronbach's alpha test;

- 3) exploratory factor analysis (EFA);
- 4) confirmatory factor analysis (CFA) to evaluate the reliability and convergent validity of the measurement scale; and
- 5) SEM analysis to assess the model fit and test the research hypotheses.

The scale of factors affecting environmental accounting, the scale of environmental accounting, and the scale of operational performance are measured on a Likert scale from 1 to 5. The study adopted appropriate variables and measurement scales through a literature review. Table 1 shows the scale of factors in the research model.

Table 1. Scale for measuring factors in the research model

Items	Measures	Sources
Scale 1: Management support (SUPP)		
SUPP1	The senior management team within our company is dedicated to the adoption of environmental accounting	Wang et al. (2019)
SUPP2	Our top management team is fully supportive of implementing environmental accounting	
SUPP3	The senior management team can allocate sufficient resources to support the implementation of environmental accounting	Experts' recommendations
SUPP4	Managers are interested in coaching and training the accounting system to perform environmental accounting	
Scale 2: Financial condition (FINA)		
FINA1	Adequate financial resources	Roxas and Chadee (2012); Halbouni and Nour (2014)
FINA2	Financial resources to train employees and buy new machinery	
FINA3	Financial resources for environmental programs	
FINA4	Secure the necessary funding to back expansion initiatives	
FINA5	Obtain credit and loans without any obstacles	
Scale 3: Technology level (TECH)		
TECH1	Workshops, equipment, water supply, and wastewater treatment ensure safe production and environmental protection	Experts' recommendations
TECH2	Applying new technologies to process and preserve seafood, such as super-speed freezing, vacuum sublimation drying, and enzyme technology	
TECH3	Accelerate the mechanization and automation of processing lines to optimize energy use and protect the environment	
TECH4	Promote ISO and HACCP quality management programs and utilize information technology for traceability as per consumer market demands	
Scale 4: Accountant qualification (QUAL)		
QUAL1	Accountants have a bachelor's degree or higher	Jamil et al. (2015)
QUAL2	Accounting staff with 3 years or more working experience	
QUAL3	Accountants can identify and measure environmental assets, environmental liabilities, revenue, and environmental costs	Experts' recommendations
QUAL4	Accountants can prepare environmental reports as required	
Scale 5: Business characteristics (CHAR)		
CHAR1	Enterprises' operations directly impact the environment	Christ and Burritt (2013)
CHAR2	Enterprises practice aquaculture according to the standards prescribed by VietGAP, GlobalGAP, and ASC/BAP in Vietnam and importing countries	Experts' recommendations
CHAR3	The production process generates waste and scrap that impacts the environment	Qian et al. (2011)

Table 1 (cont.). Scale for measuring factors in the research model

Items	Measures	Sources
Scale 6: Pressure from stakeholders (STAK)		
STAK1	Our company must comply with rigorous environmental regulations set by the local government	Wang et al. (2019); Zandi and Lee (2019)
STAK2	Investors are seeking information about the environmental aspects of our production operations	
STAK3	Increasing environmental consciousness among consumers has prompted our company to take action	
STAK4	Non-governmental organizations anticipate widespread adoption of environmental management accounting across the industry	
STAK5	Failure to implement environmental management accounting could lead stakeholders to withdraw their support for our company	
Scale 7: Legal regulations (REGU)		
REGU1	The implementation of EMA is contingent on compliance with environmental regulations for our firm	Wang et al. (2019); Hoffman (2001)
REGU2	Vietnam's environmental protection law aligns with the aquaculture standards of importing countries, facilitating implementation	Experts' recommendations
REGU3	Firms that violate environmental standards and regulations have faced multiple penalties	Wang et al. (2019); Hoffman (2001)
REGU4	Other documents regulating the environment (environmental tax, environmental statistics, CERs, etc.)	
Scale 8: Environmental uncertainty (ENUN)		
ENUN1	Change environmental regulations	Burrirt (2004); Lewis and Harvey (2011); Ojra (2014)
ENUN2	Changes in government environmental policy	
ENUN3	Competitors' innovation of environmentally friendly products affects environmental accounting practices	
ENUN4	Change environmental technology	
ENUN5	Shifts in how stakeholders respond to the organization's environmental concerns	
Scale 9: Environmental accounting implementation (IMPL)		
IMPL1	Enterprises have accounted for environmental costs, environmental income, environmental assets, and environmental liabilities (Using monetary information)	Wang et al. (2019); Schaltegger and Burrirt (2001); Ferreira et al. (2010)
IMPL2	Enterprises implement environmental policies, goals, and strategies (Using physical information)	
IMPL3	Enterprises have allocated environmental costs according to specific methods	
IMPL4	Enterprises monitor and calculate environmental performance indicators (EPis)	
IMPL5	Enterprises prepare environmental reports with specific information	
Scale 10: Operational performance (OPER)		
OPER1	The business's revenue has increased over the years	Narteh (2018); Le et al. (2019)
OPER2	Enterprises have increased profits over the years	
OPER3	Profitability (ROA, ROE...) has grown over the years	
OPER4	The company's reputation experiences improvement	
OPER5	Customer satisfaction with the company's products rises	
OPER6	More social initiatives with an environmental emphasis are implemented	

3. RESULTS

3.1. Factors influencing environmental accounting implementation

After having preliminary quantitative results, the study removed unsatisfactory observed variables, adjusted the scale, and redesigned the official questionnaire.

Table 2 shows the results of the Cronbach's Alpha test. The scale is accepted and good when it satisfies two conditions when the total variable correlation coefficient ≥ 0.3 and Cronbach's Alpha ≥ 0.6 (Nunnally & Bernstein, 1994). Table 2 shows that the scale of variables meets the requirements, except for STAKE5 and OPER6, which have a total variable correlation of 0.3, so they were eliminated. After eliminating STAKE5 and OPER6, the rerun results showed that all values met the requirements.

Table 2. Total statistics of items

No.	Items	Cronbach's alpha if item deleted	Cronbach's Alpha	Final conclusion
1	SUPP		0.908	Good quality
2	FINA		0.890	Good quality
3	TECH		0.893	Good quality
4	QUAL		0.917	Good quality
5	CHAR		0.835	Good quality
6	STAK	Removed STAK5	0.906	Good quality
7	REGU		0.897	Good quality
8	ENUN		0.936	Good quality
9	IMPL		0.923	Good quality
10	OPER	Removed OPER6	0.929	Good quality

Note: SUPP = management support; FINA = financial condition; TECH = technology level; QUAL = accountant qualification; CHAR = business characteristics; STAK = pressure from stakeholders; REGU = legal regulations; ENUN = environmental uncertainty; IMPL = environmental accounting implementation; OPER = operational performance.

Table 3. Total variance explained

	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total
1	6.432	19.490	19.490	6.136	18.593	18.593	3.983
2	3.953	11.977	31.467	3.703	11.223	29.816	4.029
3	3.223	9.768	41.234	2.947	8.932	38.748	4.198
4	2.922	8.856	50.090	2.641	8.003	46.751	3.823
5	2.758	8.358	58.448	2.462	7.461	54.212	2.938
6	2.219	6.723	65.172	1.896	5.744	59.956	2.887
7	2.032	6.158	71.330	1.707	5.173	65.129	3.700
8	1.900	5.756	77.087	1.641	4.972	70.101	2.213

Table 3 displays the factors extracted along with their explanations. The initial eigenvalue for the extracted factors exceeded the value of one. Moreover, the cumulative percentage value, amounting to 77.087%, surpassed the recommended threshold of 50%. These findings signify that the initial eight factors collectively account for 77.087% of the total variance observed in the variables.

3.2. Relationship between environmental accounting implementation and operational performance

The results of CFA that $\text{CMIN}/df = 1.214 \leq 5$; $\text{TLI} = 0.984$; $\text{CFI} = 0.985 \geq 0.9$; $\text{NIF} = 0.922$; $\text{RMSEA} = 0.024 < 0.05$ satisfactory. The measurement model fits the actual data. The scale normalized weights are > 0.5 and $p\text{-value} = 0.000 < 0.05$, which can conclude that the observed variables reach the convergent value.

Hair et al. (2013) recommend using CR, AVE, MSV indexes, and Fornell and Larcker criterion

to evaluate the convergence and discrimination of the scale. Table 4 evaluates convergence based on CR and AVE indices. The CR index is greater than 0.7, so convergence is guaranteed. The AVE index is greater than 0.5, so convergence is guaranteed. To evaluate discrimination, the study uses the MSV index. If the MSV index is less than AVE, discrimination is guaranteed. The AVE square root value of a variable is greater than the correlation between that variable and other variables in the model, so discrimination is guaranteed.

After the satisfactory CFA analysis, the study tested the SEM structural model. Table 5 shows the SEM analysis results that the theoretical model has $\text{Chi-square}/df = 1.306 \leq 3$; $P = 0.000 < 0.05$; $\text{RMSEA} = 0.028 \geq 0.05$; $\text{CFI} = 0.978 \geq 0.9$; $\text{GFI} = 0.888 \geq 0.8$; $\text{TLI} = 0.976 \geq 0.9$; which are consistent with the actual data. The SEM measurement aligns with actual data.

The impact of management support, financial condition, technology level, accountant qualification, business characteristics, pressure from stakeholders, legal regulations, and environmental uncer-

Table 4. Assessment of reliability, convergence, and discrimination validity in CFA

	CR	AVE	MSV	SQRTAVE	QUAL	OPER	ENUN	IMPL	FINA	TECH	SUPP	STAK	REGU	CHAR
QUAL	0.918	0.736	0.231	0.858	0.858									
OPER	0.930	0.728	0.231	0.853	0.481	0.853								
ENUN	0.938	0.751	0.034	0.866	0.172	0.011	0.867							
IMPL	0.926	0.715	0.202	0.845	0.429	0.336	0.184	0.846						
FINA	0.891	0.623	0.135	0.789	0.297	0.216	0.086	0.318	0.789					
TECH	0.896	0.683	0.135	0.826	0.305	0.133	0.093	0.357	0.368	0.826				
SUPP	0.910	0.718	0.202	0.847	0.408	0.448	0.066	0.449	0.244	0.224	0.847			
STAK	0.909	0.715	0.022	0.845	0.020	-0.002	-0.076	0.148	0.008	0.034	0.060	0.845		
REGU	0.899	0.692	0.027	0.832	0.085	0.056	0.039	0.165	0.062	0.101	0.022	0.080	0.832	
CHAR	0.840	0.638	0.043	0.799	0.162	0.056	0.106	0.208	0.077	0.119	0.109	-0.089	0.030	0.799

Note: SUPP = management support; FINA = financial condition; TECH = technology level; QUAL = accountant qualification; CHAR = business characteristics; STAK = pressure from stakeholders; REGU = legal regulations; ENUN = environmental uncertainty; IMPL = environmental accounting implementation; OPER = operational performance.

Table 5. Fit indices for structural equation modeling

Index	Recommended value	Structural model	Result
X ² /df	≤ 5	1.306	Good
GFI	≥ 0.8	0.888	Good
NFI	≥ 0.9	0.915	Good
TLI	≥ 0.9	0.976	Very good
CFI	≥ 0.9	0.978	Very good
RMSEA	≤ 0.08	0.028	Very good

Note: RMSEA: Root Mean Square Error Approximation; CFI: Comparative Fit Index; GFI: Goodness of Fit Index; TLI: Tucker-Lewis index.

tainty variables is direct and in the same direction as environmental accounting implementation. At the same time, environmental accounting implementation directly and positively impacts operational performance. A significant level of 5% was used. The outcomes are displayed in Table 5.

Table 6 displays the unadjusted estimation outcomes for the primary model parameters. These

results demonstrate that the correlation associations within the model are statistically significant at a confidence level of 95% ($p = 0.000 < 0.05$).

Table 7 shows that the regression coefficients serve to assess the influence of the theoretical model's components. The greater the absolute value of these coefficients, the more potent the independent variable's impact on the dependent variable.

Table 6. Regression coefficient of relationships (un-normalized)

Relationship	Estimate	S.E.	C.R.	P-value	Result
ENUN → IMPL	0.093	0.042	2.218	0.027	Accept
FINA → IMPL	0.101	0.046	2.217	0.027	Accept
TECH → IMPL	0.178	0.059	3	0.003	Accept
SUPP → IMPL	0.28	0.05	5.561	***	Accept
STAK → IMPL	0.121	0.042	2.866	0.004	Accept
REGU → IMPL	0.102	0.045	2.273	0.023	Accept
QUAL → IMPL	0.207	0.057	3.592	***	Accept
CHAR → IMPL	0.12	0.049	2.451	0.014	Accept
IMPL → OPER	0.263	0.04	6.651	***	Accept

Note: P = Sig. = Significance ≤ 0.05 , which means confidence level from 95%. *** = 0.00, means 99% confidence level. SUPP = management support; FINA = financial condition; TECH = technology level; QUAL = accountant qualification; CHAR = business characteristics; STAK = pressure from stakeholders; REGU = legal regulations; ENUN = environmental uncertainty; IMPL = environmental accounting implementation; OPER = operational performance.

Table 7. Regression coefficients (normalized) and impact of relationships

Level of impact on IMPL			Regression coefficient	%	Order
ENUN	→	IMPL	0.1	8.38	8
FINA	→	IMPL	0.113	9.46	6
TECH	→	IMPL	0.155	12.98	3
SUPP	→	IMPL	0.286	23.95	1
STAK	→	IMPL	0.129	10.80	4
REGU	→	IMPL	0.103	8.63	7
QUAL	→	IMPL	0.191	16.00	2
CHAR	→	IMPL	0.117	9.80	5
Total Impact			1.194	100%	
Impact of IMPL on OPER			Regression coefficient	%	
IMPL	→	OPER	0.351	100%	

Note: SUPP = management support; FINA = financial condition; TECH = technology level; QUAL = accountant qualification; CHAR = business characteristics; STAK = pressure from stakeholders; REGU = legal regulations; ENUN = environmental uncertainty; IMPL = environmental accounting implementation; OPER = operational performance.

The findings regarding the direct effects of the components within the research model and their influence magnitudes are detailed in Table 7. Table 7 shows that manager support has the strongest impact on environmental accounting implementation (normalized weight 0.286); next is technology (normalized weight 0.155); qualifications of accountants (normalized weight 0.191); stakeholders (normalized weight 0.129); business characteristics (normalized weight 0.117); financial resources (normalized weight 0.113); regulatory (normalized weight 0.103); and finally environmental uncertainty (normalized weight 0.1). The results also show that environmental accounting implementation significantly affects the operational performance of seafood enterprises in Vietnam (normalized weight 0.351).

4. DISCUSSION

This study has three main objectives: (1) identify factors that influence environmental accounting implementation in Vietnamese seafood companies, (2) assess the effects of these factors on environmental accounting implementation and determine the degree to which environmental accounting implementation impacts the performance of seafood enterprises in Vietnam, (3) put forth recommendations and policies about environmental accounting within the context of seafood enterprises in Vietnam.

The qualitative research findings have aided in refining the understanding of the factors influenc-

ing environmental accounting implementation and its impact on the performance of seafood businesses. The study developed a model and scale based on expert opinions. This result is the basis for quantitative research. Thus, the first objective is achieved. Quantitative research measures environmental accounting implementation and factors affecting environmental accounting implementation (SUPP, FINA, TECH, QUAL, CHAR, STAK, REGU, ENUN), and copper time measures the impact of environmental accounting implementation on operational performance. Quantitative research results show the model's results, the degree of influence of factors on environmental accounting implementation, and the level of impact of environmental accounting implementation on operational performance. After analyzing the results of this study, the study draws policy implications related to environmental accounting implementation and performance. Thus, the second and third objectives of the study are also accomplished.

Management support (SUPP) positively influences environmental accounting implementation within seafood enterprises in Vietnam, supporting Jamil et al. (2015) and Wang et al. (2019). If managers understand environmental accounting implementation, use the information on environmental accounting, and have clear consciousness, attitude, and philosophy on environmental protection and sustainable business, then environmental accounting will increase. For seafood businesses, leadership support is the key to the birth and development of environmental accounting.

Financial conditions (FINA) positively affect environmental accounting implementation, aligning with Wachira and Wang'ombe (2019) and Jamil et al. (2015). These studies show that financial resources impact environmental accounting, which suggests that limited financial resources will be an obstacle to environmental accounting. Therefore, environmental accounting implementation will be better implemented if seafood enterprises have appropriate financial resources.

Technology level (TECH) positively impacts environmental accounting implementation, consistent with Ferreira et al. (2010) and Burritt and Christ (2016). Technology is the core factor supporting information collection, processing, storage, and provision for decision-making and environmental accounting implementation. One internal aspect that has a significant impact on seafood businesses is technology.

Accountant qualification (QUAL) impacts environmental accounting implementation, in line with Jamil et al. (2015). When accountants are trained and have knowledge and understanding, environmental accounting will be implemented more smoothly. Implementing environmental accounting requires accountants to have good knowledge and skills.

Business characteristics (CHAR) positively impact environmental accounting implementation, consistent with Frost and Wilmshurst (2000), Ferreira et al. (2010), and Yekini et al. (2019). This shows that seafood enterprises have production and business characteristics that cause pollution and significantly impact the environment in the long run, so the implementation of environmental accounting will increase.

Pressure from stakeholders (STAK) positively impacts environmental accounting implementation, consistent with Frost and Wilmshurst (2000), Wang et al. (2019), and Zandi and Lee (2019). This

shows that pressure from stakeholders is significant for environmental accounting. All stakeholders require environmental information related to the production activities of enterprises.

Legal regulations (REGU) positively contribute to environmental accounting implementation, which is consistent with Hoffman (2001), Schaltegger and Wagner (2008), and Wang et al. (2019). The lack of mandatory regulations or implementation guidelines will make implementing environmental accounting in seafood enterprises difficult. Over the years, Vietnam has reformed administrative procedures, policies, and infrastructure to create a favorable environment for domestic and foreign investors to conduct investment and production activities. Many related documents have been issued, which will improve environmental accounting implementation.

Environmental uncertainty (ENUN) positively impacts environmental accounting implementation, consistent with Le et al. (2019), Ojra (2014), Lewis and Harvey (2001), and Burritt (2004). According to the Vietnam Association of Seafood Exporters and Producers, the future growth prospects of the seafood industry and the uncertainty of the surrounding environment (inside and outside the enterprise) significantly affect seafood enterprises.

Environmental accounting implementation positively impacts operational performance at seafood enterprises in Vietnam, which is consistent with Wang et al. (2019), Jasch (2003), and Kokubu and Nashioka (2005). These studies show that implementing environmental accounting positively impacts performance. It will make businesses more environmentally responsible. This is a commitment to sustainable production and business, attracting investors, accessing capital sources, creating trust with customers, and increasing revenue for businesses, thereby achieving sustainable business.

CONCLUSION

The research results have confirmed the factors affecting the implementation of environmental accounting and emphasized that the implementation of environmental accounting increases operational efficiency for Vietnamese seafood enterprises. These factors, ranked in descending order of significance,

include manager support, accounting staff qualifications, technology level, pressure from stakeholders, business characteristics, financial resources, legal regulations, and environmental uncertainty. This study offers valuable insights for business managers regarding the factors influencing the implementation of environmental accounting in businesses. It reaffirms that such implementation can significantly enhance performance, serving as a driving force for seafood businesses in Vietnam to embrace environmental accounting more comprehensively in the future.

LIMITATIONS AND FUTURE RESEARCH

Some limitations need to be considered in future research. First, the sample size is relatively small. Although this sample size is still suitable for SEM analysis, it cannot represent all seafood businesses in Vietnam. Therefore, future projects should increase the sample size for more general and representative results. Second, the study found and focused on eight factors affecting environmental accounting implementation. In fact, there are many other factors that future studies have to consider. Therefore, the research can expand and add additional factors, such as leaders' awareness of the benefits of implementing environmental accounting or factors of corporate culture, religion, auditing, etc. Finally, other studies can target other businesses in different industries, such as chemicals, footwear, construction materials production, electronics, etc.

AUTHOR CONTRIBUTIONS

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