

# Studying Determinants Affecting the Implementation of Environmental Cost Accounting in Manufacturing Enterprises in the Northern Region of Vietnam

Ngoc Trinh Minh\* Yen Nguyen Thi Hai

School of Advanced Education Programs, National Economics University, 207 Giai Phong,  
Hai Ba Trung, Ha Noi, Vietnam

\* E-mail of the corresponding author: minhngoc1709@gmail.com

## Abstract

This paper aims to discuss the determinants playing momentous roles in the implementation of environmental cost accounting in manufacturing enterprises in the Northern region of Vietnam: awareness of accountants, production field, company size, legislation, pressure from involved parties, and human resources. To assist not only managers but also the government of a country where "environmental cost accounting" is still a new definition, such as Vietnam, in promoting the implementation process of environmental cost accounting, a special approach combining the TPB model with five accounting theories has been developed. Data of this research is collected by giving out survey questionnaires to accountants, auditors, and managers working in manufacturing firms in the Northern region of Vietnam. Evaluation of the answers' quality shows that there are 215 samples deemed as valid. Testing Cronbach's Alpha, exploratory factor analysis, Pearson Bivariate Correlations, and binary regression show that there are four factors that have a positive impact on the application of environmental cost accounting, with accountant awareness having the greatest impact. The other two factors, human resources and regulation, are, on the other hand, barriers to implementing environmental cost accounting in manufacturing businesses. The authors then used the findings to make recommendations for each factor to aid in the implementation of environmental cost accounting in Vietnamese manufacturing firms.

**Keywords:** environmental cost accounting, manufacturing enterprises, Vietnam.

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## 1. Introduction

In the last decade, environmental sustainability has been prioritized by the manufacturing sector in Vietnam. The demand of involved parties (stakeholders, customers, investors, government...) put the companies in desperate need of finding a way to not only protect the environment but also increase the business benefit. From the perspective of managers and accountants, environmental cost accounting is one of the most effective tools for this goal because of its completeness and accuracy in accounting for environmental costs, contributing to creating goodwill for enterprises as well as improving the environment in the process of economic activities. Traditional environmental accounting has captured almost all financial and non-financial information of businesses. Therefore, small cost accounts (usually environmental costs) are easily forgotten or integrated into general cost accounts, making accounting errors harder to detect; therefore, affecting the decision of business strategy. Environmental cost accounting is considered as the next development step of management accounting (Birkin, 1986). By separating the operating costs of the business from the environmental costs, environmental cost accounting not only increases the competitive advantage for businesses by reducing production costs, but also helps businesses increase their prestige to their partners, customers, shareholders, and investors, thereby creating value for the business.

In fact, up to now, environmental accounting, also known as environmental cost accounting, has not had an official concept in Vietnam. However, many international studies and foreign organizations have their definition of environmental cost accounting. According to Zaneta Stasiskiene (2019), "Environmental accounting is a branch of accounting that provides economic and environmental information at various levels (Enterprise, country, economy...)". More specifically, for the enterprise level, the main job of an environmental accountant is to measure and analyze environmental costs and produce reports for inside and outside uses. Bennett et al. (2002) define environmental cost accounting as "the creation, analysis, and use of financial and non-financial information to optimize activities on economic and environmental aspects of the business with the goal of sustainable business".

According to Creswell and Clark (2007), for a topic focusing on the application of scientific products or solving business problems, the most suitable research method is a combination of qualitative and quantitative research. - mixed method. Therefore, the research method chosen for this topic is the mixed research method, in which:

- Qualitative research method is conducted through in-depth interviews with experts in the field of accounting

and managers working in manufacturing enterprises. The results obtained will be used by the research team to adjust and complete the questionnaire, and at the same time develop a research scale.

- Quantitative research method has the purpose of testing research hypotheses and measuring the impact of factors affecting environmental cost accounting. Quantitative research method was conducted through 2 phases of preliminary survey and official survey. During the formal investigation, the research team will use SPSS software to conduct measurement tests of the variables.

Using the mixed research method, the group has evaluated the level of impact that each factor has on the implementation of environmental cost accounting. It appears that there are four factors that have a positive influence on the process of applying environmental cost accounting, in which the awareness of accountants is the highest influence. On the other hand, the other two factors which are human resources and regulation are respectively the barrier of implementing environmental cost accounting in manufacturing enterprises.

In the context of global sustainable development, environmental cost accounting is needed, especially in the manufacturing sector as it is most likely to cause damage to the natural aspects. While environmental cost accounting has been successfully applied in many countries, it is still a new concept in Vietnam. This study aims to identify and evaluate the impacts of determinants on the implementation of environmental cost accounting. Thereby, giving some recommendations to the existing situation in Vietnam to successfully apply environmental cost accounting in the practice of manufacturing companies.

## **2. Background theory and Literature review**

### *2.1. Background theory*

Contingency theory was discovered in 1960 and has been the basis for the study of accounting since the 70s (Khaled Abed Hutaibat, 2005). The theory suggests that effectiveness in performance depends on the background of an organization. In other words, an organization's performance depends on how well it adapts to contingencies that often arise. Many studies in the field of accounting apply contingency theory as the basis for influencing factors such as environmental strategy, organization size, staff qualifications, and management support (Parker, 1977; Quian et al, 2011; Ahmad and Mohamed Zabri, 2015; Dang, 2016).

In the study of Burns and Scapens (2000), the old institutional theory is understood as "changes in individuals' behavior that can originate from organizational regulations or individual perception about what should be done." According to the point of view of DiMaggio and Powell (1983), the new theory shows that business is influenced by three main factors: regulations, norms, and spread effect. In particular, the regulatory element comes from the current regulations of the state and government, forcing businesses to comply; The norm represents the pressure of voluntary performance. And the last factor - spread effect, also known as imitative pressure, suggests that businesses tend to apply proven methods to solve problems.

Decision usefulness theory is understood as "normative accounting theory used as a theoretical basis to build the current accounting theory framework of the financial reporting standards and many national accounting international standards" (Godfrey et al, 2003); with the role to "emphasizes the fundamental mission of financial statements to provide information that is useful and relevant to users in making economic decisions". In other words, the perception of the information's usefulness will influence the decision-making behavior of an individual.

Legitimacy theory states that "organizations are always trying to find a balance between organizational values and social values". The most obvious proof of this theory is the phenomenon that when businesses ignore the problems encountered by society, a decrease in customer demand will occur, and therefore, cause a negative trend in their sales. The theory of legitimacy also proves that businesses need to consider the social response in achieving their goals, only then can they "ensure their continued existence and success" (Deegan, 2002).

Defining stakeholders, in his study of strategic management, Freeman (1984) said: "Stakeholder is any individual or group of people who are directly or indirectly affected by the activities of the organization include: shareholders, government agencies, political groups, trade associations, trade unions, communities, related companies, potential customers and the general public." Combining with the views of Gordon (1996) and Guthrie and Parker (1990), stakeholder theory shows that society has many "different stakeholders" and all can influence the business strategy of the enterprise. In other words, when making a decision, an enterprise needs to pay attention to the stakeholders who are affected or affect its operations.

### *2.2 Literature review*

#### *2.2.1 Literature review of environmental cost accounting*

Since the 1970s, environmental accounting has emerged as a result of increasing awareness and concern about social and environmental welfare (Khalid, Lord, & Dixon, 2012). From there, typical studies have focused on the development of environmental accounting systems and their role in disclosing information on environmental costs in the current background as well as shown the link between accounting, business, and society (Chastain, 1973; Ullman, 1976; Dierkes and Preston, 1977).

By the 1990s, although environmental accounting had not been implemented within the accounting framework of enterprises, a lot of research on the topic had been conducted, specifically cost accounting, cost savings, and revenue related to production waste and recycling.

Rubenstein (1992) in his study, wrote that although at the time of the study, environmental accounting was not widely known, public awareness of traditional accounting limitations and environmental issues were increasing. Asheim (1997) recommended establishing an environmental accounting system to prevent pollution or environmental damage. The accounting system would consider economic measures with an environmental impact on the production process and electrical consumption. Because the operation of a power plant had a great impact on natural resources and ecosystems, it was necessary to consider and take necessary corresponding measures. Lafontaine (2002) argued that economic, legal, accounting, financial and technical impacts must be considered for environmental problems in everyday life when it was becoming an issue that cannot be ignored.

At present time, the scope of research on environmental accounting has been expanded and focused on two main areas: Analysis of how the traditional accounting system copes with public pressure and politics related to environmental and ecosystem protection issues and was the combination of environmental accounting and traditional management accounting enough to solve the problem (Schaltegger and Burritt, 2010).

To gain a deeper understanding and evaluate the difference between the different perspectives on previous studies on environmental accounting, Farouk et al. (2012) examined previous studies on environmental accounting and indicated their distinctive characteristics. Through analyzing several typical studies on environmental accounting in each development period, the authors pointed out that the backgrounds of developing countries were different when compared with Western ones. In the developing countries, the socio-economic situation, as well as the motivation for implementing environmental accounting at enterprises, were different. Specifically, people in these countries didn't pay much attention to the unprofitable aspects of their enterprises. Another idea pointed out in the study was that the establishment of pre-tested environmental accounting systems helped accurately determine the environmental performance of organizations and businesses. In the article "The Role of Environmental Accounting in Sustainable Development: Empirical Study", Shakkour et al (2018) pointed out that most organizations and businesses ignore large environment-related costs. The authors also believed that accountants need to record and report costs incurred under emissions trading. Thereby, the study concludes that the rational application of environmental accounting is extremely necessary for sustainable development.

#### *2.2.2 Literature review of factors affecting environmental cost accounting implementation*

Jamil et al (2014) pointed out barriers when applying environmental accounting in Malaysia. By applying institutional theory, the study showed the influence of environmental accounting practices on firm characteristics. The results indicated that the level of implementation of environmental accounting was moderate and focused more on the performance of environmental costs. The authors pointed out that financial constraints are the biggest barrier to environmental accounting in this country. In addition, the lack of knowledge about environmental costs and accounting skills also slowed down the development of environmental accounting.

In another research direction, Ribeiro and Aibar-Guzman (2010) surveyed 205 local entities in Turkey, including 127 medium and large city councils and 76 local companies. The research results show that the size of the entity and the level of development of the accounting practice have a positive influence on the practice of applying environmental accounting. A proven point of the study is that the development of environmental accounting in this country is slow due to the influence of external pressures on the disclosure of environmental information when compared to other countries.

Intending to assess the impact of environmental accounting on the overall performance of businesses in Istanbul, Şimşek and Öztürk (2021) surveyed 1000 companies operating in Beylikdüzü (the exclusive manufacturing zone) to evaluate the impacts of 5 determinants (planning and determining costs, responsibility, and corporate image, sustainability, certification and standards, and environmental awareness) on the general performance of the enterprise. Research results showed that there was a close and linear relationship between the independent variables and the environmental accounting activities of enterprises. However, the level of environmental accounting implementation was at the lowest point. Therefore, businesses and governments need to take certain actions to promote environmental accounting, especially when the environment is still an urgent issue in society.

In Vietnam, Dao and Dao (2016) pointed out the main reasons for the unpopularity of environmental accounting: the lack of knowledge about environmental accounting, the incomplete regulation system, and the managers' lack of attention on environmental issues. The authors also give some example cases of countries that have successfully applied environmental accounting such as the US, UK, and Japan to gain insight on practical experiences for Vietnamese businesses on the development of environmental accounting.

Nguyen (2020) researched the environmental accounting orientation for mining enterprises in Vietnam. By applying a new observation technique and approach to the topic, the author concluded that the variables all affect the application of environmental accounting in mining enterprises in Vietnam. Some recommendations were

made that educational institutions should pay more attention to teaching and make environmental accounting one of the training focuses.

Nguyen (2021) with a similar research direction on the food and beverage industry has added independent variables so that it is suitable for the research context such as shareholders, audit, and financial resources. With a sample space of 236 valid surveys, combined with face-to-face interviews with experts working at 56 food companies, the author pointed out that shareholder pressure had the strongest positive influence on the application of environmental accounting. This showed the expectations of outsiders for the production associated with sustainable development. The remaining factors had a positive impact on environmental accounting as proven in the previous studies.

Previous studies tend to choose contexts in developed countries, but there are not many studies in developing countries because environmental cost accounting has not been popularized here. Studies on environmental cost accounting often go into management accounting and have not mentioned much about financial accounting.

In general, previous studies have not really provided an overview of the application of environmental cost accounting in manufacturing enterprises as most studies only focus on specific production areas. Moreover, considering the time, the studies that have been done at the time when environmental accounting have not been paid as much attention as now, so the conclusions in the research may no longer be optimal, opening space for the research team to learn and develop.

### 3. Methodology

#### 3.1. Research Models and Hypotheses

To investigate the factors influencing the implementation of environmental cost accounting in manufacturing enterprises, the model is developed using the model of the theory of planned behavior (TPB) and five accounting theories: contingency theory, institutional theory, decision usefulness theory, legitimacy theory, and stakeholder theory. To specify, three independent factors of the TPB model will be adjusted as follows:

- "Attitudes" will be interpreted as the "Awareness of accountants" factor based on institutional theory and decision usefulness theory.
- "Subjective norm" refers to a person's knowledge of social pressure on their behavior in the context of environmental accounting. (Djatej, 2003) Based on four theories including legitimacy theory, contingency theory, institutional theory, and stakeholder theory, "Subjective norm" will be interpreted by 4 main factors: The manufacturing sector, size, regulations, and related parties.
- "Perceived behavioral control" is defined by the resources available in the enterprise. This component will be described by the "Human resources" factor, according to contingency theory.

Table 1: Independent factors associated with the components of TPB model

Attitudes	Subjective Norm	Perceived Behavioral Control	Behavioral Intention
- Awareness of accountants	- Production field of enterprises - Size of enterprises - Regulations - Related parties	- Human resources	- The implementation of environmental cost accounting in manufacturing enterprises

Hypotheses:

Farouk et al (2012) stated that in developing countries, there were differences in the socio-economic background that led to the lack of awareness of environmental issues in businesses. Jamil (2014) wrote that the lack of awareness in allocating environmental cost and its benefit towards the environment was one of the reasons for the slow implementation of environmental accounting in developing countries, specifically Malaysia. Shakkour et al (2018), Dao and Dao (2016) and Duong (2018) also support the statement. Based on the aforementioned results, the group proposes the hypothesis:

**[H1]: Awareness of accountants has a positive influence on the implementation of environmental cost accounting in manufacturing enterprises in Vietnam.**

Based on the result of an in-depth interview conducted by our research group, the more damage the production process causes the more enterprises are aware of environmental issues. Ferreira et al (2010) also stated that enterprises with more sensitive production fields including mining, chemical industry, or metallurgy are more likely to adopt environmental accounting than those of other production fields. The statement was supported by Omar (2014), Lam (2019). From what the group has gathered, hypothesis [H2] is proposed as follows:

**[H2]: The production field of enterprises has a positive influence on the implementation of environmental cost accounting in manufacturing enterprises in Vietnam.**

The research of Ribeiro and Aibar-Guzman (2010) showed that there is a positive relationship between company size and the implementation of environmental accounting. Omar (2014) argues that the factor "size of audit

firms' ' and "difference in production field" influence whether enterprises accept social and environmental information disclosure. From there, our group proposes hypothesis [H3]:

***[H3]: The size of enterprises has a positive influence on the implementation of environmental cost accounting in manufacturing enterprises in Vietnam.***

In developing countries, especially in Vietnam, environmental accounting has not been widely known yet. Therefore, the lack of regulations regarding environmental accounting is understandable. Ball (2005) stated that the implementation of environmental accounting was impacted by the local regulatory system, especially environmental regulations. According to Li (2004), one of the barriers to environmental accounting implementation is the lack of regulations and legal guidance material. Hamid (2002) also suggested making changes in the regulatory system for environmental accounting to develop. The statement was reinforced by Jamil (2014), Bui (2016), Nguyen (2020).

***[H4]: Regulations have a negative influence on the implementation of environmental cost accounting in manufacturing enterprises in Vietnam.***

As environmental issues arise, the amount of pressure involved parties put on enterprises is rocketed. In the study of Khalid et al (2012), the authors made the point that for businesses to comply with environmental activities, there must be pressure (from customers, shareholders, the public, and the government). Iredele & Ogunleye (2018) in an assessment study on the application of environmental accounting in Nigeria and South Africa confirmed that one of the biggest barriers in applying environmental accounting is the lack of pressure from related parties such as the government, shareholders, and managers, making the dissemination of environmental accounting ineffective. In Vietnam, Nguyen Thanh Tai (2020) concluded that stakeholders are the driving force, pressure as well as a compulsion for textile and garment enterprises to carry out environmental cost accounting because of the manufacturing market which requires very high quality, safety, and hygiene. Based on what the group has gathered, hypothesis [H5] is proposed as follows:

***[H5]: Related parties have a positive influence on the implementation of environmental cost accounting in manufacturing enterprises in Vietnam.***

Al Kisher (2013) identified education level as an important factor contributing to the success of enterprises in applying environmental accounting. McClery et al. (2004) and Ismail and King (2007) both assert that when an enterprise has a highly qualified accountant with rich work experience, the higher the ability to apply environmental accounting to that enterprise. Dang (2016) determined that the more accountants with higher education levels, the higher the ability to apply standards. Since environmental accounting is a relatively new concept in developing countries, especially Vietnam, having knowledge about the matter would benefit significantly in the process of implementation. For that reason, our group proposed hypothesis [H6]:

***[H6]: Human resources have a negative influence on the implementation of environmental cost accounting in manufacturing enterprises in Vietnam.***

### *3.2. Research method*

**Qualitative research:** This method is implemented through an in-depth interview technique with 32 people, including accounting experts and managers from manufacturing enterprises. The findings will be used by the authors to adjust, supplement, and complete the questionnaire while also developing a research scale.

**Quantitative research:** The quantitative research method is used in two stages to test research hypotheses and measure the impact of factors affecting environmental cost accounting: preliminary survey and official survey. The questionnaire is developed based on the previous related research and adjusted to suit the study context in Vietnam.

In stage 1: Preliminary survey, the authors surveyed a small group of accountants to uncover problems in the questionnaire.

In stage 2: Official survey, the authors conducted a revised survey with a sample size of 215 people working as accountants, auditors, or having knowledge about accounting systems at manufacturing enterprises in the Northern region of Vietnam. The sampling method selected by the authors is a stratified random sampling method that divides the population into several strata including sub-groups. Among all sampling methods, the stratified sampling method is said to have the highest statistical efficiency (Nguyen Dinh Tho, 2014).

Based on the data collected, we perform the data analysis process by using SPSS software version 16. The statistical techniques in quantitative research that are performed on the SPSS software include Cronbach's alpha analysis, exploratory factor analysis, binary logistic regression analysis.

#### 4. Results

##### 4.1. Cronbach's alpha analysis

Table 2: The result of Cronbach's alpha analysis

No	Factors	Cronbach's Alpha coefficient
1	Awareness of accountants (ATT)	0.846
2	Production field of enterprises (PF)	0.826
3	Size of enterprises (SZ)	0.837
4	Regulations (RGL)	0.936
5	Related parties (RP)	0.854
6	Human resources (HR)	0.944

According to Nunnally, J. (1978), if Cronbach's Alpha coefficient is in the range from 0.8 to 1, the factors are considered to be of high reliability. Therefore, the results in Table 2 show that all six factors are reliable and consistent with the authors' scale. As a result, these items will be eligible for EFA exploratory factor analysis to ensure that the scale system of the model's factors is converging.

##### 4.2. Exploratory factor analysis

Exploratory factor analysis (EFA) examines the underlying relationships between different measured variables. The following are results of KMO and Bartlett's Test of Sphericity: KMO coefficient is 0.874 (less than 0.5) so that the EFA technique can be used and the hypothesis of variable correlation can be accepted.

Table 3: The result of exploratory factor analysis (EFA)

	Components					
	1	2	3	4	5	6
HR2	0.880					
HR1	0.877					
HR4	0.854					
HR3	0.848					
RGL2		0.876				
RGL3		0.857				
RGL1		0.812				
RGL4		0.808				
PF2			0.781			
PF4			0.759			
PF3			0.757			
PF1			0.733			
RP2				0.765		
RP5				0.755		
RP3				0.752		
RP1				0.679		
RP4						
SZ5					0.807	
SZ3					0.782	
SZ2					0.734	
SZ4					0.724	
SZ1						
ATT1						0.847
ATT2						0.829
ATT3						0.818
ATT4						
ATT5						
Extraction Method: Principal Component Analysis.						
Rotation Method: Varimax with Kaiser Normalization.						
a. Rotation converged in 7 iterations.						

EFA analysis converges 27 measured variables into 6 groups and 7 iterations. Table 3 shows the second result after excluding 4 variables: RP4, SZ1, ATT4, and TT5 due to factor loading < 0.35 (Hair et al., 2009). All Eigenvalue  $\geq 1$  with the Varimax Rotation and total variance explained 75.488% (> 50%) so this convergence is appropriate. As a result of using the EFA technique, all items of the six research components have led to the formation of 6 different factors from the initial factors.

### 4.3. Binary logistic regression analysis

The dependent variable “The implementation of environmental cost accounting in manufacturing enterprises” has a value of 1 if the research subjects support the implementation of environmental cost accounting and a value of 0 if they do not support it. After implementing binary logistic regression analysis, the results show the Omnibus test of model coefficients’ p-value is 0.000 (< 0.05) and the authors’ research model has the highest predictability of 87.4% with parameter estimates changed by less than 0.001.

Table 4: Variables in the equation

		B $\beta$	S.E	Wald	df	Sig.	Exp(B) $\beta$
Step 1a	ATT	2.211	.442	24.990	1	.000	9.122
	PF	1.035	.385	7.212	1	.007	2.816
	SZ	.862	.404	4.556	1	.033	2.368
	RGL	-.904	.401	5.081	1	.024	2.470
	RP	.446	.404	1.219	1	.027	3.563
	HR	-1.094	.347	9.944	1	.002	2.987
	Constant	-20.488	3.443	35.412	1	.000	.000

a. Variable(s) entered on step 1: ATT, PF, SZ, RGL, RP, HR.

As stated in Table 4, the Wald test’s sig value of all variables is in the range of 0.000 to 0.033 (95% confidence interval). According to beta coefficient value, 4 variables ATT, MS, SZ, RP have a positive influence on the implementations of environmental cost accounting while 2 variables RPL and HR have a negative impact on the dependent variable. Therefore, the binary logistic regression equation of this research is shown as below:

$$\log_e \left[ \frac{p_i}{1-p_i} \right] = -20.488 + 2.211*ATT + 1.035*PF + 0.862*SZ - 0.904*RGL + 0.446*RP - 1.094*HR$$

The equation indicates the variable with a higher value of beta coefficient will have a greater level of influence on the dependent variable. Besides, the higher impact on the dependent variable, the higher support of the implementation of environmental cost accounting in manufacturing enterprises.

## 5. Discussion of findings

The analysis results mentioned in section 4 can not only estimate the association between independent factors and the implementation of environmental cost accounting in manufacturing enterprises but also have predictive ability.

First, the factor with the greatest influence and positive impact on the dependent variable is “Awareness of accountants”. This finding is supported by the studies of Kumpulainen & Pohjola (2008), Chang & Deegan (2010), and Chen et al. (2020). However, in their studies, the factor related to “Attitudes” is only measured by the awareness of managers and business owners who make the final decision in deciding the change of internal accounting systems. Therefore, the awareness of all the accountants, auditors in manufacturing enterprises also play an important role in the implementation of environmental cost accounting since they are the ones who understand the most about the benefits of this accounting method.

Second, the factor of “Production field of enterprises” has a positive impact on the dependent variable with  $\beta$  equal to 1.035. Unlike some international research about environmental cost accounting in developing countries, enterprises’ production fields do not have the biggest influence in Vietnam (Ferreira & Moulang, 2010). This result is consistent with Vietnamese studies such as Nguyen (2021) and Huynh (2019). In Vietnam, rather than applying specific environmental cost accounting methods, most environmental costs are hidden in some expense accounts (Hoang, 2017; Hue, 2019). As a result, the impact of the production field of enterprises on the implementation of environmental cost accounting cannot be seen easily. This makes it difficult to identify the materiality of environmental costs.

Third, the factor of “Size of enterprises” also has a positive influence on the implementation of environmental cost accounting. The analysis result can also be seen in the research of Christ & Burrit (2013), Majeed et al. (2015), and Alkisher (2021). In Vietnam, the size of an enterprise is determined by two factors: the number of employees and the total capital. Based on that, enterprises are classified into 4 groups: micro enterprises, small enterprises, medium enterprises, and large enterprises. The size of a business, particularly a manufacturing business, has a direct impact on its production scale. The greater the scale of production, the more likely it is that environmental costs will occur.

Fourth, “Regulations” is the factor having the biggest negative impact on the dependent variable. This finding is completely different from previous related research like Che et al. (2005), Chang (2007). “Regulations” are measured by the completeness of regulations and legal documents about environmental cost accounting. But there are currently no environmental cost accounting regulations in Vietnam, only some basic legal documents for enterprises. The negative impact of “Regulations” can be explained by the differences in economic features and application environments.

Fifth, the factor that has the smallest positive impact on the implementation of environmental cost accounting is “Related parties”. This finding is partly consistent with the result of Khalid et al. (2012) and Iredele & Ogunleye (2018) in Nigeria and South Africa as the impact level of this factor in their studies is higher than the authors’ analysis result. Government, shareholder, or public pressure should be required to encourage manufacturing enterprises to implement environmental cost accounting. However, in Vietnam, the lack of pressure from these related parties is one of the most significant impediments to environmental cost accounting implementation.

Sixth, the factor of “Human resources” also has a negative influence on the dependent variable. This result is different from the findings of other authors’ research: both McClery et al. (2004) and Ismail and King (2007) claim that having a highly skilled accountant with extensive work experience improves enterprises’ capacity to apply environmental cost accounting. However, in this study, the factor of “Human resources” is measured by respondents’ knowledge and experience about environmental cost accounting, not only basic accounting skills. “Human resources” can be a barrier to environmental cost accounting implementation due to the inexperience of Vietnamese accountants in this field.

## 6. Conclusions

In the past 10 years, enterprises in Vietnam have gradually paid more attention to the paradigm shift towards greener production, specifically to the use of natural materials, investing in machinery, technology, and equipment following the international standards. To meet the needs and expectations of internal and external audiences who have expressed deep concern for environmental issues, businesses need to consider and create new solutions to minimize the impact of environmental pollution on the production process on the environment. Therefore, at present, environmental cost accounting is increasingly focused, especially when businesses are directing their attention to green product development.

From the result of this study, it is undeniable that implementation of environmental cost accounting is supported greatly by the awareness of accountants and the production field of enterprises but also has to deal with barriers created by the lack of regulations and human resources. Therefore, to strengthen the support and promote the idea of applying environmental cost accounting in manufacturing enterprises, the group contributes some recommendations as follows:

- For the government:

From the result of the study, the factor “regulation” has a negative impact on the implementation of environmental cost accounting. Since environmental cost accounting is still a relatively new concept in Vietnam, it would require a completely new regulation as well as guidance documents on how to apply the new accounting method. On September 25, 2020, the Government approved Resolution No. 136/NQ-CP on sustainable development and promulgated the revised Law on Environmental Protection in November 2020, creating a premise for the development of industrial parks, a tool for sustainable development, including environmental accounting. However, the number of regulations related to environmental cost and environmental accounting is relatively low and therefore in need of addition. Second, the Ministry of Finance should issue a new accounting regime for environmental cost accounting that includes the accounting standards as well as the separate cost allocation system for different environmental expenses. In the current regime, a lot of environmental expenses do not have separate accounts as they are often included in other accounts, usually overhead accounts. It would be a crucial step to encourage enterprises to take up the new accounting method. Lastly, the government should offer preferential policies on tax for enterprises that choose to adopt environmental cost accounting as an act of encouragement.

- For the enterprises:

As awareness of accountants has the most positive impact on the implementation of environmental cost accounting, it is significant that this factor needs to be boosted. The enterprises should develop a training course about environmental cost accounting for accountants and managers as they are the ones who will directly handle the accounting method and make decisions based on the result. Moreover, enterprises should focus on investing financial and human resources for the accounting apparatus, especially environmental cost accounting to adapt to the new accounting method faster.

Production field and size of enterprises are also a strong factor that influences on applying environmental cost accounting. Due to the specificity of the manufacturing industry, businesses can cause severe environmental problems in the production process no matter what size of the enterprise is. Therefore, enterprises should develop a long-term business strategy that takes into account environmental costs as well as the impact of environmental standards and regulations so that not only the economic aspect of the entity is beneficial but also the environmental and social aspects.

- For other related parties:

Although “related parties” doesn’t have much influence on applying environmental cost accounting, it is still a new matter of interest, and it requires more attention from other parties in order to be popularized and widely



applied.

As human resource has the greatest negative impact on implementing environmental cost accounting, a need for improvement is required. For starters, accountants in manufacturing enterprises should be well equipped with knowledge about the new accounting methods as well as the required skills to adopt environmental cost accounting. They should make themselves familiar with the new accounting method since self-learning has been proven to have an undeniable impact on learners in the aspect of obtaining knowledge. As for the educational institutions, it is vital that they take up environmental accounting and make it an official focus point in the teaching process so that the future accountants can be competent in dealing with environmental cost accounting.

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## Appendix

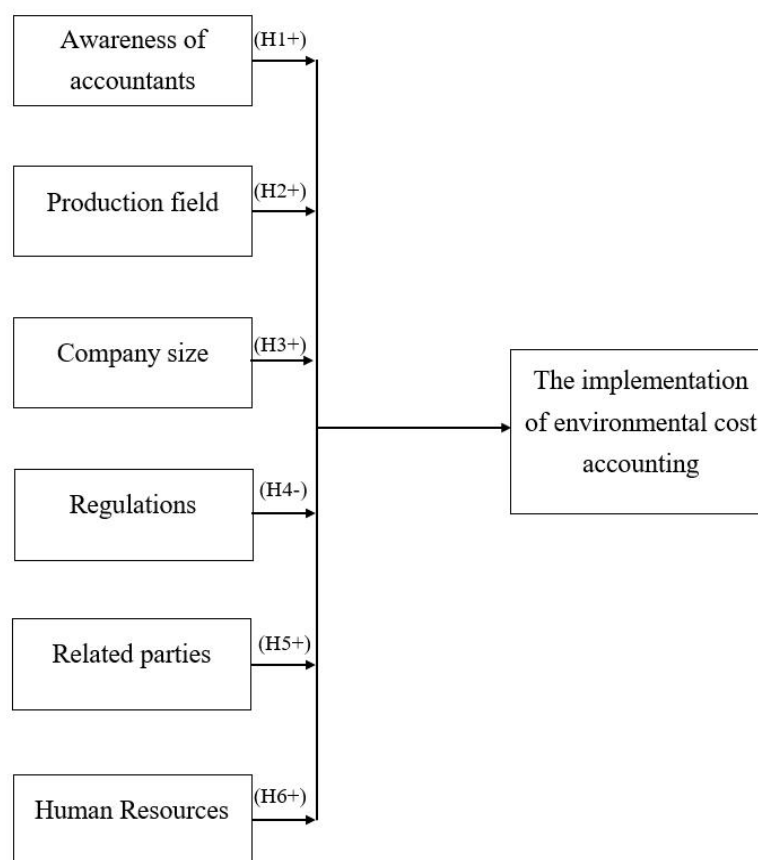


Figure 1: Research model

Table 5: Variables Measurement

No.	Factor Symbol	Factor	Variable	Expected direction
1	ATT1	Awareness of accountants	I think environmental cost accounting implementation as essential	+
2	ATT2		I think environmental cost accounting implementation as beneficial	
3	ATT3		I support environmental cost accounting implementation	
4	ATT4		I think businesses need to be responsible in protecting the environment	
5	ATT5		I think protecting the environment improve corporates' image.	
6	PF1	Production field of enterprises	Enterprises with sensitive production fields tend to adopt environmental cost accounting	+
7	PF2		Enterprises with sensitive production fields tend to incur cost accounts relating to environmental protection.	
8	PF3		Enterprises with sensitive production fields tend to incur unexpected risks, affecting negatively to the environment.	
9	PF4		Enterprises with sensitive production fields have to face many additional compensations and affect business interests.	
10	SZ1	Size of enterprises	The larger the enterprise's revenue, the higher the feasibility of implementing environmental cost accounting.	+
11	SZ2		The larger the number of employees, the higher the level of environmental accounting performance will be.	
12	SZ3		The larger the organizational structure of the enterprise, the higher the feasibility of implementing environmental accounting will be.	
13	SZ4		The larger the total assets of the enterprise, the higher the feasibility of implementing environmental cost accounting.	
14	SZ5		The larger the capital source of the enterprise, the higher the feasibility of implementing environmental cost accounting.	
15	RGL1	Regulations	Vietnam has issued an accounting regime related to the organization of environmental cost accounting for enterprises.	-
16	RGL2		The current regime already has guidance on accounting documents, accounting accounts and financial statements to reflect information on environmental costs.	
17	RGL3		There are specific guidelines on accounting for environmental costs incurred in enterprises.	
18	RGL4		Legal documents and standards on environmental cost accounting in the operation of manufacturing enterprises are complete and synchronous.	
19	RP1	Related parties	Influences from the government and environmental organizations make businesses adopt environmental cost accounting.	+
20	RP2		The influence from customers causes enterprises to adopt environmental cost accounting.	
21	RP3		Influences from financial institutions and investors cause enterprises to adopt environmental cost accounting.	
22	RP4		Influences from press agencies and the media cause businesses to adopt environmental cost accounting.	
23	RP5		The influence from the environmental community causes businesses to adopt environmental cost accounting.	
24	HR1	Human resources	Accounting staff has a lot of experience about environmental cost accounting.	+
25	HR2		Accounting staff are skilled about environmental cost accounting.	
26	HR3		Accounting staff have knowledge of environmental cost accounting.	
27	HR4		Accounting staff are trained in environmental cost accounting.	