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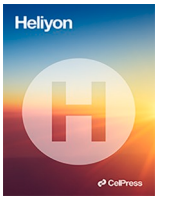

Research article

The impact of managers' attitudes towards environmental management accounting and green competitive advantage in Vietnam manufacturers

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ABSTRACT

Environmental management accounting (EMA) has positive support for providing information for green competitive advantage. Based on upper echelons theory (UET), this study examines the impact of upper managers' attitudes towards the environment regarding the choice of green production strategy, EMA implementation, and green competitive advantage (GCA). The moderating role of regulatory pressure (RP) in some relationships is also investigated. This study, conducted in Vietnam, features a data set of 234 medium and large manufacturers. The sample is restricted to medium and large firms only, as these possess sufficient financial resources to operate independent marketing and management accounting functions. Partial Least Squares Structural Equation Modeling (PLS-SEM) is used to test hypotheses. We found that it has a significant positive and direct effect of attitude towards the environment on choosing a green production strategy and the implementation of EMA, thereby achieving a green competitive advantage. We also find that regulatory pressures have a moderator role and are positive in some relationships. This study applied UET in the management accounting field and presented the significance of the compatibility between upper managers' attitudes towards the environment, strategies, and EMA implementation that would improve the long-term competitive advantage of the organizations.

1. Introduction

Across several countries, studies that have been conducted regarding managerial attitudes towards environmental issues are quite limited. Although environmental attitudes have been examined in Japan [1], Sweden and Baltic countries [2], Turkey [3], Canada [4], and China [5], but studies show different results on organizations' environmental performance [6,7]. Moreover, empirical studies on the psychological characteristics of managers' attitudes towards the environment have been limited in developing countries, especially Vietnam, which has a transitional economy. With the serious environmental pollution happening in Vietnam, the need to apply environmental management accounting (EMA) is very necessary to contribute to environmental protection. In Vietnam, numerous firms and organizations are currently adopting production processes and service provisions that adhere to green and ecologically sustainable standards, aligning with the country's goal for sustainable development (General Statistics Office of Vietnam, 2021). In

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order to increase information disclosure and understand the importance of EMA implementation, the Ministry of Finance issued guidance on corporate income tax policy for environmental protection activities in 2015. These legal provisions show that the government is making efforts to encourage businesses to pay more attention to environmental protection issues in general and to implement EMA in particular.

This study based on the UET's perspective to study the relationship between top manager 's characteristics, strategies and control systems to performance for the organization as a whole. And even more special, when psychological characteristics that are translated into strategic decision-making, choosing an effective control system, and gaining green performance, still need to be further explored [8]. In the field of strategic management, the topic related to firm-level strategy and actions is of great importance to individual-level forces, because a strategic decision by top managers will greatly affect the entire organization [9]. On environmental issues, firms' responses are driven by both external and internal factors. As important internal factors, the choice of green production strategy and green competitive advantage are predicted to be influenced by top managers' attitudes towards the environment [8]. Based on environmental protection, the traditional model of green production strategy promotes organizational green competitive advantage. Recently, a number of studies have focused on green competitive advantage, such as the study of Kuo et al. [10], which found that green core competence has a positive impact on green competitive advantage; green intellectual capital has a significant positive association with green competitive advantage [11]. Besides, many theoretical and empirical studies have shown the existence of a relationship between: upper manager 's characteristics - strategic choice behavior, designing and using information from a control system - the performance of organizations [8,12–15]. However, until now these relationships: attitude toward environmental -green product strategy - EMA - green competitive advancement – have not been paid attention by researchers.

Based on upper echelon theory, regulatory pressure (RP) has been identified as a characteristic of managerial discretion [16]. However, the subject of management accounting has thus far neglected to explore the concept of RP, as well as its potential moderating influence on the decision-making process for the implementation of GPS and EMA systems. The original model of UET in 1984 did not have a moderating variable in the model, and managerial discretion is considered a moderating variable added by Hambrick & Finkelstein (1987) [16], which includes three groups of factors. Factors of the environment outside the organization receive little attention. According to Hambrick & Finkelstein (1987) [16], the moderating variable in UET will play a moderating role in the decision-making process. The Vietnamese government has recently shown a growing interest in environmental conservation. The Vietnamese Parliament approved Environmental Protection Law No. 72/2020/QH14 on November 17, 2020. Every firm operating in Vietnam will be impacted by this environmental rule, particularly while executing their manufacturing strategy. Regulatory pressure is a factor that belongs to environmental characteristics outside the organization, so regulatory pressure will play an important role in the process of choosing GPS and the behavior of using EMA information. In the context of global environmental concerns, it becomes imperative for businesses to incorporate environmental protection measures into their accounting systems and engage in environmental responsibility reporting. By doing so, businesses can enhance their legitimacy when conducting operations. Once GPS and EMA have been effectively implemented and proven advantageous for certain businesses, the subsequent spillover effect will swiftly propagate, leading to the adoption of GPS and EMA by the remaining businesses within society as well.

Hambrick & Mason [8] first introduced UET, and thereafter, it was extended and supplemented [14,16,17]. Recently, this theory has gradually, although on limited occasions, been used in the field of management accounting [14,18]. Based on UET, this study examines attitudes towards the environment that affect choosing a green production strategy, EMA implementation, and the GCA of businesses. Moreover, the moderator role of the RP is also considered.

This is the first study to look at the relationship between CEOs' attitude towards the environment, green production strategy selection, EMA implementation, and green competitive advantage within the same study framework. Second, the RP's moderator role is taken into account regarding two relationships: (1) between the CEO's attitude towards the environment and the choice of a green production strategy, and (2) between the CEO's attitude towards the environment and EMA implementation. Finally, in the context of Vietnam's transitional economy, this study focuses on CEOs' attitudes towards the environment to explain their behavior in selecting green production strategies, EMA implementation for decision-making, and controlling and reinforcing green competitive advantage that has previously been overlooked.

In Vietnam, EMA is a new and unattractive field of research. This study is considered timely and relevant. Through this empirical study, it has been shown that GCA will be achieved through the perceptions and behaviors of upper managers in manufacturing enterprises. Therefore, this result emphasizes the importance of upper managers' attitudes toward the environment, because attitudes will change or determine their corporate governance behavior.

2. Theoretical framework and literature review

2.1. Upper echelons theory

Hambrick and Mason [8] developed a theoretical framework based on top managers' characteristics that addresses organizational interpretations of the business environment, strategic choice, and performance.

Currently, in the field of accounting, relying on UET to consider the psychological impact of upper managers on EMA implementation in particular and the management control system in general is still quite limited and they often use the PLS-SEM model for experimental testing [12–14]. In addition, the consideration of psychological factors has only recently been widely used in financial accounting and auditing [19]. Using the main quantitative research method, psychological characteristics often considered in the field of accounting and auditing include: overconfidence, selfish personality, aversion to risk and acceptance of risk. Hribar & Yang (2016) [20] showed results demonstrated that the CEO's overconfidence has a strong impact on profit management activities. Olsen et al. [21]

argue that the CEO's selfish personality and earnings per share have a positive relationship, while Ham et al. [22] argue that the CFO's selfish personality has a positive impact on their profit management behavior. Notably, research by Liem & Hien (2020) [12] found that managerial risk-taking propensity positively influences the use of a management control system (MAS). Additionally, age and education characteristics significantly impact the behavior of using MAS information in organizations.

Draws on upper echelon theory to study upper managers, organizational strategy and using a combination of qualitative and quantitative research method, studies by Naranjo-Gil & Hartmann (2007) [23] have shown the positive impact of the homogeneity of the top management team on the choice of strategic change in Western hospitals in Spain. Speckbacher & Wentges (2012) [24] believe that family members in the top management team will have a positive impact on the effectiveness of setting the strategic goals of the organization. Naranjo-Gil & Hartmann (2007) [23] argue that a CEO's educational background in medicine has a positive impact and supports the implementation of agile strategies in the organization. On the contrary, CEOs with an educational background in business will positively impact the selection and implementation of a cost leadership strategy. Papadakis (2006) [25] argues that in conditions of low historical performance, education background and attitude towards risk have a positive impact on the international strategic decision-making process of companies. However, up to now, researches on CEOs' attitudes towards environmental on choosing GPS have not received much attention.

Fig. 1 depicts the viewpoint of top-level executives regarding businesses, which, in accordance with the Upper Echelons Theory (UET), can be employed to comprehend the connections between the environmental stance of upper-level executives and the environmental strategies adopted by manufacturing firms. Further, Hambrick & Finkelstein [16] stated that discretion is present in situations characterized by the absence of constraints and a significant degree of ambiguity regarding methods and ends. This ambiguity arises when there are several plausible choices available.

The Upper Echelons idea posits that the individual backgrounds and worldviews of top managers can influence the strategic decisions made by organizations, as well as their control systems and performance. This idea has been developed through the synthesis of anecdotal evidence. As previously said, the strategic decision-making process undertaken by executives or the upper management on behalf of their firm can be seen as a reflection of the personal attributes and qualities possessed by these managers. Characteristics encompass a cognitive foundation and ideals, as well as discernible attributes such as age, functional trajectories, prior job backgrounds, educational attainment, socioeconomic origins, financial status, and collective attributes. Hambrick and Mason (1984) highlighted the importance of psychological factors in top managers, while also placing considerable emphasis on observable backdrop elements. Due to the inherent challenges associated with quantifying the cognitive foundations and value systems of senior executives. Further exploration is required to understand the psychological features via which the background characteristics of top managers are translated into strategic decision-making, utilizing a control system and performance (Hambrick, 2007). Based on UET, studies on performance as a dependent variable in research models in the field of management accounting are quite limited [12–14,18], and only care about financial performance but not about achieving green competitive advantage. This has been called for more attention by many scholars [12,18,26,27].

2.2. Managers' attitude towards the environment

The two most important aspects of human psychology are considered to be personal values and attitudes. There are two distinct types of environmental attitudes that have been identified in the previous research: (1) the attitude toward the environment, and (2) the attitude toward ecological behavior [28]. Only a small portion of the study on this subject is concerned with perceptions of ecological behavior [28]. However, environmental concern is equivalent to a positive environmental attitude. This term describes innate human tendencies that shape environmental actions [29]. The environment has been the focus of the majority of environmental attitude research. The phrase "attitude towards the environment" is reviewed along with personal values in the study of Milfont and Duckitt (2004) [29]. In certain ways, attitude towards the environment reflects human predispositions that influence their behavior [29,30]. Based on Schultz et al. [31], attitude towards the environment is defined as what a person thinks, feels, and plans to do in response to environmental activities and challenges. Some authors describe attitude towards the environment as an emotional

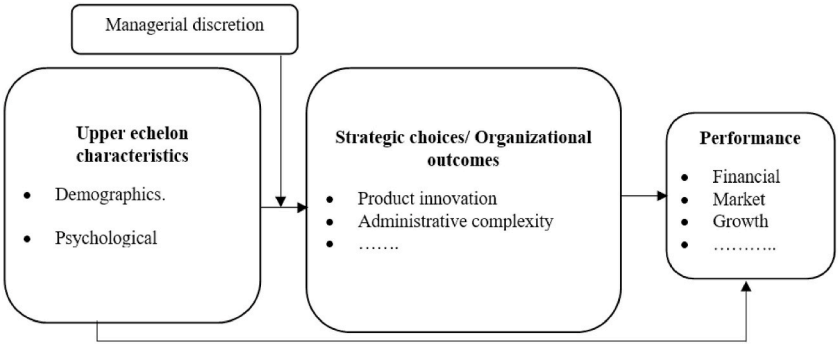

Fig. 1. UET conceptual model.
(Source: Adjusted from Hambrick & Mason [8] and Hiebl [18].

response to environmental issues [31–33].

2.3. Green production strategy (GPS)

The concept of environmental strategy pertains to the degree to which a company incorporates environmental concerns into its strategic planning [34,35]. Environmental strategies are frequently driven by legislative or competitive considerations rather than by the company's core values [34]. In modern manufacturing, the green production strategy is the expression of the sustainable development strategy [36]. The term "green" is often substituted with "sustainable", and green production means making things from greener materials, using greener methods and operations, getting greener results, and being greener to throw away in the end. These are all usual traits of green production [37]. According to research, a green production strategy does not imply zero pollution, but rather a production or process that causes the least environmental damage or a process chosen to minimize environmental damage [35, 38].

2.4. Environmental management accounting (EMA)

Daft and Weick [39], p.286 described EMA as the process of translating events to create shared knowledge and conceptual patterns among top managers to explain organizational processes and analyze environmental information. For CEOs, EMA will be a useful system that can support them and assist them in reducing their company's environmental impacts and making better decisions in the face of external pressure [40]. CEOs can use EMA information to recognize, gather, use, and analyze financial data to make informed and effective environmental management decisions [41]. In EMA, data from both environmental and economic accounting are combined to show how managerial decisions affect a company's bottom line. A system like EMA allows businesses to track, gather, compile, and evaluate data on the environment [42]. Not only can EMA provide relevant information for management regarding the reduction of pollution, but it can also support decision-making and performance management [42].

2.5. Green competitive advantage (GCA)

Competitive advantage is identified by the differentiated position of the organization compared to competitors gained through resource exploitation [43]. In this study, to enhance the achievement of sustainable development, GCA is defined as a critical factor to consider. An organization will have a GCA when it implements a unique strategy that competitors cannot currently or potentially achieve or that they could generate similar benefits from Ref. [44]. Therefore, the organization's GCA will give it a relative position in an industry. An organization can also gain a GCA when it creates unique products that are accepted and appreciated by customers and cannot be imitated by competitors [45].

2.6. Regulatory pressure (RP)

According to the UET, managerial discretion acts as a moderator in the relationship between upper management characteristics and strategy selection and outcomes. Individual components, organizational elements, and environmental factors all have a role in managerial discretion [16]. Regulatory pressure can be considered a component of environmental factors. The possibility of stricter environmental laws in the future can also motivate companies to innovate in order to obtain a competitive edge [46]. When facing and dealing with problems related to environmental issues, the organization's governance actions need to be carefully considered, which are strongly influenced by the government's environmental regulatory pressure [47]. When developing and implementing environmental strategies, organizations are under significant pressure from their government's regulations [47].

2.7. Hypothesis development

2.7.1. Impact of managers' attitudes towards the environment on their behavior of green production strategy choices

Corporate environmental strategy is likewise an organizational competency in that it combines and employs a variety of viewpoints (such as the CEO's attitude and knowledge) to achieve a particular objective [12]. Top management's perceptions of environmental issues have an influence on opportunities for and adoption of voluntary environmental strategy [33,48]. Firms with managers who have a positive attitude towards the environment would be more focused on natural environment issues [48,49]. An owner-manager who has a healthy respect for nature is essential to the growth and maintenance of the company's proactive environmental strategy. The objective of a green production strategy is to reduce the negative impact of production activities on the environment and also to satisfy the pursuit of economic benefits. This strategy will reduce the pressure of the organization on the environment in which it operates [50].

H1. CEOs' attitudes towards the environment will have a positive impact on choosing a GPS.

2.7.2. Impact of managers' attitude towards the environment on environmental management accounting implementation

In developing nations, mimetic, normative, and contingent factors played a greater role in the adoption of EMA practice [51,52]. Empirical evidence presented by Schaltegger et al. [53] demonstrated that various managers care about and process various forms of environmental data. Among the many EMSs available, EMA can be especially useful in assisting the company in identifying, collecting,

utilizing, and analyzing various types of accounting information relevant to its environmental management [41]. To be an effective aspect of corporate administration, EMA, as suggested by Labodová [54], needs to be a part of an integrated system of management. Executives who have a positive outlook on the adoption of environmental practices are more likely to increase their companies' involvement in environmental management [55].

H2. CEOs' attitudes towards the environment will have a positive impact on EMA implementation.

2.7.3. Impact of managers' attitude towards the environment on green competitive advantage

Green product design, supply chain management, eco-branding, environmental disclosure, and product life cycle stewardship are just some of the areas where managers that take a proactive stance see competitive advantages and reputational benefits [56]. Green competitive advantage includes unique activities or products that competitors cannot easily imitate [57]. The relationship between attitude towards the environment and other variables, including control systems (such as EMA implementation), will contribute to the sustainable performance of an organization [8]. Their attitude towards the environment will determine CEOs' environmental behavior [8]. A positive attitude will cause CEOs to choose an environmentally friendly business strategy or product that will provide the foundation for achieving a green competitive advantage [14]. Therefore, a relationship between attitude towards the environment and GCA is predicted to exist. Through top management, a value strategy can be created that is not easily implemented by any current or potential competitors, and thus the benefits of a strategy are unable to be duplicated [44]. Therefore, the most critical factor for a company to obtain a GCA is the mentality of its upper management.

H3. CEOs' attitudes towards the environment will have a positive impact on GCA.

2.7.4. Impact of green production strategy on green competitive advantage

Environmental entrepreneurship is the practice of integrating proactive environmental initiatives for the purpose of gaining a competitive advantage and addressing a variety of market failures [56,58]. The objective of sustainable development is to provide opportunities for the improvement of products and production processes compatible with social demands [59]. Since customers are increasingly interested in and demanding that the products they buy and use be environmentally friendly, a green production strategy that links social responsibility to the core business can be a major competitive advantage for an enterprise. So, to gain a green competitive advantage by integrating environmental protection activities into product design and packaging in manufacturing enterprises is also a significant trend [60]. Green production can improve enterprises competitive advantage; opting for green production satisfies the needs of green consumers [61].

H4. GPS will have a positive impact on GCA.

2.7.5. Impact of green production strategy on environmental management accounting implementation

A successful strategy needs to be consistent with the organization's structure and management control system [62,63]. As part of implementing a green production strategy, EMA is considered a support tool for upper managers in the process of implementing a production strategy [8]. The usefulness of the EMA goes beyond a financial management approach. The two main kinds of EMA information are: physical information pertaining to resources and monetary information including expenses, revenues, savings, and other related factors associated with the environment. So, EMA information is helpful for effective decision-making and improved environmental performance through the control of environmental costs and available benefits [64,65].

H5. The GPS will have a positive impact on EMA implementation.

2.7.6. Impact of environmental management accounting implementation on green competitive advantage

Long-term organizational performance benefited from the use of environmental management accounting [66]. It is clear that implementing environmental management accounting pushes businesses to design methods that will strengthen their competitive advantages in the green market. Managers have recognized that the greatest benefit provided by EMA is its usefulness in helping to discover opportunities to improve corporate reputation and the long-term decision-making of the organization [67]. Specifically, implementing EMA helps businesses improve their environmental performance and save costs, thereby helping to improve pricing decisions, reduce resource waste, and increase revenue, while market access is also promoted, improving the efficiency of investment capital [67,68]. EMA provides a platform for managers to recognize the tension between economic growth and adverse environmental impacts and to identify actions to reduce environmental impact while improving economic performance [53].

H6. The implementation of EMA will have a positive impact on GCA.

2.7.7. The moderator role of regulatory pressure

The green production strategy is currently in its initial phase in Vietnam, serving as a crucial mechanism for attaining the harmonious advancement of environmental preservation and economic growth. Given the difficulty of achieving swift progress through market forces alone, the implementation of this strategy necessitates government intervention and regulation [35,69]. Government regulation pressure affects strategic choice and may lead to a misalignment of an organization within the context of these regulations [70]. Internal and external stakeholders who are concerned about the product's environmental impact greatly on the green production strategy [70,71]. According to Bansal and Roth [72], growing external pressure causes upper managers to adopt different organizational responses to green production. External influences (e.g., customers, government) may potentially impact on green

production strategies [70].

H7a. RP will have a positive moderator role in the relationship between CEOs' attitudes towards the environment and their choice of GPS.

Strong institutions in developing nations apply institutional isomorphic pressure to organizations to adopt EMA [35,51]. Regulatory pressures have also been identified as a significant driver of voluntary adoption of environmental practices in previous empirical studies. Firms were found to be motivated to adopt ISO 14001 by perceived regulatory pressures [73]. Environmental regulations have a significant impact on competitive behavior by introducing new costs and opening up new avenues for addressing them [51]. While corporations are not obligated to do so, the potential influence of regulatory pressures might serve as a motivating factor for firms to proactively adopt EMA practices. Prior studies have revealed that various regulations have key roles in pressuring business to adopt and apply EMA throughout the enterprise [74].

H7b. RP will have a positive moderator role in the relationship between CEOs' attitudes towards the environment and EMA implementation.

A summary of the research hypotheses is shown in Fig. 2.

3. Research methodology

3.1. Variable measurement

In this study, scales that have been used in other studies were used to measure the present variables. All answers were written down on a Likert scale with five points: 1 meant "strongly disagree" and 5 meant "strongly agree". The CEOs' attitudes towards the environment were assessed using a 15-item revised version of the NEP scale [75]. According to Zameer et al. [76], there are four basic elements that can be used to evaluate a green production strategy (GPS). The effectiveness of EMA was assessed using a six-item scale developed by Chaudhry & Amir [77]. This study referred to Lin and Chen [78] to measure green competitive advantage (GCA), which incorporates four items. Based on the research of Huang et al. [70], the scale for regulatory pressure (RP) measurement included five items. Details of the scales are presented in Table 1.

3.2. Sample collection

Data from the manufacturing sector in Vietnam was used for this study because of the relevance of environmental strategy, EMA implementation, and EP for these companies. The study population comprised listed manufacturing firms that could best represent the country's manufacturing sector and could provide accurate information regarding their environmental attitudes, strategic decisions, EMA implementation, and RP. The researchers employed a method of convenience sampling in order to obtain the sample. When conducting a survey, it is crucial to consider an important requirement, which is to ensure that the research sample is representative of the population. The sample included CEOs of manufacturing enterprises in southern, central, and northern Vietnam in three forms of ownership: foreign, state, and private. The sample also covers almost all the main manufacturing industries in Vietnam. Convenience sampling is appropriate when there is relative homogeneity and insignificant variability in the population [79]. Since the CEOs of manufacturing enterprises are overall, the behavior difference can be accepted and is high homogeneity, and this method consumes the least resources among the sampling techniques. In addition, in Vietnam, managers are unfamiliar with the surveys for research, so they often avoid participating in surveys. Hence, the convenience sampling technique was selected as the approach for gathering the official

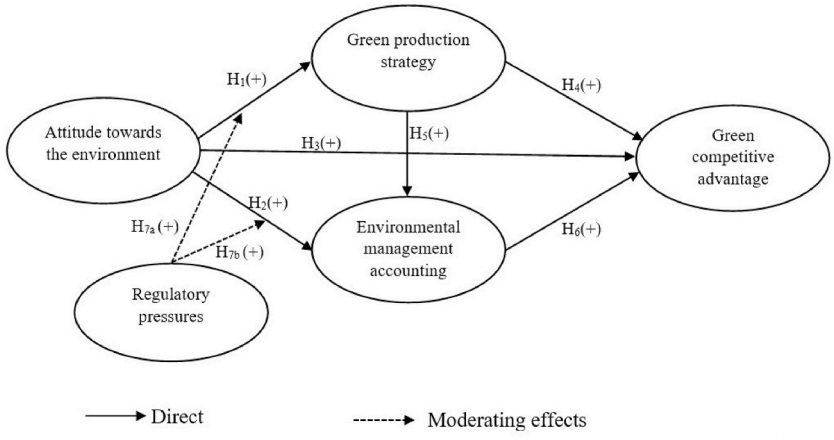

Fig. 2. Research model.
Source: Own developed

Table 1
Measurement scale of research variables.

Attitudes towards the environment (Dunlap et al., 2000) • The global population is nearing the threshold of the earth's carrying capacity. • Humans do not have the right to change the natural environment to meet their needs. • The interference of humans with natural processes frequently leads to catastrophic outcomes. • Human impact will not ensure that the Earth remains viable • The environment is being subjected to significant abuse by human beings. • Plants and animals possess an equal entitlement to existence, comparable to that of humans. • The earth has plenty of natural resources if we just learn how to develop them. • The resilience of natural ecosystems is insufficient to withstand the impacts caused by modern industrialized nations. • Despite possessing unique capabilities, humans remain bound by the principles governing the natural world. • The purported ecological disaster confronting humanity has been significantly overstated. • The earth can be described as a spacecraft characterized by finite space and limited resources. • Humans have been historically positioned as the dominant species over the rest of the natural world. • The normal state of the natural world is highly intricate and susceptible to disruption. • It is anticipated that humanity will acquire a sufficient understanding of natural phenomena to exert control over them in due course. • If current trends persist, it is highly likely that we will imminently encounter a significant ecological catastrophe.	Green production strategy (Zameer et al., 2020) • Our company uses eco-friendly materials that pollute less or not at all; • Our company uses materials that are simple to return, reuse, and break down. • Our company recycles and gets back goods that are no longer useful. • Eco-labeling is used by our business. Environmental management accounting *Chaudhry & Amir (2020)* •Our firm's accounting system recording all physical inputs and outputs (such as energy, water, materials, wastes, and emissions). •The accounting system employed by our firm is capable of conducting studies on product inventory, product improvement, and product environmental impacts. •Our firm utilizes environmental performance targets to measure and manage physical inputs and outputs. •Our firm's accounting system can identify, estimate, and classify environmental-related costs and liabilities. •Our company's accounting system has the capability to generate and utilize cost accounts that are specifically tied to the environment. •The accounting system utilized by our organization possesses the capability to assign environmental-related expenditures to various products.
Regulatory pressure *(Huang* et al*., 2016)* • Our organization is motivated to engage in green innovation efforts due to the influence of emission standards. •The adoption of production technology standards motivates our organization to engage in environmentally sustainable innovation endeavors. •The firm's engagement in green innovation efforts is motivated by the presence of legal threats. •The presence of government oversight compels our organization to engage in environmentally conscious innovation endeavors. •The imposition of administrative penalties serves as a motivating factor for our organization to engage in green innovation endeavors.	**Green Competitive Advantage** *(Lin & Chen, 2017)* •The company possesses a competitive advantage in terms of cost efficiency in environmental management and green innovation when compared to its primary competitors. •The company's green goods and services are better than those of its main rival. •The company can do more environmental research and think of new green ideas than its main rivals. •he business is better at taking care of the environment than its main rivals.

data in this study.

This study using Hair et al.'s proposal [80], that the minimum sample size of a study must be at least five times the number of observed variables in that study. This study has 34 observational variables, so $34 \times 5 = 170$ observations are the minimum sample size. We chooses the above proposal for two main reasons: (1) it is very difficult to survey more than 300 observations [81] or 10 times the number of observed variables [80] because (1) the survey object is a rather special position; and (2) with a minimum sample size of 170, it was a small sample, and the PLS-SEM analysis overcame the small sample disadvantage of the study through rigorous standards and running bootstrapping when performed from PLS-SEM analysis. Therefore, the author finds that the minimum sample size of 5 times the number of observed variables is quite appropriate in the context of this study, but the results are still reliable and accurate. A total of 2943 formal copies of the questionnaire were distributed; this number guaranteed that the study's minimum sample size was met.

Google form survey: The survey questionnaire was distributed to a sample of 2043 chief executive officers (CEOs) representing manufacturing organizations. The CEOs were selected based on their possession of personal email addresses, which were obtained from various sources, including enterprise websites, entrepreneur clubs, and entrepreneur associations. After removing surveys that were deemed inappropriate, a total of 83 questionnaires were retained for the purpose of analysis. In order to mitigate the possibility of sample bias, which can arise in convenience sampling due to under- or over-representation, it is imperative to undertake numerous measures. These measures include conducting a thorough examination of prior research and implementing continuous reminders [82]. A correspondence containing an invitation letter, together with a hyperlink to a survey accessible over the internet, was dispatched to department managers via their respective email accounts. The managers who were sent the invitation letter expressed their agreement to participate by accessing the web-based questionnaire through the provided link. This methodology is subject to limitations in the form of response mistakes, where participants may supply erroneous or misleading data, as well as non-response errors, when the intended respondents fail to provide a response. The lack of response to a survey may pose a potential issue for the accuracy of estimates, particularly if there are discernible patterns of divergence between individuals who reply and those who do not. The potential

impact of this factor on the generalizability of the study findings should be considered [83]. In order to address this issue, the implementation of suitable protocols was undertaken, including the initiation of communication with the relevant individual, the provision of incentives for task completion, and the subsequent follow-up through the dispatch of reminder emails. Reminder letters were dispatched at regular intervals of three weeks over a span of three months subsequent to the initial invitation letter, with the intention of motivating recipients to provide their responses.

Direct survey: By the convenient relationship of the author, 900 questionnaires were sent. After exclusions, there were 151 questionnaires used for analysis.

Although there is a low response rate of 8 % (234/2943), CEOs from different types of production (Textile, leather shoes; Food production; Plastic, packaging; Mechanical machines; Medicine Process the wood, …) can still represent CEOs in provinces and regions in Vietnam relatively. In addition, the proportion of enterprises belonging to three economic regions in Vietnam in the official sample can still be relatively representative of the overall population. Therefore, 234 questionnaires were included in the analysis, still ensuring the representativeness of the population in this study. All respondents who chose to give their consent to participate in this study's questionnaire.

3.3. Method of analysis

The statistical tools known as SmartPLS3 and PLS-SEM were applied in this work specifically for the purpose of conducting path analysis. Hair et al. [84] proposed a two-step analysis method for evaluating both the measurement model and the structural model. If the UET has not yet developed, it is recommended to use PLS-SEM instead of CB-SEM [84]. In this study, the PLS-SEM method is used to estimate the relationships in the model for many reasons: (1) although UET has appeared since 1984 and is widely used in the field of management, but in the field of accounting, it has only recently been applied and there are very few studies based on UET to study EMA [14]; (2) PLS-SEM works effectively with small sample sizes and complex models (this study sample size is 234 with 8 hypotheses); therefore, it is more reasonable to choose the PLS-SEM method; (3) PLS-SEM can handle cause and effect measurement of models easily. We used 5000 resamples while employing the bootstrap method.

4. Results

The formal research sample structure is presented in Table 2, which shows the demographics of the participating respondents. Average age of the respondents is approximately 42 years old. Textile, leather shoes industry accounted for the largest proportion in the final sample, with the rate of 26.5 %. Private ownership manufacturing enterprises are predominant in the sample structure, and enterprises are concentrated in southern Vietnam (nearly 75 % of enterprises in the sample are concentrated in this region). According to the White Book 2020 [85], of the 610,637 operating enterprises, the southern region accounts for 74.4 % of the sample, concentrating a large number of enterprises in the whole of Vietnam. Large enterprises account for nearly 46 % of the country's total number of enterprises, including Ho Chi Minh City (239,623), Binh Duong (31,599), Long An (leading in the Mekong Delta) (8883), the central region (95,558; 13.4 %), and the North (252,694). The White Book 2020 also reports that 60 % of the country's investment capital is in the south. On the other hand, due to the convenient sampling method and the author's ability to properly reach the survey object, it is limited. With the number of businesses from the three economic regions in the final sample, it can still be a good representation of the population.

From the above statistical information, it can be concluded that the sample can be relatively representative of the population of Vietnamese manufacturing enterprises in terms of manufacturing industry, ownership form, age of managers, proportion of businesses in different regions of Vietnam.

Table 2
Description of the sample research.

Manufacturing sector	Fre.	%	Age of CEO	Fre.	%
Textile, leather shoes	62	26.5	<30	12	5.1
Food production	12	5.0	30–39	78	33.3
Plastic, packaging	37	16.0	40–49	115	49.1
Mechanical machines	28	12.0	50–59	23	9.8
Medicine	6	2.5	>=60	6	2.7
Process the wood	30	13.0	**Total**	**234**	**100**
Other manufacturing sector	59	25.0			
Total	**234**	**100**	**Location**	**Fre.**	**%**
Types of ownership	**Fre.**	**%**	Southern	174	74.4
State ownership	12	5.2	Central	19	8.1
Private ownership	175	74.8	North	41	17.5
Foreign ownership	47	20.0	**Total**	**234**	**100**
Total	**234**	**100**			

Source: Data from authors' survey

4.1. Measurement model

Since the data had no outliers. The common technique of bias affects the correlation between the dependent and independent variables; Harman's single-factor is employed here [86]. Along with the other five, there is one fixed factor. These factors together account for 71.92 % of the retrieved variance. Since only 28.6 % of the total variance recovered for the entire model (around 50 %), or the typical method bias, is accounted for by the first element, the bias is not a significant issue [86].

According to Hair et al. [84], the measurement model was evaluated using the following criteria: (1) internal reliability is necessary when assessing the reliability of different observed variables when measuring the same trait (as measured by Cronbach's alpha, composite reliability, and rho A); (2) convergent validity is the measurement that is positively correlated with other measures in the same measure (as measured by outer loading of observed variables greater than 0.7 and AVE greater than 0.5); (3) discriminating value is used to show that a variable is different from other variables in the model (assessed by results of cross-loading coefficient, Fornell-Larcker criterion, factor HTMT).

All scales met the acceptable level of accuracy (see Table 3). The scales all reached a point of convergence (see Fig. 3).

The results in Table 3 show that all scales have: $0.7 < \text{rho\_A} < 0.95$. Cronbach's alpha: $0.7 < \alpha < 0.95$; The composite reliability of all variables has $0.8 < CR < 0.95$. The average variance extracted (AVE) is a condition to evaluate the convergence value. Therefore, the AVE value should be larger than 0.5; the higher the convergence value, the higher the guarantee. The values of AVE presented in Table 3 are all greater than 0.5; therefore, the scales achieve the necessary reliability.

Cross-loadings coefficient, Fornell - Larker criteria, and Heterotrait - Monotrait Ratio of Correlations (HTMT) were used to evaluate discriminant validity [84]. Following testing, the cross-loadings coefficient is significantly higher than in the other structure.

In the Fornell - Larcker criterion results table presented in Table 4, the square root of the AVE of each structure is greater than the correlation coefficient between the structures.

The discriminant validity was confirmed by the HTMT value (Table 5) being less than 0.9. Furthermore, after running bootstrapping 5000 times, the confidence interval of the HTMT value ranges from 2.5 % to 97.5 % excluding the value 1.

4.2. Structural model

After assessing the measurements model, the next step was to assess the structural model. The objectives of this step were: (1) to test the predictive capability; and (2) to examine the relationships between the research variables. The significance of correlations was determined by running bootstrapping 5000 times on the data [84]. Table 6 shows the results of the indicators.

The predictive capability of the independent variables is evaluated using the coefficient of determination (R^2). Table 6 shows that the R^2 value of the green production strategy is 0.352, the EMA is 0.393, and the green competitive advantage is 0.531, indicating that the level of prediction presented is adequate [87]. Q^2 of the dependent variables is greater than zero, indicating that the model is predictive. The theoretical model was tested 2000 times, and statistically significant associations (p-value <0.5) were discovered (see Table 6).

One of the main goals of this study was to test the RP moderator. The results of the RP measurement model showed that the product is both trustworthy and valuable. The two-stage technique [88] was then used to evaluate the moderator variable.

Results in Table 7 indicate that RP plays a moderator role in the relationship between attitude towards the environment and green production strategy, and between attitude towards the environment and EMA implementation. All the hypotheses are statistically significant ($p < 0.05$). Regulatory pressure significantly enhances the connection between manager's attitudes towards environmental and green production strategy ($\beta = +0.181$); EMA implementation ($\beta = +0.172$). The coefficient β of the moderating variable is smaller than the ATE variable that directly influences GPS and EMA. However, this result showed that regulatory pressure enhances the beneficial influence of interactions in the research model ($\beta > 0$ and $p < 0.05$). That indicated the significant role of RP in the process of implementing the environmental strategy, EMA implementation.

The 15-item NEP scale [75] was used in this study to gauge the environmental attitudes of top managers. Top managers in this study demonstrated a relatively strong endorsement of the majority of NEP statements that represent different aspects of environmental attitudes, even though a comparison of findings with previous research using the NEP scale is hampered by the use of different scales or reporting formats [89]. The perceived advantage scale was created to capture senior managers' attitudes about the environment in order to acquire green competitive advantages, just as the NEP examined their broad views regarding the environment in the process of choosing environmentally friendly production strategies and control systems that support them in gaining advantages.

Table 3
Scale accuracy analyses.

Research construct	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
Attitudes towards the environmental	0.940	0.945	0.947	0.545
Environmental management accounting	0.914	0.923	0.933	0.699
Green competitive advantage	0.781	0.806	0.858	0.603
Green production strategy	0.791	0.799	0.863	0.613
Regulatory pressure	0.786	0.786	0.860	0.654

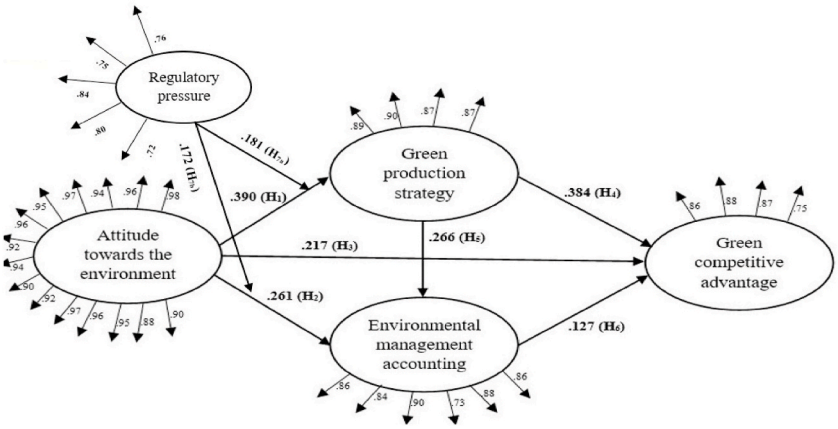

Fig. 3. PLS-SEM analysis results of the theoretical model.

Table 4
Fornell-Larcker criterion.

Concepts	1	2	3	4	5
1. Attitudes towards the environment	**0.738**				
2. Environmental management accounting	0.364	**0.836**			
3. Green competitive advantage	0.413	0.347	**0.777**		
4. Green production strategy	0.390	0.367	0.515	**0.783**	
5. Regulatory pressure	0.450	0.362	0.482	0.654	**0.763**

Table 5
Heterotrait - Monotrait ratio (HTMT).

Concepts	1	2	3	4	5
1. Attitudes towards the environment					
2. Environmental management accounting	0.382				
3. Green competitive advantage	0.467	0.392			
4. Green production strategy	0.430	0.417	0.632		
5. Regulatory Pressure	0.420	0.415	0.432	0.363	

Table 6
Hypothesis testing results.

Examined Relationships	Coefficient	T	p-values	Hypothesis test
H_1: Attitude toward the environment - > Green production strategy	0.390	4.630	0.000	Supported
H_2: Attitude toward the environment - > Environmental management accounting	0.261	3.008	0.003	Supported
H_3: Attitude toward the environment - > Green competitive advantage	0.217	2.832	0.005	Supported
H_4: Green production strategy - > Green competitive advantage	0.384	5.270	0.000	Supported
H_5: Green production strategy - > Environmental management accounting	0.266	3.822	0.000	Supported
H_6: Environmental management accounting - > Green competitive advantage	0.127	2.145	0.032	Supported
R^2 Green production strategy = 0.352	Q^2 Green production strategy = 0.186			
R^2 Environmental management accounting = 0.393	Q^2 Environmental management accounting = 0.129			
R^2 Green competitive advantage = 0.531	Q^2 Green competitive advantage = 0.086			

Table 7
Tests for moderating effects.

Examined Relationships	Coefficient	R^2	p-value
Attitude toward the environment → Green production strategy	0.386	0.411	0.045
Attitude toward the environment x RP → Green production strategy	0.181		0.037
RP → Green production strategy	0.221		0.000
Attitude toward the environment → Environmental management accounting	0.278	0.454	0.013
Attitude toward the environment x RP → Environmental management accounting	0.172		0.030
RP → Environmental management accounting	0.215		0.039

5. Discussion

The findings revealed a significant positive association between CEOs' attitude towards the environment and their behavior in terms of green production strategy, EMA implementation, and green competitive advantage, supporting hypotheses 1, 2, and 3. It may be deduced that when the CEOs' positive attitude towards the environment increased, EMA adoption would increase; this finding is verified by previous research by Labodová [54] and Park & Kim [55]. The CEOs will use EMA data to enhance processes, build products, and make decisions about performance evaluation.

Many companies have used EMA - related green manufacturing strategy to achieve an advantage as a result of the reform process and increased competitiveness. When a GPS is chosen, CEOs will be forced to use EMA to obtain GCA. Long-term competitive advantage can be improved by aligning strategy and control systems. This finding strengthened that of previous studies [30,43,68], and hypotheses 4, 5, 6 were fully supported. This study also supported recent studies that focus on the relationship between environmental management accounting (EMA) and environmental performance [90], investigate the association between EMA and firms' financial performance [91], investigate the impact of environmental innovation comprising product innovation and process innovation on firms' financial performance [92], and link between EMA, board role performance, company characteristics, and environmental performance [93,94]. Similar to the survey research in previous typical studies, but in this study, the survey subjects are CEOs in medium- and large-scale manufacturing enterprises in Vietnam. This study stands from the perspective of UET to study how to combine the CEO's personality traits with a green production strategy, along with a control system like EMA, to achieve competitive benefits in the long run. This is a new direction, a combination of human psychology - strategy - control system and non-financial efficiency; in which the CEO psychological factor plays the role of an antecedent variable affecting all behaviors in the organization.

Vietnam, with a transitional economy, rapid growth of the economy, and environmental issues is more concerned by government, customers, and organizations. Notably, RP has an influence on EMA implementation that implies that RP requires a suitable strategy and changes in the operations of the organizations regarding management's environmental information needs. When RP increases, the ability to choose a green production strategy and EMA implementation will increase. Hypotheses 7a and 7b were supported by these observations. As a result, the role of RP as a moderator in the research model was supported. This outcome bolstered Hambrick and Finkelstein's research [16]. Besides, this experimental research result serves as a signal to encourage CEOs of Vietnamese manufacturing businesses to prioritize environmental issues in their strategic planning. In order to create an EMA control system tailored for green strategy.

An environmental strategy when selected and implemented requires a sound and efficient accounting system to support the strategy. This is considered a long-term competitive weapon for Vietnamese manufacturing enterprises. Through empirical research, this result determines that CEOs' attitudes will determine their behavior in the production process, contributing to raising CEOs' awareness of the importance of attitudes toward the environment, which will lead to correct strategic decisions and design an effective control system. And when their organization is successful, it will create a sustainable competitive advantage, contributing to spreading the success of an organization. When an organization successfully implements a green production strategy, it becomes famous and builds its image. At the same time, the CEOs of that business will create an image of themselves. In other words, this research helps CEOs reshape their attitudes towards the environment. Only when awareness and attitudes are changed will behavior change.

6. Conclusion and implications

6.1. Conclusion

This result contributes to reinforcing previous studies (attitude towards the environment) emphasizing that CEO's important role in the ability to direct the organization to achieve a sustainable competitive advantage [56], and the role of top upper managers in the process of choosing an environmental strategy for the organization to pursue. In addition, for the successful implementation of the environmental strategy, the organization and the CEO need to have a control system in place to support them in making day-to-day administrative and strategic decisions, this result reinforced for the research of Solovida & Latan [90] and Chaudhry et al. [92]. The pressure from the institution contributed to increasing the choice of green production strategy in Vietnamese manufacturing enterprises, as well as further promoting the implementation of the EMA. This result has contributed to adding more significance to the study of Song et al. [69].

In the context of Vietnam, this finding may suggest that top manufacturers' managers have a favorable view of how they and their organization interact with nature. Besides, this study focused on the impact of aspects such as environmental mindset, green production strategy, and EMA implementation, as well as green competitive advantage. The study 's findings suggest that all direct associations are positive and significant. The correlations between (i) the CEOs' attitude towards the environment and green production strategy and (ii) the CEOs' attitude towards the environment and EMA implementation were both moderated by RP.

6.2. Implications

6.2.1. Theoretical implications

The following are some theoretical implications of this study: First, we discovered that choosing a green production approach was significantly associated with the CEOs' environmental attitude. This finding supported UET [8] and corroborated Porter's proposal [45].

This result was consistent with their inference that managers who wished to achieve long-term competitive advantage were more

likely to follow a green production strategy. Second, the feature of CEOs in EMA implementation confirmed Labodová's [54] conclusion. Companies and CEOs who are more environmentally conscious were more likely to implement and maintain EMA. Research results will provide implications for important benefits while promoting EMA implementation in Vietnamese manufacturing enterprises. This empirical investigation has demonstrated the benefits of implementing EMAs, contributing to further evidence supporting the results of Sari et al., [66]. The results support the study of van Der Poll [51] has shown that whether or not to implement EMA depends largely on the manager's views and attitudes towards the environment and sees the importance of the EMA or not? This was consistent with previous research that implied that top management's psychological characteristics influenced their behavior (e.g. Liem & Hien [12,13]; Hambrick & Finkelstein [16]). Thirdly, because manufacturing companies are under pressure from regulators, CEOs' attitudes towards the environment were more likely to favor green production strategies and EMA implementation. Consequently, the moderator role of RP was reinforced regarding Hambrick's proposal [95]. Finally, because the green competitive advantages variable is important in the UET model, this research helps to bridge the gap and respond to Hiebl 's request [18].

6.2.2. Managerial implications

This study has some managerial implications. Firstly, results indicated Vietnam manufacturers' CEOs would not only implement EMA for different decision - making related to environmental issues but would also support their decisions to implement a green production strategy. Thus, it appears that, at these manufacturers, there is a relationship between the implementation and practice of EMA, CEOs' attitude towards the environment, and intention to choose green production strategy. Secondly, when an organization experiences pressure from the regulator, not only does the pursuit of a green production strategy increase, but also the demand to implement and practice EMA, due to the need for EMA information by CEOs of Vietnam manufacturers. Thirdly, aligned with Chenhall [96] and Hambrick & Mason [8], green competitive advantages for manufacturers would be reinforced by a combination of factors: green production strategy and EMA implementation. This implies that to achieve this advantage, Vietnam manufacturers need to choose a strategy and environmental control system suitable to the psychological characteristics of upper managers (like the CEO). Finally, the study's findings suggest that in Vietnam's transitional economy, the adoption, design, and implementation of EMA could reinforce green competitive advantages across national boundaries (i.e. enterprises operating in a transitional economy, such as that of Vietnam). Companies from the Anglo-American block (e.g., Australia, the United Kingdom, and the United States) that are interested in setting up shop in Vietnam would do well to take into account the aforementioned findings. Research showed the importance of managers' awareness of the environment. The research also contributes to raising awareness for managers in pursuing environmentally responsible production and business strategies. The knowledge gained from the research can promote the implementation of EMA in Vietnam's production enterprises towards the goal of increasing competitive benefits and sustainable economic benefits, environmental protection and sustainable development. Many different aspects can be considered when implementing EMA, but through this study, it can be seen that the significant role of CEOs will shape the strategy and determination to implement EMA in Vietnamese manufacturing enterprises. In the event that an enterprise has not yet implemented EMA, upper managers may consider appointing a CEO, who has a psychological toward the environmental and focuses on sustainable competitive advantage. The CEO's environmental orientation can be assessed through their commitments and awareness of the environment. However, the most important aspect for CEOs in this regard is their ability to encourage everyone to prioritize the organization's environmental goals over personal ambitions, providing guidance, motivation, and support in various operational situations, while nurturing employees' passion to generate innovative ideas for the organization to achieve success in green production strategies and pursue the full implementation of EMA. Besides that, we need to introduce green production into teaching in a university environment that trains future business leaders who can understand the importance of CEO perceptions for the environment [97].

6.3. Limitations and directions for future research

This research also has certain limitations. First, future research should investigate additional significant aspects from UET that influence the decision to choose a green production strategy, as well as the EMA's support for environmental decision making. Secondly, future research should consider other higher management qualities as well as other moderator variables. Thirdly, future studies could increase the construct validity by assessing attitude towards the environment utilizing 360° input (from other members of the top management team: CFO, chairman, vice - chairman, for example). Next, this is a cross-sectional study, so it does not take into account the time lag when implementing the strategy. Future research should carry out a longitudinal study to compare the results achieved at different stages of environmental strategy implementation. Finally, PLS is a latent variable modeling technique that requires only a small sample size for the most complex types of regression [98]. To conduct even our most challenging regression, which included GCA as the dependent variable and four independent variables, we needed at least 40 examples. Furthermore, the possibility of similar technique biases is increased because all of the responses to a series of survey items in this study came from the same CEO. The prevalence of common technique bias was evaluated using Harman's single-factor test. Un-rotated component analysis was used to all of the measuring constructs, and the result was four factors. Therefore, there were no mistakes in the overall cumulative variance.

Data availability

Data will be made available on request.

CRediT authorship contribution statement

Vo Tan Liem: Writing – original draft, Methodology, Data curation, Conceptualization. **Nguyen Ngoc Hien:** Writing – review & editing, Methodology, Data curation.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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References

[1] J.C. Pierce, N.P. Lovrich Jr., T. Tsurutani, T. Abe, Environmental belief systems among Japanese and American elites and publics, Polit. Behav. (1987) 139–159.
[2] G.D. Gooch, Environmental beliefs and attitudes in Sweden and the Baltic states, Environ. Behav. 27 (4) (1995) 513–539.
[3] A. Furman, A note on environmental concern in a developing country: results from an Istanbul survey, Environ. Behav. 30 (4) (1998) 520–534.
[4] M.C.R. Edgell, D.E. Nowell, The new environmental paradigm scale: wildlife and environmental beliefs in British Columbia, Soc. Nat. Resour. 2 (1) (1989) 285–296.
[5] C. Lee, J. Thad Barnowe, D.E. McNabb, Environmental perceptions, attitudes and priorities: cross-cultural implications for public policy, Cross Cult. Manag. An Int. J. 12 (1) (2005) 61–83.
[6] O. Branzei, P.D. Jennings, I. Vertinsky, A knowledge-based view of environmental performance in different cultural contexts: Canada, Japan, and China, in: Academy of Management Conference, 2002.
[7] G. Lăzăroiu, L. Ionescu, M. Andronie, I. Dijmărescu, Sustainability management and performance in the urban corporate economy: a systematic literature review, Sustainability 12 (18) (2020) 7705.
[8] D.C. Hambrick, P.A. Mason, Upper echelons: the organization as a reflection of its top managers, Acad. Manag. Rev. 9 (2) (1984) 193–206.
[9] T. Felin, N. Foss, Individuals and organizations: thoughts on a micro-foundations project for strategic management and organizational analysis, in: Research Methodology in Strategy and Management, Emerald Group Publishing Limited, 2006.
[10] F.-I. Kuo, W.-T. Fang, B.A. LePage, Proactive environmental strategies in the hotel industry: eco-innovation, green competitive advantage, and green core competence, J. Sustain. Tourism 30 (6) (2022) 1240–1261.
[11] P. Astuti, L. Datrini, Green competitive advantage: examining the role of environmental consciousness and green intellectual capital, Manag. Sci. Lett. 11 (4) (2021) 1141–1152.
[12] V.T. Liem, N.N. Hien, The impact of manager's demographic characteristics on prospector strategy, use of management accounting systems and financial performance, J. Int. Stud. 13 (4) (2020) 54–69, https://doi.org/10.14254/2071-8330.2020/13-4/4.
[13] V.T. Liem, N.N. Hien, Exploring the impact of dynamic environment and CEO's psychology characteristics on using management accounting system, Cogent Bus. Manag. 7 (just-accepted) (2020) 1712768.
[14] V.T. Liem, The impact of education background on using cost management system information, Cogent Bus. Manag. 8 (1) (2021) 1944011.
[15] O. Pavlatos, X. Kostakis, The impact of top management team characteristics and historical financial performance on strategic management accounting, J. Account. Organ. Change 14 (4) (2018) 455–472.
[16] D.C. Hambrick, S. Finkelstein, Managerial discretion: a bridge between polar views of organizational outcomes, Res. Organ. Behav. 9 (1987) 369–406.
[17] M.R.W. Hiebl, B. Gärtner, C. Duller, Chief financial officer (CFO) characteristics and ERP system adoption: an upper-echelons perspective, J. Account. Organ. Change 13 (1) (2017) 85–111.
[18] M.R.W. Hiebl, Upper echelons theory in management accounting and control research, J. Manag. Control 24 (3) (2014) 223–240.
[19] M. Plöckinger, E. Aschauer, M.R.W. Hiebl, R. Rohatschek, The influence of individual executives on corporate financial reporting: a review and outlook from the perspective of upper echelons theory, J. Account. Lit. 37 (1) (2016) 55–75.
[20] P. Hribar, H. Yang, CEO overconfidence and management forecasting, Contemp. Account. Res. 33 (1) (2016) 204–227.
[21] K.J. Olsen, K.K. Dworkis, S.M. Young, CEO narcissism and accounting: a picture of profits, J. Manag. Account. Res. 26 (2) (2014) 243–267.
[22] C. Ham, M. Lang, N. Seybert, S. Wang, CFO narcissism and financial reporting quality, J. Account. Res. 55 (5) (2017) 1089–1135.
[23] D. Naranjo-Gil, F. Hartmann, Management accounting systems, top management team heterogeneity and strategic change, Account. Org. Soc. 32 (7–8) (2007) 735–756.
[24] G. Speckbacher, P. Wentges, The impact of family control on the use of performance measures in strategic target setting and incentive compensation: a research note, Manag. Account. Res. 23 (1) (2012) 34–46.
[25] V.M. Papadakis, Do CEOs shape the process of making strategic decisions? Evidence from Greece, Manag. Decis. 44 (3) (2006) 367–394.
[26] V.T. Liem, N.N. Hien, Exploring the impact of dynamic environment and CEO's psychology characteristics on using management accounting system, Cogent Bus. Manag. 7 (1) (2020), https://doi.org/10.1080/23311975.2020.1712768.
[27] L.T. Vo, N. Van Vo, T. Ngoc Pham, N.N. Hien, The impact of historical performance and managerial risk-taking propensity on the behavior of choosing prospector strategy and using strategic management accounting information in Viet Nam manufacturer, Sage Open 13 (4) (2023) 21582440231219360.
[28] F.G. Kaiser, S. Wölfing, U. Fuhrer, Environmental attitude and ecological behaviour, J. Environ. Psychol. 19 (1) (1999) 1–19.
[29] T.L. Milfont, J. Duckitt, The structure of environmental attitudes: a first-and second-order confirmatory factor analysis, J. Environ. Psychol. 24 (3) (2004) 289–303.
[30] G. Lăzăroiu, L. Ionescu, C. Uță, I. Hurloiu, M. Andronie, I. Dijmărescu, Environmentally responsible behavior and sustainability policy adoption in green public procurement, Sustainability 12 (5) (2020) 2110.
[31] P.W. Schultz, C. Shriver, J.J. Tabanico, A.M. Khazian, Implicit connections with nature, J. Environ. Psychol. 24 (1) (2004) 31–42.
[32] Y.-S. Chen, Y.H. Lin, Y.-J. Wu, How personality affects environmentally responsible behaviour through attitudes towards activities and environmental concern: evidence from a national park in Taiwan, Leisure Stud. 39 (6) (2020) 825–843.
[33] X. Li, N. Wang, B. Jiang, T. Jia, Institutional pressures and proactive environmental strategy: the mediating effect of top managerial environment attitude and the moderating effect of new media pressure, Bus. Strat. Environ. 32 (8) (2023) 6106–6123.
[34] S.B. Banerjee, E.S. Iyer, R.K. Kashyap, Corporate environmentalism: antecedents and influence of industry type, J. Market. 67 (2) (2003) 106–122.
[35] A.D.N. Gunarathne, K. Lee, P.K. Hitigala Kaluarachchilage, Institutional pressures, environmental management strategy, and organizational performance: the role of environmental management accounting, Bus. Strat. Environ. 30 (2) (2021) 825–839.
[36] F. Liu, J. Yin, H. Cao, Y. He, Investigations and practices on green manufacturing in machining systems, J. Cent. South Univ. Technol. 12 (2) (2005) 18–24.
[37] Y. He, F. Liu, H. Cao, H. Zhang, Process planning support system for green manufacturing and its application, Front. Mech. Eng. 2 (1) (2007) 104–109.

[38] S.S.B. Junior, D. da Silva, M.L.D. Gabriel, W.R. de Oliveira Braga, The influence of environmental concern and purchase intent in buying green products, Asian J. Behav. Stud. 3 (12) (2018) 183.
[39] R.L. Daft, K.E. Weick, Toward a model of organizations as interpretation systems, Acad. Manag. Rev. 9 (2) (1984) 284–295.
[40] T. Daddi, F. Testa, M. Frey, F. Iraldo, Exploring the link between institutional pressures and environmental management systems effectiveness: an empirical study, J. Environ. Manag. 183 (2016) 647–656.
[41] M. Amir, N.I. Chaudhry, Linking environmental strategy to firm performance: a sequential mediation model via environmental management accounting and top management commitment, Pakistan J. Commer. Soc. Sci. 13 (4) (2019) 849–867.
[42] R.L. Burritt, T. Hahn, S. Schaltegger, Towards a comprehensive framework for environmental management accounting—links between business actors and environmental management accounting tools, Aust. Account. Rev. 12 (27) (2002) 39–50.
[43] C.W. Hofer, D. Schendel, Strategy Formulation: Analytical Concepts, West Publ., 1978.
[44] J. Barney, Firm resources and sustained competitive advantage, J. Manag. 17 (1) (1991) 99–120.
[45] M.E. Porter, What Is Strategy?, 1996.
[46] T.J. Dean, R.L. Brown, Pollution regulation as a barrier to new firm entry: initial evidence and implications for future research, Acad. Manag. J. 38 (1) (1995) 288–303.
[47] A.M. Rugman, A. Verbeke, Corporate strategies and environmental regulations: an organizing framework, Strat. Manag. J. 19 (4) (1998) 363–375.
[48] S. Sharma, Managerial interpretations and organizational context as predictors of corporate choice of environmental strategy, Acad. Manag. J. 43 (4) (2000) 681–697.
[49] O. Ogiemwonyi, A. Bin Harun, M.N. Alam, B.A. Othman, Do we care about going green? Measuring the effect of green environmental awareness, green product value and environmental attitude on green culture. An insight from Nigeria, Environ. Clim. Technol. 24 (1) (2020) 254–274.
[50] R. Agarwal, C.E. Helfat, Strategic renewal of organizations, Organ. Sci. 20 (2) (2009) 281–293.
[51] H.M. van Der Poll, The barriers and drivers of environmental management accounting practices' adoption in developed and developing countries for sustainable development, Sustain. Dev. 30 (5) (2022) 1222–1234.
[52] N. Asiri, T. Khan, M. Kend, Environmental management accounting in the Middle East and North Africa region: significance of resource slack and coercive isomorphism, J. Clean. Prod. 267 (2020) 121870.
[53] S. Schaltegger, R. Burritt, D. Zvezdov, J. Hörisch, J. Tingey-Holyoak, Management roles and sustainability information. Exploring corporate practice, Aust. Account. Rev. 25 (4) (2015) 328–345.
[54] A. Labodová, Implementing integrated management systems using a risk analysis based approach, J. Clean. Prod. 12 (6) (2004) 571–580.
[55] E. Park, K.J. Kim, An integrated adoption model of mobile cloud services: exploration of key determinants and extension of technology acceptance model, Telematics Inf. 31 (3) (2014) 376–385.
[56] V.D. Dragomir, V.D. Dragomir, Theoretical aspects of environmental strategy, Corp. Environ. Strateg. Theor. Pract. ethical Asp. (2020) 1–31.
[57] C. Cao, X. Tong, Y. Chen, Y. Zhang, How top management's environmental awareness affect corporate green competitive advantage: evidence from China, Kybernetes 51 (3) (2022) 1250–1279.
[58] P. Mishra, M. Yadav, Environmental capabilities, proactive environmental strategy and competitive advantage: a natural-resource-based view of firms operating in India, J. Clean. Prod. 291 (2021) 125249.
[59] E. Fernández, B. Junquera, M. Ordiz, Managers' profile in environmental strategy: a review of the literature, Corp. Soc. Responsib. Environ. Manag. 13 (5) (2006) 261–274.
[60] P. Shrivastava, S. Hart, Creating sustainable corporations, Bus. Strat. Environ. 4 (3) (1995) 154–165.
[61] Á.M. Ritter, M. Borchardt, G.L.R. Vaccaro, G.M. Pereira, F. Almeida, Motivations for promoting the consumption of green products in an emerging country: exploring attitudes of Brazilian consumers, J. Clean. Prod. 106 (2015) 507–520.
[62] J. Gerdin, J. Greve, Forms of contingency fit in management accounting research—a critical review, Account. Org. Soc. 29 (3–4) (2004) 303–326.
[63] N. Gunarathne, K.-H. Lee, Corporate cleaner production strategy development and environmental management accounting: a contingency theory perspective, J. Clean. Prod. 308 (2021) 127402.
[64] H. Latan, C.J.C. Jabbour, A.B.L. de Sousa Jabbour, S.F. Wamba, M. Shahbaz, Effects of environmental strategy, environmental uncertainty and top management's commitment on corporate environmental performance: the role of environmental management accounting, J. Clean. Prod. 180 (2018) 297–306.
[65] T.T. Le, T.M.A. Nguyen, T.T.H. Phan, Environmental management accounting and performance efficiency in the Vietnamese construction material industry—a managerial implication for sustainable development, Sustainability 11 (19) (2019) 5152.
[66] R.N. Sari, A. Pratadina, R. Anugerah, K. Kamaliah, Z.M. Sanusi, Effect of environmental management accounting practices on organizational performance: role of process innovation as a mediating variable, Bus. Process Manag. J. 27 (4) (2021) 1296–1314.
[67] A. Ferreira, C. Moulang, B. Hendro, Environmental management accounting and innovation: an exploratory analysis, Account Audit. Account. J. 23 (7) (2010) 920–948.
[68] S. Bresciani, S.U. Rehman, G. Giovando, G.M. Alam, The role of environmental management accounting and environmental knowledge management practices influence on environmental performance: mediated-moderated model, J. Knowl. Manag. 27 (4) (2023) 896–918.
[69] M. Song, S. Wang, H. Zhang, Could environmental regulation and R&D tax incentives affect green product innovation? J. Clean. Prod. 258 (2020) 120849.
[70] J.-W. Huang, Y.-H. Li, M.-T. Yen, The relationship between green innovation and business performance-the mediating effect of Brand image, Xing Xiao Ping Lun 13 (1) (2016) 89.
[71] C. Baah, et al., Examining the correlations between stakeholder pressures, green production practices, firm reputation, environmental and financial performance: evidence from manufacturing SMEs, Sustain. Prod. Consum. 27 (2021) 100–114.
[72] P. Bansal, K. Roth, Why companies go green: a model of ecological responsiveness, Acad. Manag. J. 43 (4) (2000) 717–736.
[73] M. Nakamura, T. Takahashi, I. Vertinsky, Why Japanese firms choose to certify: a study of managerial responses to environmental issues, J. Environ. Econ. Manag. 42 (1) (2001) 23–52.
[74] S. Wang, H. Wang, J. Wang, Exploring the effects of institutional pressures on the implementation of environmental management accounting: do top management support and perceived benefit work? Bus. Strat. Environ. 28 (1) (2019) 233–243.
[75] R.E. Dunlap, K.D. Van Liere, A.G. Mertig, R.E. Jones, New trends in measuring environmental attitudes: measuring endorsement of the new ecological paradigm: a revised NEP scale, J. Soc. Issues 56 (3) (2000) 425–442.
[76] H. Zameer, Y. Wang, H. Yasmeen, Reinforcing green competitive advantage through green production, creativity and green brand image: implications for cleaner production in China, J. Clean. Prod. 247 (2020) 119119.
[77] N.I. Chaudhry, M. Amir, From institutional pressure to the sustainable development of firm: role of environmental management accounting implementation and environmental proactivity, Bus. Strat. Environ. 29 (8) (2020) 3542–3554.
[78] Y.-H. Lin, Y.-S. Chen, Determinants of green competitive advantage: the roles of green knowledge sharing, green dynamic capabilities, and green service innovation, Qual. Quantity 51 (2017) 1663–1685.
[79] N.K. Malhotra, I.B. Baalbaki, N.N. Bechwati, *Essentials Of Marketing Research, an Applied Orientation*. AU, Pearson Higher Education, 2007.
[80] J.F. Hair, W.C. Black, B.J. Babin, R.E. Anderson, "Multivariate Data Analysis: Pearson New International Edition,", 1, Essex Pearson Educ. Ltd., 2014, 2.
[81] B.G. Tabachnick, L.S. Fidell, Using Multivariate Statistics, fifth ed., Allyn & Bacon/Pearson Education, Boston, 2007.
[82] K. Kumar, Conducting mini surveys in developing countries, USAID program design and evaluation methodology report, Cent, Dev. Inf. Eval. US Agency Int. Dev 15 (2006) 1–32.
[83] M. Smith, Research Methods in Accounting, SAGE Publications Ltd, London, 2003.
[84] J.F. Hair Jr., L.M. Matthews, R.L. Matthews, M. Sarstedt, PLS-SEM or CB-SEM: updated guidelines on which method to use, Int. J. Multivar. Data Anal. 1 (2) (2017) 107–123.
[85] Ministry of Planning and Investment, Vietnam Enterprise White Paper 2020, Statistical Publishing House, Hanoi, 2020.

[86] P.M. Podsakoff, S.B. MacKenzie, J.-Y. Lee, N.P. Podsakoff, Common method biases in behavioral research: a critical review of the literature and recommended remedies, J. Appl. Psychol. 88 (5) (2003) 879.
[87] D. Wijesinghe, D. Samudrage, Top manager orientation, management accounting systems and strategy implementation: evidence from the Sri Lankan manufacturing sector, NSBM J. Manag. 1 (1) (2016).
[88] W.W. Chin, B.L. Marcolin, P.R. Newsted, A partial least squares latent variable modeling approach for measuring interaction effects: results from a Monte Carlo simulation study and an electronic-mail emotion/adoption study, Inf. Syst. Res. 14 (2) (2003) 189–217.
[89] S.M. Cruz, B. Manata, Measurement of environmental concern: a review and analysis, Front. Psychol. 11 (2020) 363.
[90] G.T. Solovida, H. Latan, Linking environmental strategy to environmental performance: mediation role of environmental management accounting, Sustain. Accounting, Manag. Policy J. 8 (5) (2017) 595–619.
[91] Y. Qiu, A. Shaukat, R. Tharyan, Environmental and social disclosures: link with corporate financial performance, Br. Account. Rev. 48 (1) (2016) 102–116.
[92] N.I. Chaudhry, H. Asad, R.I. Hussain, Environmental innovation and financial performance: mediating role of environmental management accounting and firm's environmental strategy, Pakistan J. Commer. Soc. Sci. 14 (3) (2020) 715–737.
[93] S.K. Nkundabanyanga, B. Muramuzi, K. Alinda, Environmental management accounting, board role performance, company characteristics and environmental performance disclosure, J. Account. Organ. Change 17 (5) (2021) 633–659.
[94] L.W. Lu, M.E. Taylor, A study of the relationships among environmental performance, environmental disclosure, and financial performance, Asian Rev. Account. 26 (1) (2018) 107–130.
[95] D.C. Hambrick, Upper Echelons Theory: an Update, Academy of Management Briarcliff Manor, 2007. NY 10510.
[96] R.H. Chenhall, Management control systems design within its organizational context: findings from contingency-based research and directions for the future, Account. Org. Soc. 28 (2–3) (2003) 127–168.
[97] C.B. Pocol, L. Stanca, D.-C. Dabija, I.D. Pop, S. Mişcoiu, Knowledge co-creation and sustainable education in the labor market-driven university–business environment, Front. Environ. Sci. 10 (2022) 781075.
[98] W.W. Chin, The partial least squares approach to structural equation modeling, Mod. methods Bus. Res. 295 (2) (1998) 295–336.