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ESG-Integrated Accounting Information Systems and Green Decision-Making Effectiveness: The Moderating Role of Top Management Commitment

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Abstract - **This study aims to examine the influence of the level of environmental, social, and governance (ESG) integration into accounting information systems on green decision-making effectiveness, while simultaneously assessing the moderating role of top management commitment in Vietnamese listed enterprises. The study applies a quantitative method with a cross-sectional design, collecting data from 416 listed enterprises on HOSE and HNX through survey questionnaires. Data were analyzed using structural equation modeling (SEM) with SPSS and AMOS software. The results indicate that the level of ESG integration into accounting information systems has a positive impact on green decision-making effectiveness ($\beta = 0.487$, $p < 0.001$). However, an important finding is the distinct differentiation among components: environmental and governance data integration have strong impacts, while social data integration lacks statistical significance. Top management commitment plays a positive moderating role, in which resource allocation and direct involvement have significantly stronger impacts than declarative support. These findings suggest that enterprises should prioritize environmental and governance data integration, while leaders need to shift from declarative commitment to concrete action commitment. The uniqueness of this study lies in decomposing ESG components and leadership commitment, challenging assumptions about the homogeneity of the three ESG pillars in emerging economies, while providing the first empirical evidence on ESG integration mechanisms into accounting systems in the Vietnamese context.**

Keywords: **Accounting Information Systems, ESG Integration, Green Decision-Making Effectiveness, Top Management Commitment, Vietnamese Listed Enterprises**

I. INTRODUCTION

Over the past decade, sustainable development has shifted from a voluntary and encouraged concept to a mandatory requirement for enterprises globally. Within the framework of the 2030 Agenda for Sustainable Development Goals, enterprises play a central role in addressing environmental and social challenges (Jain & Babu, 2024; Sharma & McLean, 2025). The stakeholder pressure is becoming more and more significant, as institutional investors demand ESG data as the main requirement in making investment choices (Amel-Zadeh & Serafeim, 2018). The recent emergence of international reporting regimes, the Global Reporting Initiative, the Sustainability Accounting Standards Board, and, in particular, the convergence of the standards with the International Sustainability Standards Board, is generating an extreme need to systematically incorporate non-financial data into management systems of enterprises (Rabet & Mousavi, 2017; Adams & Abhayawansa, 2022).

The green growth strategy is a national strategy in Vietnam with Decision 1658/QD-TTg on the National Strategy of Green Growth of 2021-2030 (Tran & Nguyen, 2023). The information disclosure on the securities market is gradually satisfied by Circular 96/2020/TT-BTC on the information disclosure and Decree 119/2025/ND-CP on the amendment of Decree 06/2022 on greenhouse gas emission reduction, which was adopted on June 9, 2025. However, the implementation status at enterprises shows a significant gap between regulatory requirements and implementation capacity, as most enterprises still view sustainability reporting as a compliance obligation rather than a strategic management tool (Nguyen et al., 2021). This situation raises questions about the role of accounting information systems in bridging the aforementioned gap.

The accounting information systems are in the midst of a radical transformation, where the traditional role has been conducted to record financial transactions, but a platform that is based on multidimensional information to be used in decision-making is implemented (Habeeb, 2022; Prasetianingrum & Sonjaya, 2024). According to a study by (Maas et al., 2016), the quality of sustainable information is based on the degree of interaction with management accounting systems. The connection between information systems and effectiveness of decision making has been

verified in organizational information processing theory (Burton et al., 2020) though one more question is still unsolved: when ESG data is incorporated in the traditional accounting systems, are these elements equally important in the process of making green decisions or is there a priority hierarchy related to the institutional features of a particular country? The literature available is predominantly on how sustainable information disclosure correlates with financial performance (Friede et al., 2015), but less emphasis is put on the mechanism of how sustainable data can be integrated into the accounting systems. Notably, studies in developed economies tend to view the three ESG pillars as a homogeneous whole; however, this assumption has never been verified in emerging economies like Vietnam, where institutional pressure is unevenly distributed among sustainability aspects. Additionally, the role of top management commitment in transforming information system capabilities into decision-making effectiveness remains an unclear mechanism. The existing literature tends to recognize leadership commitment as a unidimensional variable (Neely et al., 2020), which does not reflect the truth that public statements, resource distribution, and direct engagement could produce various effects, and this phenomenon is particularly true in organizations where the power distance is high. In terms of empirical evidence, quantitative evidence on the level of sustainable data integration into accounting systems in emerging economies remains very limited, and in Vietnam, published works on developing multidimensional scales for this issue seem to remain unexplored.

Therefore, this study was conducted not only to test the overall relationship but also to decompose both the ESG-integrated accounting information system and leadership commitment into constituent components to identify what factors truly make a difference (Khamitdkhanovich et al., 2025). Specifically, the study aims to build and test a model on the influence of the level of ESG integration into accounting information systems on green decision-making effectiveness, with the moderating role of top management commitment in Vietnamese enterprises. The study sets four specific objectives as follows: (i) To identify and measure the components of integration level including environmental data integration, social data integration, governance data integration, and automated reporting capability; (ii) To assess the impact of integration level on green decision-making effectiveness manifested through green investment decision quality, decision-making speed, and the level of sustainable information use; (iii) To test the moderating role of top management commitment decomposed into leadership support, resource allocation, and direct involvement; and (iv) To propose managerial implications suitable for the Vietnamese enterprise context and countries with similar conditions.

This approach allows answering a question with profound practical significance: under limited resource conditions, which system component should enterprises prioritize investing in, and what type of commitment is needed from leaders to maximize green decision-making effectiveness. By addressing the above objectives, the study expects to contribute new empirical evidence, clarifying the complex role of each component of the integrated accounting information system and each aspect of leadership commitment in the emerging economy context. These results have not only academic significance but also provide important implications for managers, investors, and policy-making agencies.

The paper is organized into six sections. Following the introduction, section two presents the theoretical foundation and develops research hypotheses. Section three describes the research methodology, including research design, sample, scales, and analytical techniques. Section four presents the research results from structural equation model analysis. Section five discusses the main findings and implications. Section six concludes with contributions, limitations, and future research directions.

II. THEORETICAL FOUNDATION AND HYPOTHESIS DEVELOPMENT

2.1. Foundational Theoretical Basis

2.1.1. Resource-Based View

The resource-based view (RBV) refers to the synthesis of (Barney & Hesterly, 2019) according to which organizations attain sustainable competitive advantage by owning and using strategic resources with four properties, namely valuable, rare, difficult to imitate, and non-substitutable (VRIN criteria). In this theoretical framework, there has been an addition of non-tangible resources such as information systems and sustainability capabilities. ESG-based accounting information systems are considered to be the strategic resources that fulfill the above-mentioned criteria in this study. The system is useful as it gives non-financial data that can be used in making strategic decisions. The rarity is also exhibited by the fact that not all businesses can create a working integrated system. It is easy to differentiate the system because it involves a complicated combination of technology, procedures, and human capability of the resource. The capacity of incorporating the ESG data into the accounting systems enables businesses to be in a position to respond to the emerging sustainability demands and satisfy the emerging demands of extra-high levels of transparency of the information on sustainability.

2.1.2. Contingency Theory

The application of contingency theory to the management control systems by (Chenhall, 2003) confirms that there is no optimal form of organization structure or management system that fits all situations; instead, it has to be effective in respect to fit with the specific contingency factors. This paper has shown that the effectiveness of accounting information systems and their design varies according to numerous situational factors, including strategy, technology, size, and organizational culture. In this research, it is the contingency

theory that gives the moderation hypothesis the theoretical support. The effectiveness of green decision-making, given the presence of an ESG-integrated information system of accounting, does not always have the same effect but varies depending on the commitment of top management. The commitment of leadership is a situational cause that establishes a situation where the system will be at its best.

2.1.3. Upper Echelons Theory

A theory of Upper Echelons states that the companies are viewed as the reflections of the top management teams, and organizational performance is directly linked to cognitive qualities, values, and experience of high officials (Neely et al., 2020). The process of making strategic decisions is influenced by the manner in which leaders make sense of the information that surrounds them and their distribution of organizational focus. The empirical studies conducted by (Bansal, 2003) prove that one of the most important factors in the implementation of environmental initiatives is the top management commitment. The Upper Echelons theory illustrates how leadership commitment works in this context in three mechanisms, as far as this study is concerned. To begin with, leadership commitment influences the manner in which the ESG-integrated accounting information system is implemented and run. Second, support from leaders creates an organizational culture that values the use of ESG information in decision-making. Third, leaders determine the priority level and resource allocation for green decision-making activities.

2.1.4. Organizational Information Processing Theory

According to the organizational information processing theory, organizations perform well when the level of information processing is equivalent to the level of environmental uncertainty (Burton et al., 2020). In high uncertainty conditions, organizations need to improve their capacity to gather, evaluate, and transfer information. Enterprises, when it comes to making green decisions, experience a lot of uncertainty because of the intricacy of ESG information and the varying needs of interested parties (Maas et al., 2016). This requirement is addressed through the use of ESG-integrated accounting information systems that improve the non-financial information processing functions. The system gathers information through various sources and synthesizes and analyzes based on common standards, hence reducing the uncertainty of information. Consequently, green decision-making can be made of a much better quality and speed.

2.2. Research Hypothesis Development

2.2.1. The Relationship between ESG Integration Level into Accounting Information Systems and Green Decision-Making Effectiveness

The integration of ESG into accounting information systems is characterized by the process of systems design and operation in a manner that gathers, processes, integrates, and reports environmental, social, and governance information along with the conventional financial information (Maas et al., 2016). The degree of integration could go as far as collecting single ESG indicators manually or fully automated with a smooth flow of internal data links.

ESG-integrated systems will have four main elements, including environmental data integration, which is related to emissions, energy, and waste; social data integration, which is linked to labor and community and supply chain; governance data integration, which revolves around board structure, business ethics, and risk management; and automated ESG reporting capacity based on the international standards.

The effectiveness of green decision-making captures how much the decisions made in an enterprise are based on the considerations of the environment and sustainability, which is evaluated on three dimensions, namely, the quality of decisions on green investment, the speed of decision-making, and the intensity of ESG information utilization in a decision (Latan et al., 2018). According to the resource-based view, an ESG-integrated accounting information system can be seen as a strategic resource that deliver high-quality information in the decision-making process (Barney & Hesterly, 2019). This system meets the valuable criterion because it provides reliable and timely ESG data. Rarity is manifested in the fact that building an integrated system requires specific technical and organizational capabilities. The system is difficult to imitate due to the complexity in design and operation. This information resource cannot be substituted for traditional data collection methods.

Organizational information processing theory supplements the explanation of the impact mechanism (Burton et al., 2020). Green decision-making is characterized by a high level of uncertainty caused by the complexity of environmental data and the various needs of other stakeholders. The ESG-integrated systems improve the level of information processing by gathering data from various sources, standardizing it under the same standards, and automatically applying analytical capabilities. This is to minimize information uncertainty and gives the managers a clear picture on which to make decisions.

Several research results demonstrate that integrating ESG factors into accounting information systems helps transform organizational decision-making processes. Alareeni & Hamdan, (2020) underline the fact that the integration of ESG offers stable financial data to the stakeholders, enabling them to make suitable decisions. As shown by (Ellili, 2022), ESG disclosure has a positive effect on the performance of firms and efficiency of their investments. The study by (Lins et al., 2017; Krasodomska & Eisenschmidt, 2025) further found that the greatest degree of CSR activities made the companies with considerably higher stock returns in the 2008-2009

financial crisis, and thus the suggested result indicates that ESG integration may form trust and enhance the quality of green decisions during volatility. Henri & Journeault, (2010) and Alastal, (2021) observed positive effects of the environmental management control systems on proactive environmental strategy. Moreover, the analysis by (Appelbaum et al., 2017) referred to the fact that big data analytics in accounting enhances its effectiveness to a considerable extent.

However, some studies show results that depend on contextual factors. Qian & Schaltegger, (2017) found that the relationship between environmental information systems and decision-making effectiveness is only significant under strong external regulatory pressure. Journeault et al., (2016) pointed out that eco-control system effectiveness depends significantly on the enterprise's environmental strategy level. Gunarathne & Lee, (2021) found that the impact of environmental management accounting systems on decision-making is strongly influenced by organizational culture and leadership commitment, with some cases showing statistically insignificant relationships when lacking these supporting conditions.

Nevertheless, most empirical studies still affirm the positive impact of ESG information integration into accounting systems on sustainable decision-making quality, especially when enterprises have proactive environmental strategies and appropriate management capabilities. Some of the studies have rendered inconsistent results, which can be attributed to the variance in institutional background, corporate culture, and level of system development, and also support the need to incorporate moderating variables like top management commitment in the research model. Therefore, the following hypothesis is proposed:

H1: The level of ESG integration into accounting information systems has a positive impact on enterprise green decision-making effectiveness.

To test this relationship in more detail, four sub-hypotheses are developed corresponding to the ESG-integrated system components:

H1a: Environmental data integration has a positive impact on green decision-making effectiveness.

H1b: Social data integration has a positive impact on green decision-making effectiveness.

H1c: Governance data integration has a positive impact on green decision-making effectiveness.

H1d: Automated ESG reporting capability has a positive impact on green decision-making effectiveness.

2.2.2. The Moderating Role of Top Management Commitment

Top Management Commitment (TMC) is defined as the degree to which top leaders demonstrate support, allocate resources, and directly participate in specific enterprise initiatives (Sanusi & Johl, 2021; Broadribb, 2024). Top management commitment in the case of sustainable governance puts into view the extent to which top management regards ESG matters as strategic priorities (Wijethilake, 2017; Liu & Jiang, 2025). In this study, the top management commitment has three dimensions that are based on (Dasinapa, 2024). First, Leadership Support reflects the degree to which top management publicly supports, communicates the importance, and motivates ESG integration activities throughout the organization. Second, Resource Allocation is the level at which leaders devote financial, manpower, and technological resources that are required in running and developing ESG-incorporated accounting information systems. Third, Direct Involvement is an indicator of the extent to which the top management engages in the design, monitoring, and utilization of ESG information in the enterprise strategy. The Upper Echelons Theory is a theory that confirms that cognition, values, and commitment of top management influence the manner in which organizations perceive the environment, choose strategies, and utilize management information systems (Hambrick, 2007). Accordingly, even when enterprises possess advanced ESG-integrated accounting information systems, the actual effectiveness of this system in supporting green decision-making still depends significantly on the degree to which top management values, uses, and acts based on the ESG information provided (Naranjo-Gil & Hartmann, 2007). Besides, Contingency Theory states that there cannot be a universal best system design, yet the management control systems can be effective based on their relationships with the internal and external organizational situational factors (Otley, 2016; Chenhall, 2003). Top management commitment is a major contingent variable that provides positive grounds for ESG-AIS systems to achieve their full potential in improving high-quality green decisions through setting organizational priorities, offering sufficient resources, and establishing a culture of meaningful ESG information utilization (Journeault et al., 2016; Gunarathne & Lee, 2021).

Many empirical studies have provided evidence supporting the moderating role of top management commitment in the relationship between management systems and enterprise sustainable performance. Wijethilake, (2017), in a study of Australian listed enterprises, demonstrated that top management support has a positive moderating role in the relationship between proactive environmental strategy and sustainable performance, in which the impact of strategy on outcomes is only significant when leaders demonstrate high commitment. The foundational research of (Wijethilake, 2017), through in-depth qualitative analysis at British and Japanese enterprises, identified individual leader commitment as one of the core drivers promoting enterprise ecological responsiveness, especially in transforming strategic intentions into actual actions. More recently, in a

multinational study on sustainable supply chain management (Alzubi, 2025) discovered that top management commitment not only has a direct effect on the environmental performance but also enhances the effect of the management control systems in the achievement of sustainable results. Equally, a study by (Appannan et al., 2023) revealed that top management involvement in the manufacturing enterprises in Malaysia is quite relevant in enhancing the effectiveness of environmental management accounting systems in advancing ecological performance.

In terms of resource allocation, (Dasinapa, 2024) is able to conclude that the operation of environmental information systems is a prerequisite for leaders to commit resources to it. According to (Gunarathne & Lee, 2021), the majority of the environmental management accounting systems lack the desired effects on decision-making quality due to a lack of commitment and direct participation of the top management. Journeault, (2016) also showed that CEO attention and direct participation in using environmental information are the determining factors in system effectiveness for supporting green strategic decision-making. The next hypothesis is as follows, based on the theoretical background and empirical testing findings:

H2: The top management commitment is positively moderating the relationship between the level of ESG integration into AIS and the green decision-making effectiveness. In particular, the effect of ESG-AIS on the effectiveness of green decision-making will be great when the commitment of top management is high. In order to examine this moderation effect in more detail as applied to each dimension of top management commitment, the following sub-hypotheses are offered:

H2a: ESG-AIS has a positive relationship with leadership support (LS) in moderating the relationship between the two.

H2b: Resource Allocation (RA) is a moderating variable with a positive impact on the relationship between ESG-AIS and the green decision-making effectiveness.

H2c: Leadership of the Diagnostic Marketing Relation: Direct Involvement (DI) (leadership) positively mediates the relationship between green decision-making effectiveness and ESG-AIS. With the above formulated theoretical foundation and hypotheses of research, this paper will present a theoretical model to explain the relationship between the level of ESG integration into accounting information systems (ESG-AIS) and green decision-making effectiveness (GDME), where top management commitment (TMC) will be introduced as a moderating variable. The proposed research model is presented in fig. 1 below.

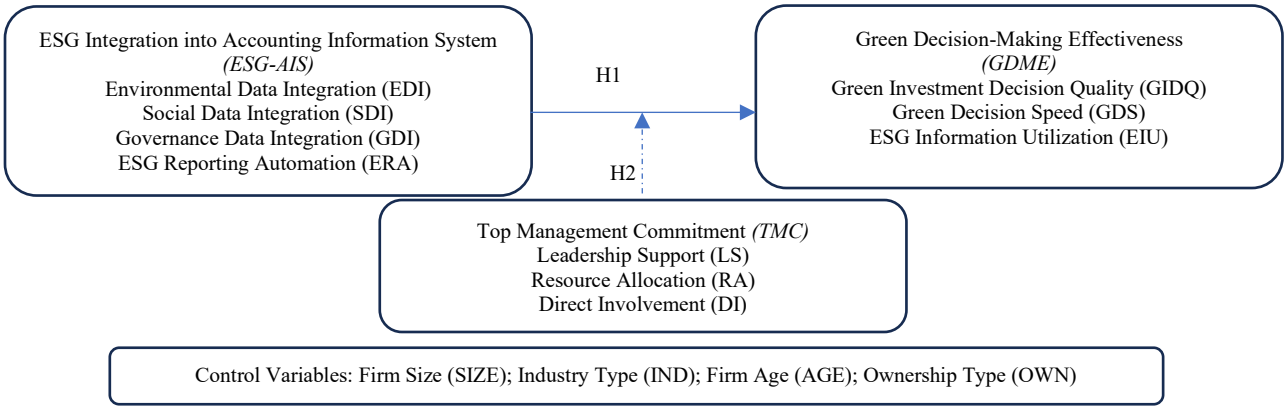

Fig. 1 Proposed Research Model

III. RESEARCH METHODOLOGY

3.1. Research Design and Context

This study applies a quantitative method with a cross-sectional design through self-administered questionnaire surveys. This methodological choice is justified by three reasons: the research objective requires testing causal relationships based on an established theoretical framework; the complex model with second-order constructs necessitates structural equation modeling (SEM); and the study aims for generalizability to the population of Vietnamese listed enterprises.

3.2. Sample and Data Collection

3.2.1. Population and Sample Selection Criteria

The population of the research industry consists of enterprises in the Ho Chi Minh City Stock Exchange (HOSE) and the Hanoi Stock Exchange (HNX). In order to make sure they are relevant to research goals; chosen enterprises should be able to fulfill three criteria at the same time. The first one is that the enterprises must have published annual reports or sustainability development reports, which means that enterprises are more aware and practice annual reports or sustainability development reports. The second criterion is that the enterprises must have implemented accounting information systems, either in the form of ERP or specialized

accounting software; it is a condition to evaluate the degree of ESG integration into AIS. The third criterion involves that at least 3 years of continuous operation of the enterprise exist, and so, enterprises were given enough time to develop a stable governance system.

3.2.2. Sample Size Determination

The sample size was calculated depending on SEM technical requirements. Murtagh & Kurtz, (2016) recommend that the minimum sample size should be 10 times the observed variables or 200 observations, whichever is bigger. The minimum sample size is 400 observations since there were 40 variables observed. The study was supposed to receive about 750-800 questionnaires, bearing in mind the expected response rates and the invalid questionnaires.

3.2.3. Sampling Method and Survey Subjects

Purposive non-probability with industry stratification is employed in the study. This method was chosen for two reasons: ensuring participating enterprises meet research criteria, and ensuring industry diversity to increase sample representativeness. Specifically, enterprises were divided into three main industry groups, including industrial manufacturing, financial services, and trade services, with allocation ratios corresponding to the industry structure of the listed enterprise population.

The sample of the surveys was selected based on the criteria of having the right role and experience to evaluate factors of ESG integration into AIS and the effectiveness of green decision-making in enterprises. Particularly, chief accountants or chief financial officers (CFO), chief executive officers (CEO), or general directors, heads of the accounting department, and ESG or sustainable development personnel are among them. The choice of a wide range of survey participants is designed to gather a detailed outlook of the participants who are directly involved in running accounting information systems and to make a decision related to ESG.

3.2.4. Data Collection Process

The three primary channels that were used to gather data were between February and June 2025. The first channel was direct email to target enterprises with research introduction letters and online survey links. The second channel was through the network of the Vietnam Association of Accountants and Auditors (VAA) and the Enterprise Sustainable Development Club. The third channel was direct surveys at conferences and specialized events on accounting and sustainable development.

To increase response rates and ensure data quality, the study applied several measures, including sending reminder emails every two weeks, ensuring anonymity and information confidentiality for respondents, and committing to share summary research results with participating enterprises.

3.2.5. Sample Collection Results

A total of 780 survey questionnaires were distributed, of which 512 were returned, achieving a response rate of 65.6%. After screening, 96 questionnaires were eliminated due to: serious missing data with missing rates over 10% (34 questionnaires), straight-lining response patterns (28 questionnaires), and outliers identified through Mahalanobis distance (34 questionnaires). The final sample size reached 416 valid observations, corresponding to an effective response rate of 53.3%, exceeding the minimum threshold of 400 observations required by SEM.

Sample characteristics show appropriate diversity. By industry, the industrial manufacturing group accounted for 42.3% (176 enterprises), financial services accounted for 31.5% (131 enterprises), and trade services accounted for 26.2% (109 enterprises). By scale according to the number of employees, enterprises with under 200 people accounted for 28.4%, from 200 to 500 people accounted for 45.2%, and over 500 people accounted for 26.4%. By ownership type, private enterprises accounted for 52.6%, state-owned enterprises accounted for 31.7%, and FDI enterprises accounted for 15.7%. By respondent position, chief accountants and CFOs accounted for 48.3%, CEOs and general directors accounted for 18.5%, heads of accounting departments accounted for 21.9%, and ESG personnel accounted for 11.3%.

3.3. Measurement Instruments

3.3.1. Origins and Basis for Scale Development

The scales in this study were developed based on the principle of inheriting and adapting from verified research works in international academic literature, to ensure reliability and content validity.

The independent variable "Level of ESG Integration into Accounting Information Systems" (ESG-AIS) was conceptualized as a second-order construct reflecting four integration aspects: environmental data integration (EDI, 4 items), social data integration (SDI, 4 items), governance data integration (GDI, 4 items), and automated ESG reporting capability (ERA, 4 items). The items were developed from (Journeault et al., 2021; Vitolla et al., 2020; Zemankova, 2019; Thanh Thuy Ngoc, 2025), while referencing GRI Standards and the TCFD framework.

A second-order construct with three items measured the dependent variable, which was the Green Decision-Making Effectiveness (GDME): green investment decision quality (GIDQ, 4 items), green decision speed (GDS, 4 items), and extent of ESG information used in decisions. (EIU, 4 items). The scale was developed based on (Henri & Journeault, 2010) on environmental management control systems.

A second-order measure of the moderating variable, which was the Top Management commitment (TMC), was assessed with three components: leadership support (LS, 4 items), resource allocation (RA, 4 items), and direct involvement (DI, 4 items). It was based on the scale used by (Bansal, 2003; Wijethilake, 2017) regarding leadership on corporate environmental strategy.

There were 40 items in the model, and they were all based on the 5-point Likert scale of 1 (strongly disagree) to 5 (strongly agree).

3.3.2. Scale Adaptation Process for the Vietnamese Context

To ensure scale appropriateness for the Vietnamese context, the study implemented an adaptation process in three steps. In the first step, original English scales were translated into Vietnamese by two independent experts, then back-translated by a third expert to verify semantic equivalence. In the second step, the draft scale was evaluated by an expert panel through preliminary qualitative research. In the third step, the scale was preliminarily validated statistically through preliminary quantitative research.

3.3.3. Preliminary Research

Preliminary qualitative research was conducted through semi-structured in-depth interviews with four experts, including: 01 academic from a university with in-depth teaching and research experience on ESG and accounting information systems, 02 chief accountants from listed enterprises with ERP implementation experience, and 01 sustainable development expert working at a large enterprise. Experts were requested to estimate linguistic clarity, content suitability, and measureability of every item. The outcomes of the interviews caused some changes in the wording of 8 items to facilitate professional terms in Vietnam, and no items were cut or put into the questionnaire. Preliminary quantitative studies were done on a sample of 64 observations to determine the reliability and factor structure of the scale. Results of the analysis also revealed that all the scales had Cronbach's Alpha coefficients that exceeded 0.7, with a range of values between 0.78 and 0.89. Corrected item-total correlations of all items were above 0.3. Exploratory factor analysis (EFA) results with KMO test reaching 0.81 and Bartlett's test statistically significant ($p < 0.001$), items converged correctly into factors according to the original design with factor loadings above 0.5. These results indicate the scale is qualified for use in the main study.

IV. RESEARCH RESULTS

4.1. Descriptive Statistics of Research Variables

The findings of the descriptive statistics indicate that there are some interesting features of the current situation in the integration of ESG into the accounting information systems of the Vietnamese listed enterprises. In the case of the independent variable ESG-AIS, the range of mean values of components is between 2.89 and 3.47, which is moderate integration. The top mean score (Mean = 3.47) is the governance data integration (GDI), which indicates that the listed enterprises have been keen on the governance factors, including related-party transaction transparency and audit trail traceability; this is an element that is required by the regulatory agencies of the securities market. On the other hand, automated ESG reporting capability (ERA) has the lowest score (Mean = 2.89), especially the capacity to generate reports based on international standards, including GRI, SASB, CDP (ESG14: Mean = 2.71) is not a high level, which is also a big gap between the current system functionality and the global sustainability reporting demands. In the case of the dependent variable GDME, the total mean of the variable is 3.21, implying that the effectiveness of the enterprise green decision-making is moderately good.

Green investment decision quality (GIDQ: Mean = 3.31) is rated higher compared to decision-making speed (GDS: Mean = 3.19) and ESG information use level (EIU: Mean = 3.12). This suggests that enterprises have initially focused on the quality of environment-related decisions; however, integrating ESG information into regular decision-making processes and KPI systems remains limited.

For the moderating variable TMC, top management commitment level is rated at a fairly high level (Mean total = 3.39). Leadership support (LS: Mean = 3.52) has the highest score, particularly leadership protection of ESG projects when facing short-term financial pressure (TMC4: Mean = 3.61), which is positively evaluated. Nonetheless, the allocation of resources (RA: Mean = 3.27) is much lower, with a difference between the declarative commitment and the actual action commitment when investing in resources.

As far as the data distribution is concerned and have a Skewness of between -.42 and 0.24 and a Kurtosis of -.64 to -.11 which are not too far away (Skewness < 2 and Kurtosis < 7) as per the recommendation by (Murtagh & Kurtz, 2016), confirming data does not seriously violate normal distribution assumptions and is suitable for subsequent SEM analyses.

4.2. Scale Reliability Assessment

Scale reliability was measured by Cronbach's Alpha coefficients and item-total scale correlation coefficients that had been corrected. According to a scale is considered reliable when Cronbach's Alpha ≥ 0.7 and the corrected item-total correlation of each observed variable ≥ 0.3. Reliability analysis results for 40 observed variables belonging to three research constructs are presented in table I.

TABLE I CRONBACH'S ALPHA RELIABILITY ASSESSMENT RESULTS

Scale	Number of Items	Cronbach's Alpha	Corrected Item-Total Correlation (Min–Max)
ESG-AIS	16	0.891	0.412–0.724
EDI	4	0.827	0.548–0.697
SDI	4	0.814	0.512–0.681
GDI	4	0.856	0.594–0.724
ERA	4	0.839	0.571–0.708
GDME	12	0.876	0.438–0.691
GIDQ	4	0.842	0.562–0.691
GDS	4	0.819	0.524–0.667
EIU	4	0.831	0.538–0.684
TMC	12	0.903	0.487–0.746
LS	4	0.867	0.612–0.746
RA	4	0.848	0.574–0.712
DI	4	0.859	0.591–0.728

Analysis results show all scales achieve reliability according to established standards. Specifically, Cronbach's Alpha coefficients of scales range from 0.814 (SDI) to 0.903 (TMC), all exceeding the minimum threshold of 0.7. For the independent variable ESG-AIS, the composite scale achieves α = 0.891, in which the governance data integration component (GDI) has the highest reliability (α = 0.856), reflecting consistency in respondent assessments of corporate governance aspects. The social data integration component (SDI) possesses the minimum coefficient in the set (= 0.814), however, exceeding the satisfactory value. The composite scale has a value of 0.876, which is the α of the dependent variable GDME and components of 0.819 (GDS) to 0.842 (GIDQ). This finding indicates that observed variables of the effectiveness of green decision-making are internally high. The moderating variable TMC has the highest reliability among the three research constructs, with α = 0.903. This reflects consistency in respondent perceptions of the role of top management commitment, while showing that manifestations of leadership commitment, such as support, resource allocation, and direct involvement, have close relationships with each other.

Corrected item-total correlation coefficients of all observed variables range from 0.412 to 0.746, exceeding the minimum threshold of 0.3. This confirms that each observed variable contributes significantly to measuring the construct it belongs to; no observed variable needs to be eliminated to improve scale reliability.

4.3. Exploratory Factor Analysis

Before conducting factor analysis, prerequisites were tested through the Kaiser-Meyer-Olkin (KMO) and Bartlett tests. The findings indicate that the KMO coefficient is 0.847, and hence satisfies the minimum criterion of 0.5, which shows that the KMO coefficient is satisfactory to undertake the factor analysis. The test provided by Bartlett has Chi-square = 8,247.361; the null hypothesis, H 0 = that the correlation matrix is an identity matrix, has a significance, Sig. = 0.000, which is not less than 0.05, which proves that the observed variables correlate with each other and the factor analysis is suitable. The results of the exploratory factor analysis with Promax rotation demonstrate that 40 observed variables are converged to 10 factors with an eigenvalue = 1.042, which covers 68.73% of the total variance.

The EFA findings indicate that all 40 variables observed have their factor loading between 0.659 and 0.791, which is larger than 0.5, which is the lowest. Variables converge correctly into 10 factors according to the original theoretical design; no significant cross-loading phenomenon exists. Total variance extracted reaches 68.73%, exceeding the 50% requirement. Factor structure fits the theoretical model, qualifying for conducting confirmatory factor analysis (CFA).

4.4. Confirmatory Factor Analysis

The overall measurement model, including 10 first-order constructs with 40 observed variables, was tested simultaneously. CFA analysis results show the model achieves a good fit with the data. Model fit indices, composite reliability (CR), average variance extracted (AVE), and standardized factor loadings are summarized in table II.

Findings indicate that the model fit indices all achieve satisfactory values as per the requirements of. The composite reliability (CR) values are between 0.821 and 0.873, which are above the 0.7 mark. Average variance extracted (AVE) varies between 0.536 and 0.633, with all of them surpassing the 0.5 marker, which indicates convergent validity of scales. All standardized factor loadings are statistically significant ($p < 0.001$) and exceed the 0.5 threshold.

TABLE II CFA RESULTS – MODEL FIT, RELIABILITY, AND CONVERGENT VALIDITY

Panel A: Model Fit Indices			
Index	Value	Threshold	Assessment
Chi-square (χ^2)	1,124.687		
df	695		
Chi-square/df	1.618	≤ 3	Acceptable
GFI	0.904	≥ 0.9	Acceptable
CFI	0.952	≥ 0.9	Acceptable
TLI	0.946	≥ 0.9	Acceptable
RMSEA	0.039	≤ 0.08	Acceptable
SRMR	0.041	≤ 0.08	Acceptable
Panel B: Construct Reliability and Convergent Validity			
Construct	CR	AVE	Factor Loadings (λ)
ESG-AIS Components			
Environmental Data Integration (EDI)	0.834	0.558	0.687 – 0.794
Social Data Integration (SDI)	0.821	0.536	0.655 – 0.762
Governance Data Integration (GDI)	0.862	0.612	0.724 – 0.816
Automated ESG Reporting (ERA)	0.847	0.581	0.708 – 0.789
GDME Components			
Green Investment Decision Quality (GIDQ)	0.851	0.589	0.712 – 0.798
Green Decision Speed (GDS)	0.828	0.547	0.681 – 0.759
ESG Information Utilization (EIU)	0.839	0.567	0.694 – 0.781
TMC Components			
Leadership Support (LS)	0.873	0.633	0.752 – 0.824
Resource Allocation (RA)	0.856	0.598	0.718 – 0.796
Direct Involvement (DI)	0.864	0.614	0.738 – 0.807

Notes: CR = Composite Reliability (threshold ≥ 0.7); AVE = Average Variance Extracted (threshold ≥ 0.5); All factor loadings are significant at $p < 0.001$; Factor loadings range represents the minimum to maximum standardized loadings for each construct.

Discriminant validity was assessed according to the Fornell-Larcker criterion, in which the square root of AVE for each construct must be greater than the correlations between that construct and other constructs. Results are presented in table III.

TABLE III DISCRIMINANT VALIDITY ASSESSMENT – CORRELATION MATRIX AND SQUARE ROOT OF AVE

Construct	EDI	SDI	GDI	ERA	GIDQ	GDS	EIU	LS	RA	DI
EDI	0.747									
SDI	0.524	0.732								
GDI	0.487	0.461	0.782							
ERA	0.538	0.492	0.516	0.762						
GIDQ	0.412	0.378	0.429	0.451	0.767					
GDS	0.386	0.354	0.391	0.418	0.547	0.740				
EIU	0.401	0.367	0.408	0.436	0.562	0.518	0.753			
LS	0.328	0.312	0.341	0.356	0.398	0.371	0.384	0.796		
RA	0.346	0.329	0.358	0.372	0.412	0.389	0.401	0.584	0.773	
DI	0.339	0.318	0.352	0.364	0.406	0.378	0.392	0.568	0.541	0.784

Notes: Diagonal values (in bold) represent the square root of AVE for each construct; Off-diagonal values represent inter-construct correlations; Discriminant validity is established when diagonal values exceed all corresponding off-diagonal values in the same row and column.

Results show the square root of AVE for each construct is greater than all correlations with other constructs in the same row and column, confirming discriminant validity meets requirements according to the Fornell-Larcker criterion. Constructs in the measurement model are clearly distinct conceptually.

4.5. Structural Model Analysis

To assess structural model fit and estimated using the Maximum Likelihood (ML) method with 416 observations. Results show the structural model achieves a good fit with the data. Chi-square/df index = 1.701 is within an acceptable threshold. All the CFI and TLI indicators are above the 0.9 mark, and GPI measures at 0.897, which is regarded as a good indicator of high complexity models. Both the RMSEA = 0.041 and SRMR = 0.044 are much lower than that of 0.08, which indicates that the model is appropriate in testing research hypotheses. Table IV shows the results of the estimation of the direct relationships in the structural model. The study tests both the overall impact of ESG-AIS on

GDME (H1) and individual impacts of each component (H1a-H1d).

TABLE IV HYPOTHESIS TESTING RESULTS

Hypothesis	Path	Standardized Coefficient (β)	S.E.	C.R.	p-value	Result
H1	ESG-AIS → GDME	0.487	0.068	6.842	<0.001	Supported
H1a	EDI → GDME	0.312	0.054	4.716	<0.001	Supported
H1b	SDI → GDME	0.067	0.058	0.941	0.347	Not supported
H1c	GDI → GDME	0.289	0.051	4.523	<0.001	Supported
H1d	ERA → GDME	0.134	0.062	2.187	0.029	Supported

Notes: S.E. = Standard Error; C.R. = Critical Ratio; Significance levels: p < 0.001 (*), p < 0.01 (), p < 0.05 (*); Bootstrap with 5,000 resamples was applied to confirm the stability of estimates.

Analysis results show distinct differentiation in the impacts of ESG-AIS components on green decision-making effectiveness. Hypothesis H1 is supported with β = 0.487 (p < 0.001), confirming the overall positive impact of ESG integration level into AIS on GDME. However, when decomposed by each component, results show a more complex picture: environmental data integration (EDI: β = 0.312) and governance data integration (GDI: β = 0.289) have strong impacts with high statistical significance (p < 0.001); automated ESG reporting capability (ERA: β = 0.134) has weaker but still significant impact (p = 0.029); while social data integration (SDI: β = 0.067) has no statistically significant impact (p = 0.347).

The coefficient of determination R^2 of the dependent variable GDME reaches 0.418, showing that the independent variables in the model (including four ESG-AIS components) explain 41.8% of the variance in green decision-making effectiveness. This explanation level is evaluated as moderately good in social science research, reflecting the reality that green decision-making effectiveness is also influenced by many factors beyond the ESG integration level into accounting information systems.

Structural model analysis results are illustrated in fig. 2.

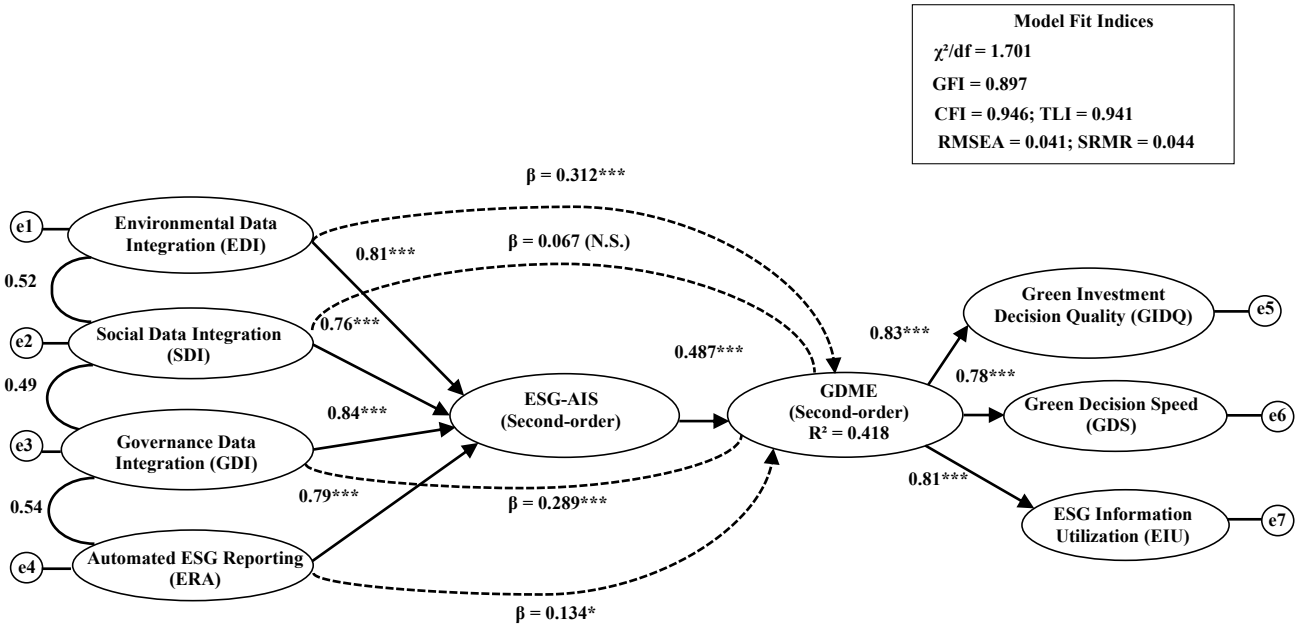

Fig. 2 Structural Equation Model with Standardized Path Coefficients

*Notes: *** p < 0.001; * p < 0.05; n.s. = not significant; Solid lines = second-order factor loadings; Dashed lines = direct effects from first-order components to GDME*

Thus, structural model testing results show that ESG integration level into accounting information systems has a positive and statistically significant impact on green decision-making effectiveness (H1 is supported). However, an important finding of the study is the distinct differentiation in impacts of each component: environmental and governance data integration play key roles, automated reporting capability has a weaker impact, while social data integration shows no significant impact in the Vietnamese listed enterprise context.

4.6. Testing the Moderating Role of Top Management Commitment

To test the moderating role of top management commitment (TMC) on the relationship between ESG-AIS and GDME and applied multi-group analysis. The research sample was divided into two groups based on the median value (Median = 3.41) of the TMC variable: the high commitment group includes 203 observations with TMC scores > 3.41, and the low commitment group includes 213 observations with TMC scores ≤ 3.41. Differences in path coefficients between the two groups were tested through the chi-square difference test ($\Delta\chi^2$).

Before comparing path coefficients, measurement invariance between the two groups was tested. Results show the measurement model achieves configural invariance with CFI = 0.941 and RMSEA = 0.044, and achieves metric invariance with $\Delta\chi^2 = 18.47$, $\Delta df = 12$, $p = 0.103 > 0.05$. These results confirm that comparing path coefficients between two groups is methodologically appropriate. Results comparing path coefficients between high and low commitment groups are presented in table V.

Multi-group analysis results show that the path coefficient ESG-AIS → GDME in the high commitment group ($\beta = 0.614$) is significantly higher than in the low commitment group ($\beta = 0.327$), with $\Delta\chi^2 = 11.842$, statistically significant ($p < 0.001$). This confirms the positive moderating role of TMC. Notably, the impact of SDI on GDME shows no significant difference between the two groups ($p = 0.231$), consistent with the results of the non-significant direct impact of SDI reported in the previous section.

TABLE V MULTI-GROUP COMPARISON

Path	High TMC (β)	Low TMC (β)	$\Delta\chi^2$	Δdf	p-value	Conclusion
ESG-AIS → GDME	0.614	0.327	11.842	1	<0.001	Significant difference
EDI → GDME	0.418	0.194	8.267	1	0.004	Significant difference
SDI → GDME	0.112	0.031	1.436	1	0.231	No significant difference
GDI → GDME	0.386	0.168	7.694	1	0.006	Significant difference
ERA → GDME	0.219	0.058	5.183	1	0.023	Significant difference

Notes: High TMC group: n = 203 (TMC > Median); Low TMC group: n = 213 (TMC ≤ Median); Median of TMC = 3.41; $\Delta\chi^2$ test conducted using chi-square difference between constrained and unconstrained models.

Next, tested the moderating role of each TMC component (LS, RA, DI) through separate multi-group analyses. Results are summarized in table VI.

TABLE VI MODERATING EFFECTS OF TMC COMPONENTS ON ESG-AIS → GDME RELATIONSHIP

Moderator	High Group (β)	Low Group (β)	Δβ	$\Delta\chi^2$	p-value	Effect Strength
Leadership Support (LS)	0.542	0.391	0.151	4.218	0.040	Weak
Resource Allocation (RA)	0.628	0.298	0.330	13.647	<0.001	Strong
Direct Involvement (DI)	0.597	0.284	0.313	12.094	<0.001	Strong

Notes: Groups divided by median of each TMC component; LS Median = 3.52; RA Median = 3.28; DI Median = 3.39; Effect strength classification: Weak (p < 0.05), Moderate (p < 0.01), Strong (p < 0.001).

Results show all three TMC components have moderating roles, though with different magnitudes. Resource allocation (RA) has the strongest moderating effect ($\Delta\beta = 0.330$, $p < 0.001$), followed by direct involvement (DI) with $\Delta\beta = 0.313$ ($p < 0.001$). The moderating effect of leadership support (LS) is not as strong (0.151, $p = 0.040$), meaning that (a) ESG-AIS × TMC Interaction on GDME concrete action commitment is more significant than declarative commitment. In order to visualize the pattern of the moderation effect, fig. 3 includes interaction plots that demonstrate the amplifying effect of TMC on the relationship between ESG-AIS and GDME.

(b) Moderating Effects by TMC Components

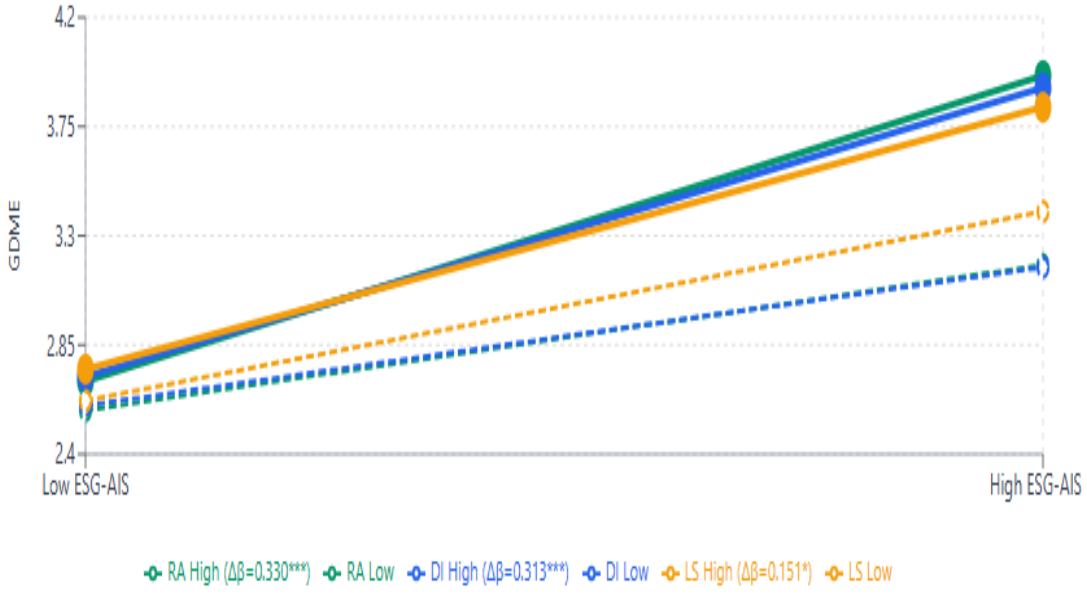

Fig. 3 Interaction Plot: Moderating Effect of Top Management Commitment

*Notes: *** $p < 0.001$; * $p < 0.05$; LS = Leadership Support; RA = Resource Allocation;*

DI = Direct Involvement. Steeper slopes indicate stronger ESG-AIS effects on GDME. The divergence between High and Low TMC lines demonstrates the moderating effect of magnitude.

Fig. 3(a) demonstrates that while both high and low TMC groups show positive ESG-AIS effects on GDME, the slope for the high TMC group (β = 0.614) is substantially steeper than that of the low TMC group (β = 0.327). The deviating trend verifies that TMC enhances the transformation of ESG integration competencies into decision-making results. Fig. 3(b) shows that the moderating strengths of the TMC components are different, with the Resource Allocation and Direct Involvement having significantly broader gaps between high and low groups than the Leadership Support, which clearly demonstrates that action-based commitment leads to stronger moderating effects than declarative support. Judging by the results of the multi-group analysis above, the hypothesis H2 is proved with the help of testing: the

commitment of top management is the positive moderator between the ESG-AIS and GDME relationship (0.287, $p < 0.001$). H2b and H2c have the highest level of support of $p < 0.001$, and H2a has the weakest support of $p < 0.05$. This discovery enjoys serious practical implications: the real resource distribution and the direct engagement in ESG committed activities by leaders play more decisive roles than the outcry of support.

V. Discussion

5.1. Impact of ESG Integration into Accounting Information Systems on Green Decision-Making Effectiveness

The findings of the research prove the existence of a positive correlation between the degree of accounting information systems integration of ESG and the effectiveness of green decision-making (0.487, $p < 0.001$). This result supports the resource-based perspective (Barney & Hesterly, 2019) that ESG-based accounting information systems fit the VRIN requirements of generating competitive advantage, and is in line with the organization information processing theory (Burton et al., 2020) that decreases the uncertainty of information. This result agrees with (Alareeni & Hamdan, 2020; Ellili, 2022) on the positive impact of ESG integration on decision-making quality.

The finding with deepest academic significance is the distinct differentiation in the impacts of ESG-AIS components. Environmental data integration (EDI: $\beta = 0.312$) and governance data integration (GDI: $\beta = 0.289$) have strong impacts, while social data integration (SDI: $\beta = 0.067$) lacks statistical significance. This finding raises doubts regarding the universality of implicit assumptions in the literature on developed economies, like Friede et al., (2015), that the three ESG pillars equally deliver efforts in the performance of enterprises. Rather, this observation is a significant indication that the effects of environmental management accounting systems are controlled by certain institutional settings of individual nations (Gunarathne & Lee, 2021).

EDI in Vietnam has a strong effect as the country is experiencing more rigid legal regulations regarding the management of the environment, specifically the Decree 119/2025/ND-CP covering the inventory of greenhouse gas and the National Strategy of Green Growth 2021-2030. Once the integration of environmental information in accounting systems is done, managers can measure environmental costs and make green investments based on a definite cost-benefit analysis. An example of such is a manufacturing company that uses an automated system that gathers the energy usage data on a process-by-process basis, and can use a very short time to locate the hotspots of consumption and invest in the most efficient energy-saving technology. Moreover, integration of environmental data enables businesses to track their achievements on emission reduction goals, hence, implementing strategies as soon as there is a need.

In a similar way, the high effect of GDI denotes strict corporate governance demands of Circular 96/2020/TT-BTC and regulations by the State Securities Commission. When the governance data are included in the accounting systems, enterprises are able to systematically track and report indicators, including the board structure, the compensation policy on the ESG performance, and the risk management process. This not only complies with the requirements but also improves monitoring quality and strategic decision-making within the company. On the other hand, the lack of a significant effect of SDI demonstrates some institutional qualities of Vietnam, where the pressure of regulation on the social aspects is much lower compared to Europe, where rules like the EU Taxonomy or the Corporate Sustainability Reporting Directive (CSRD) are present.

Issues such as workforce diversity, community impact, or human rights in supply chains have not received commensurate attention from regulatory agencies and investors in Vietnam. Therefore, even when enterprises integrate social data into accounting systems, this information is rarely used in actual decision-making due to a lack of clear institutional motivation.

5.2. Moderating Role of Top Management Commitment

Multi-group analysis results confirm the positive moderating role of top management commitment on the relationship between ESG-AIS and green decision-making effectiveness. The path coefficient of the high commitment group (= 0.614) is almost twice that of the low commitment group (= 0.327), and the difference between the two (= 2.87) is highly significant (= 0.001). This result supports the Upper Echelons theory regarding defining the decisive role of top management characteristics on organizational outcomes (Neely et al., 2020), and it also corresponds to the contingency theory of management control systems according to (Chenhall, 2003): the effectiveness of the management control system depends on the context. This result agrees with (Wijethilake, 2017; Gunarathne & Lee, 2021) on the key role of leadership commitment in transforming system capabilities into actual effectiveness.

The study's new contribution is identifying strong differentiation among constituent components of top management commitment. Findings indicate that resource allocation (RA: Δ 0.330) and direct involvement (DI: 0.313) have a strong moderating effect that is significant ($p < 0.001$), and leadership support (LS: 0.151) has a much weaker moderating effect ($p = 0.040$). This result provokes the common view of past research in which leadership commitment was measured as a unifactorial variable, and the magnitude of impacts of all types of commitment was conceived as equal.

In the Vietnamese organizational culture context, characterized by high power distance according to Hofstede's model, the difference between leaders' "saying" and "doing" has particular significance. Employees at Vietnamese

organizations tend to observe leaders' actual actions rather than words to determine the organization's true priorities. This explains why resource allocation and direct involvement have stronger moderating effects than declarative leadership support.

Take a case of two companies that use ERP systems with ESG modules of the same level of technical integration. In enterprise A, the top management is committed to approving big budgets for employee training, hiring consultants, and assigning specific people to be in charge of ESG data management. On the other hand, in enterprise B, the system is installed with a very limited budget without extra funds to run and develop. Research results show that with the same initial technical integration level, enterprise A will achieve significantly higher green decision-making effectiveness thanks to allocated resources helping the system operate effectively and continuously improve.

Similarly, the strong moderating role of direct involvement implies that when CEOs periodically participate in ESG performance evaluation meetings, directly review indicators from the system, and approve enterprise ESG reports, the entire organization receives clear signals about management's priority level for this issue. As a result, ESG information from accounting systems naturally becomes an important input in decision-making processes at all organizational levels, not merely data collected to meet reporting requirements. On the other hand, leaders supporting ESG solely by words without being involved in it make employees perceive ESG as a sham and not a strategy.

5.3. Research Contributions

Our study contributes to the body of knowledge in three directions. First, it extends the resource-based view by demonstrating that ESG information resource value is not homogeneous but depends on the institutional pressure of each national context, suggesting future studies in emerging economies should separately examine the impacts of each ESG component. Second, it extends Upper Echelons theory by decomposing leadership commitment and identifying different roles of each component, showing that concrete action commitment plays a more decisive role than declarative commitment. Third, it provides empirical evidence and validated scales for future studies in Vietnam and countries with similar conditions.

VI. CONCLUSION AND IMPLICATIONS

6.1. Conclusion

This study establishes the causal relationship between ESG integration level into accounting information systems and green decision-making effectiveness at Vietnamese listed enterprises. The findings using structural equation modeling analysis and 416 observations prove that ESG-integrated accounting systems have a positive effect on green decision-making, effective 41.8 % of the variance of the dependent variable explained, 416 observations, $\beta = 0.487$, $p < 0.001$). The most important discovery can be made concerning the existence of considerable heterogeneity among ESG components: the data integration with environment ($\beta = 0.312$, $p < 0.001$) and with governance ($\beta = 0.289$, $p < 0.001$) has strong evidence, whereas social data integration has no statistical significance ($\beta = 0.067$, $p = 0.347$). This provokes the belief that the pillars of the ESG are homogeneous, as commonly found in the literature of the developed economy. Multi-group analysis supports the fact that top management commitment is a significant moderator of the relationship between ESG-AIS and GDME, and the path coefficient of the high commitment group ($\beta = 0.614$) is almost 2 times higher than that of the low commitment group ($\beta = 0.327$). Importantly, the moderating effect of resource allocation ($\Delta\beta = 0.330$) and direct involvement ($\Delta\beta = 0.313$) demonstrates a significantly stronger one than that of the declarative leadership support ($\Delta\beta = 0.151$), which means that the concrete action commitment is even more significant than the verbal commitment in the context of the Vietnamese organizational culture.

6.2. Implications

For enterprise managers, research results suggest focused investment strategies. With controlled resource requirements, the businesses are advised to incorporate data on environmental and governance into the accounting systems first before venturing into the social elements. The top management should transition to action commitment, instead of the declarative one, by setting particular budgets on the functioning of the ESG system and being directly involved in the regular assessment of sustainability indicators. To the technology solution providers, the research has shown that there is a need to generate ERP modules that are dedicated to the integration of environmental data with automatic features for collecting statistics of emission indicators, consumption of energy, and waste treatment cost. The features of audit trail traceability and related-party transaction transparency must be designed in such a way that they can be extended to requirements of an increasingly stricter nature.

For policymakers, findings on weak impacts of social data integration suggest the need to complete legal frameworks on social information disclosure, including regulations on workforce diversity and supply chain responsibility. Issuing specific guidance on ESG integration into enterprise accounting systems will create necessary institutional motivation to enhance green decision-making effectiveness across the market.

6.3. Limitations and Future Research Directions

Despite achieving stated research objectives and recognize that our study has certain limitations. A cross-sectional design does not allow for a full assessment of causal relationships over time between ESG integration level and decision-making effectiveness. The sample scope limited to listed enterprises may limit generalizability to small and medium enterprises not yet listed. Additionally, self-reported data may be influenced by cognitive bias from respondents.

Future studies may apply longitudinal designs to track changes over time, expand samples to non-listed enterprises, or combine objective data from financial reports to strengthen the robustness of results.

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