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Leveraging management accounting for strategic decision making: Key drivers and performance impact in Vietnamese mechanical manufacturing firms

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Abstract: The Vietnamese mechanical manufacturing sector is a cornerstone of the country's industrial economy, facing intense competition and rapid technological changes. Despite the critical role of strategic decision-making in these enterprises, research on management accounting practices in this sector remains limited, especially regarding factors influencing its adoption and impact on firm performance. This study addresses the gap by analyzing the application of management accounting for decision-making (MAMD) within the unique context of Vietnamese mechanical manufacturing enterprises (VMMEs). This research aims to identify and evaluate key factors influencing the adoption of MAMD in VMMEs and to quantify its impact on both financial and operational performance metrics. By doing so, the study seeks to provide empirical evidence on the strategic benefits of MAMD, contributing to an enhanced understanding of management accounting as a tool for driving competitiveness and performance in emerging economies. The study employs Structural Equation Modeling (SEM) to analyze data collected through structured surveys from a sample of 79 VMMEs, selected from the Vietnam Association of Mechanical Industry (VAMI) across three key sub-sectors: machinery, auto/vehicle components, and electronics manufacturing. Responses were gathered from 232 senior executives, chief accountants, and workshop foremen, ensuring comprehensive insights into strategic, financial, and operational dimensions. Results reveal that manufacturing technology, market competition, and accountants' competencies significantly influence MAMD adoption, enhancing decision-making speed and accuracy. Specifically, firms with robust MAMD systems report a 15% improvement in decision-making efficiency and a 10% increase in return on assets. These findings underscore MAMD's role in boosting performance in VMMEs and highlight the need for targeted strategies to facilitate its adoption. This study adds to the literature by providing a framework for integrating management accounting in industry-specific contexts, promoting sectoral growth and sustainability.

Keywords: *Decision-making, Emerging economies, Firm performance, Management accounting, Mechanical Manufacturing.*

1. Introduction

In recent years, the Vietnamese mechanical manufacturing sector has experienced substantial growth fueled by globalization, technological advancement, and evolving market demands. Within this competitive and dynamic environment, enterprises must effectively manage operational resources to remain competitive, making strategic decision-making essential. Management accounting has thus

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emerged as a critical tool, offering precise and actionable insights that facilitate informed decision-making and enhance firm performance.

Despite its strategic benefits, management accounting practices in Vietnamese mechanical manufacturing enterprises (VMMEs) remain underdeveloped. Existing global research highlights the significant impact of management accounting on firm performance; however, there is a notable gap in studies specifically addressing its application within the Vietnamese manufacturing sector. This gap is particularly relevant given the unique challenges posed by cultural, economic, and operational factors that characterize the Vietnamese market. Bridging this research gap could provide VMMEs with a competitive advantage by optimizing resource allocation, productivity, and profitability through effective management accounting.

The purpose of this study is to investigate the factors influencing management accounting practices in VMMEs and assess their impact on firm performance. By examining the interaction between key factors such as manufacturing technology, market competition, and accountants' competence and the implementation of management accounting for decision-making (MAMD), this study aims to provide empirical evidence on the role of management accounting in enhancing firm performance within this sector. The research employs Structural Equation Modeling (SEM) to rigorously analyze the collected data, ensuring that findings are both reliable and generalizable.

The remainder of this article is structured as follows: the literature review provides a theoretical foundation and presents hypotheses based on previous studies, while the methodology section outlines the sampling approach, data collection methods, and analytical techniques employed. Following this, we present our findings on the impact of management accounting on firm performance, concluding with a discussion of implications, limitations, and directions for future research.

2. Literature Reviews

2.1. The Evolution of Management Accounting

The evolution of management accounting has seen significant shifts over the years, particularly in response to the changing demands of large-scale, market-driven economies. Management accounting emerged in the early 19th century in the United States, catalyzed by the need for governance information within a rapidly industrializing economy [1]. Despite substantial global research on management accounting, no universally accepted definition has emerged, reflecting the field's complexity and adaptability to varying organizational contexts [2-4].

From the managerial perspective, management accounting functions primarily as a tool for providing essential financial and operational insights to aid decision-making [5]). Contrastingly, the Chartered Institute of Management Accountants [6] presents management accounting as an intersection of finance and strategic management, highlighting its role in creating, protecting, and enhancing value for stakeholders. This view is supported by the Institute of Management Accountants [7] which emphasizes management accounting's role in facilitating planning, performance management, and strategic decision-making. Similarly, the IFAC (International Federation of Accountants) [8] positions management accounting as a multifaceted process of identification, measurement, and analysis, underscoring its strategic role in supporting organizational objectives.

In strategic decision-making, management accounting for decision-making (MAMD) comprises three main elements: the collection of relevant information, its processing and analysis, and the dissemination of insights to support strategic choices [3, 4]. These core components serve as the foundation for studies investigating how management accounting practices influence organizational performance. The importance of MAMD is particularly pronounced in sectors such as manufacturing, where complex production processes demand a high level of strategic and operational alignment [9].

2.2. Related Theories

Theoretical frameworks have been developed to explain the factors influencing management accounting practices, including Contingency Theory, Cost-Benefit Theory, and Psychology Theory.

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These frameworks provide a comprehensive understanding of the drivers of management accounting adoption and its implications for organizational performance, especially in manufacturing contexts where environmental and operational contingencies play a crucial role.

Contingency Theory: This theory posits that there is no universally optimal way to organize or apply management accounting practices. Instead, their success depends on alignment with situational factors, which vary by industry, market conditions, and organizational structure [10, 11]. This theory has been extensively applied in management accounting to explore how external and internal contingencies such as firm size, competitive intensity, organizational structure, and technological advancements shape the adoption and utilization of management accounting practices [12-15]. Recent studies have emphasized information technology as a crucial contingency factor, influencing how organizations collect, process, and leverage data for managerial decisions [16].

In the context of Vietnamese Mechanical Manufacturing Enterprises (VMMEs), where rapid technological advancements and competitive pressures are prominent, Contingency Theory underscores the need for adaptable management accounting practices. These practices allow firms to respond dynamically to shifts in market demand and technological trends [17].

Cost-Benefit Theory: It examines the balance between the costs associated with implementing management accounting practices and the benefits they bring to organizational decision-making. This theory suggests that the complexity of a firm's operations and the scale of its decision-making needs influence the extent to which it can benefit from sophisticated accounting systems [18-20]. In larger firms, the benefits of implementing advanced management accounting practices often justify the associated costs. However, for smaller firms, these costs may outweigh the benefits, leading to a more limited application of such practices.

For VMMEs, Cost-Benefit Theory is particularly relevant, as it highlights the need for cost-effective accounting solutions that align with their unique operational constraints. Research indicates that firm size, managers' information needs, and decision complexity are significant factors that influence the adoption of MAMD in manufacturing [21, 22]. This theory also suggests that for small and medium enterprises, such as many VMMEs, prioritizing cost-effective management accounting practices is critical for optimizing decision-making without overextending resources.

Psychology Theory: This theory emphasizes the socio-psychological factors influencing decision-making within organizations, suggesting that the effectiveness of management accounting depends on the alignment of individual behaviors with organizational goals. This perspective highlights the role of corporate culture, interpersonal relationships, and managers' and accountants' perceptions of accounting's strategic importance in shaping management accounting practices [18, 21, 23]. In manufacturing sectors, these socio-psychological factors significantly impact how management accounting information is utilized to support decision-making.

In VMMEs, where the manufacturing process is highly technical and management accounting often involves complex operational data, socio-psychological factors such as corporate culture and managerial attitudes toward accounting information play a crucial role in influencing the effectiveness of MAMD [13, 24].

2.3. Positioning within the Existing Literature

Prior research has predominantly centered on management accounting practices in large multinational corporations and industries with distinct operational structures, such as finance and retail. While these studies collectively affirm the positive impact of management accounting on firm performance, a critical gap remains in understanding its specific applications within the mechanical manufacturing sector, particularly in emerging economies like Vietnam [12, 25]. For Vietnamese Mechanical Manufacturing Enterprises (VMMEs), which navigate a competitive, technology-driven environment, a contextualized understanding of the factors influencing management accounting practices is crucial.

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This study seeks to bridge this gap by investigating the sector-specific determinants affecting management accounting for decision-making (MAMD) in VMMEs. By focusing on key factors such as manufacturing technology, market competition, and the competence of accountants, this research provides empirical evidence on how management accounting can effectively support strategic decision-making and enhance firm performance within the Vietnamese manufacturing landscape. The study contributes to the existing literature by presenting a refined perspective on management accounting practices that align with the unique operational demands of the mechanical manufacturing sector, offering insights that are tailored to the context of emerging economies.

3. Research Methods

3.1. Hypothesis Development

Drawing on insights from Contingency Theory, Cost-Benefit Theory, and Psychology Theory, this study proposes hypotheses to explore the influence of key factors market competition, manufacturing technology, accountant competence, managerial support, and information technology on the adoption of MAMD in VMMEs. Through these hypotheses, the study seeks to illuminate how management accounting can drive both financial and non-financial performance outcomes in this sector.

This literature review highlights the diverse theoretical perspectives that inform the study of management accounting practices and positions this research within a context that has been underexplored: Vietnamese mechanical manufacturing. By addressing this research gap, the study aims to contribute to a more robust understanding of management accounting practices in emerging economies, offering practical insights that can enhance competitiveness and operational efficiency in the manufacturing industry.

In synthesizing previous studies, we identified 11 factors influencing management accounting practices, divided into two categories: internal and external factors. Group 1 encompasses eight internal factors: owners/managers' participation, accountant competence, firm size, organizational structure, corporate culture, foreign ownership, manufacturing technology, business strategy, and awareness of environmental instability. Group 2 includes three external factors: market competition, information technology application, and customer resources. Management accounting for decision-making (MAMD) depends not only on the needs of administrators but also on the compatibility of practices with business characteristics. To establish a research model, we conducted group discussions with eight experts, including administrators, chief accountants of Vietnamese mechanical manufacturing enterprises (VMMEs), and management accounting researchers. The experts emphasized that the core purpose of management accounting is to provide information for internal users. Thus, key internal factors, such as manager participation, accountant competence, and manufacturing technology, are essential when examining factors affecting MAMD.

Market Competition and MAMD: Market competition is a fundamental external factor that shapes organizational strategies, including management accounting practices. In a competitive market, firms face pressure to optimize resources, control costs, and make informed strategic decisions to maintain competitiveness. Studies have shown mixed results on the impact of competition on management accounting adoption. While William and Seaman [26] found no significant relationship, more recent studies argue that intense competition pushes firms towards adopting advanced management tools, including MA, for a strategic edge. For example, Guilding, et al. [27] observed that strategic management accounting techniques are more prevalent in highly competitive environments.

Hypothesis 1 (H1): Market competition has an impact on MAMD.

Managers' Participation and MAMD: Managers play a critical role in influencing the extent to which MAMD practices are adopted. Their support and involvement can facilitate the effective implementation of MA systems, as they determine the strategic relevance of accounting information [28, 29]. Studies suggest that management involvement is essential in environments where MAMD is used to support decision-making processes [18]. With high managerial engagement, the organization is more likely to allocate resources for MAMD development.

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Hypothesis 2 (H2): Managers' participation has an impact on MAMD.

Accountants' Competence and MAMD: Accountant competence is essential for implementing effective MAMD practices, as it requires not only technical expertise but also analytical skills to generate useful insights from financial data. Studies indicate that the training and skills of accountants influence the adoption of MAMD [13]. In Malaysia, Ismail and King [18] found that firms with better-trained accountants adopted MA practices more effectively, underscoring the role of competence in applying MA techniques.

Hypothesis 3 (H3): Accountants' competence has an impact on MAMD.

Manufacturing Technology and MAMD: Manufacturing technology significantly impacts MAMD as it creates a demand for specialized accounting techniques. Advanced manufacturing systems like JIT and lean manufacturing require adaptive MA practices [30, 31]. In VMMEs, where high-precision and automation are common, MA can assist in evaluating and improving operational efficiency, which is critical in competitive manufacturing settings.

Hypothesis 4 (H4): Manufacturing technology has an impact on MAMD.

Application of Information Technology and MAMD: The role of information technology (IT) in transforming MAMD practices cannot be overstated. IT adoption facilitates real-time data processing, decision support, and analysis, allowing MA to provide more relevant and timely information [31]. The integration of IT into accounting practices has enhanced the role of accountants from mere record-keepers to strategic advisors, particularly in data-intensive industries like manufacturing [22].

Hypothesis 5 (H5): Application of information technology has an impact on MAMD.

MAMD and Firm Performance: Firm performance is often measured through financial metrics such as revenue growth, profitability, and ROI, as well as non-financial indicators like customer satisfaction [5]. Effective MAMD can enhance decision-making quality, thereby improving performance [17, 32]. Firms with advanced MAMD practices have been shown to achieve higher operational efficiency and profitability [33].

Hypothesis 6 (H6): MAMD positively influences firm performance.

Theoretical framework: The framework explores how five key factors market competition, managers' participation, accountants' competence, manufacturing technologies, and information technology application impact the effectiveness of Management Accounting for Decision-Making (MAMD) in Vietnamese Mechanical Manufacturing Enterprises (VMMEs). These factors, categorized as internal and external, influence MAMD, which in turn affects firm performance. The framework posits that effective MAMD enables strategic decision-making, improving both financial and operational performance. By addressing the unique needs of VMMEs, this framework underscores the strategic role of management accounting in enhancing competitiveness and optimizing resource allocation in a complex manufacturing environment. Theoretical framework was developed as shown in Figure 1:

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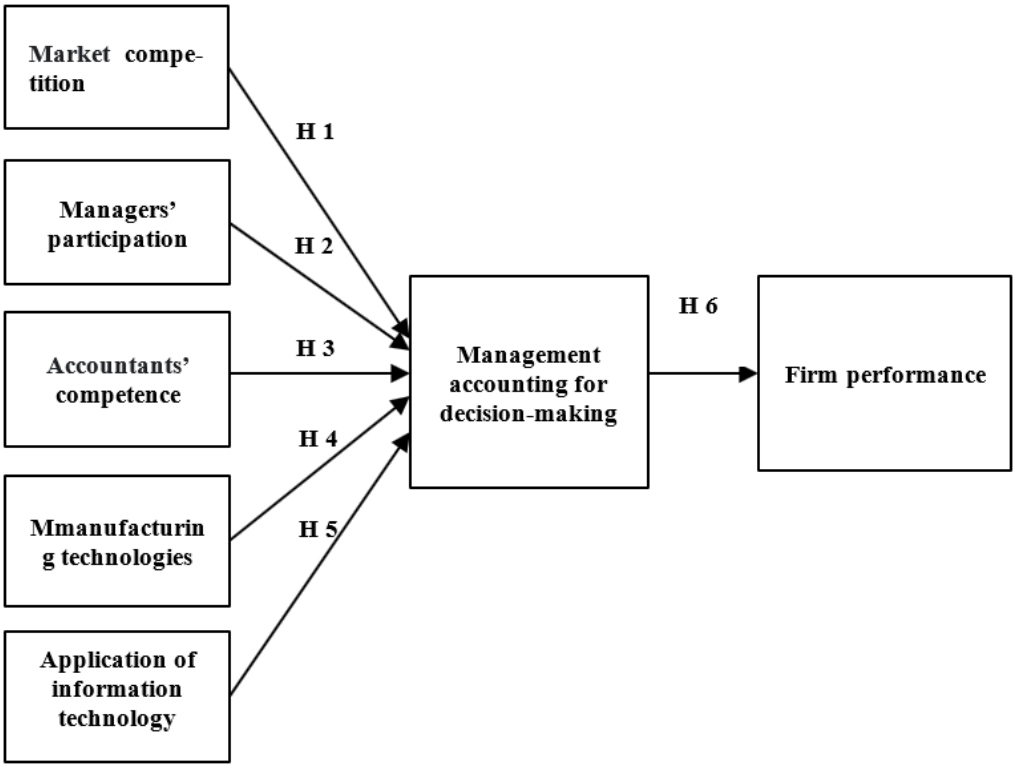

Figure 1.
Theoretical framework of the study.

3.2. Data Collection

Based on data from the Ministry of Industry and Trade, approximately 3,100 Vietnamese Mechanical Manufacturing Enterprises (VMMEs) were operational by the end of 2021, playing a key role in driving Vietnam's industrial growth. Due to data limitations across all enterprises, this study focuses on a sample of 79 companies within the Vietnam Association of Mechanical Industry (VAMI), which offers a representative cross-section of the mechanical manufacturing sector. Specifically, our sample includes companies from three critical sub-sectors: machinery and equipment manufacturing, auto/vehicle components suppliers, and electronics manufacturing, each contributing unique expertise and requirements within the industry.

To ensure comprehensive and knowledgeable responses, we conducted 232 interviews with carefully selected respondents from each company, focusing on senior executives, chief accountants or heads of accounting departments, and workshop foremen. Senior executives provided insights on strategic management and market positioning, while chief accountants detailed financial and accounting practices. Workshop foremen contributed practical perspectives on day-to-day operational efficiency and decision-making processes.

This approach enabled a well rounded collection of data across strategic, financial, and operational dimensions, forming a robust foundation for analyzing factors influencing the adoption of management accounting in VMMEs.

3.3. Study Instruments

The questionnaire, serving as the primary study instrument, was carefully structured into three sections to capture a comprehensive dataset. The first section focused on collecting demographic details from respondents, such as name, gender, job position, and years of experience. This foundational

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information provided critical context for interpreting the responses and offered insights into the profile diversity of participants from Vietnamese Mechanical Manufacturing Enterprises (VMMEs).

The second section of the questionnaire examined various factors influencing the adoption of Management Accounting for Decision-Making (MAMD). This section aimed to systematically identify and assess both internal and external factors affecting MAMD practices within VMMEs, establishing a basis for analyzing how these determinants contribute to strategic decision-making across the sector.

The third section explored the link between MAMD practices and firm performance, with an emphasis on evaluating the impact of MAMD on both operational and financial outcomes in VMMEs. This section was designed to elucidate the strategic value of management accounting in fostering enhanced performance metrics within the Vietnamese mechanical manufacturing industry.

Sections 2 and 3 collectively included 27 measurement items that correspond to the variables proposed in the research model. These items were adapted from established studies to reflect the unique characteristics of VMMEs, enhancing their relevance and accuracy [4, 13, 18, 21, 23, 29]. Respondents provided answers on a five-point Likert scale, ranging from "1 - Strongly disagree" to "5 - Strongly agree," allowing for a nuanced understanding of each factor. Table 1 presents a detailed summary of the specific items within the survey model.

Table 1.
The study variable.

Factor/ Study Variable	Code	Observation variables
Market competition (COM)	COM 1	A large number of competitors in the same segment
	COM 2	Competition on revenue/ market share
	COM 3	Competition on price
	COM 4	Competition on distribution channels
Managers' participation (MAN)	MAN 1	Manager has a high demand for the application of MAMD
	MAN 2	Manager has knowledge of MAMD
	MAN 3	Manager accepts the cost to apply MAMD
	MAN 4	Manager supports the organization of MAMD
Accountants' competence (ACT)	ACT 1	Degrees/certificates of accountants are suitable for professional work
	ACT 2	Accountants have the ability to use accounting and management softwares
	ACT 3	Accountants have the capacity and qualifications to analyze, solve problems and advise managers to make decisions.
Manufacturing technologies (PPC)	PPC 1	The design and production process is strictly controlled
	PPC 2	Production system is flexible
	PPC 3	The machine is controlled by digital
	PPC 4	Products are designed and manufactured to maximize the added value to the customers.
Application of information technology (ITC)	ITC 1	The business has modern computer systems and telecommunications networks to support collecting, processing, analyzing and providing management accounting information.
	ITC 2	Accounting software of business can be flexibly changed and upgraded as required
	ITC 3	Business has used ERP software
	ITC 4	Business has applied Big Data technology
Management accounting for decision-making (MAMD)	MAMD 1	Collecting management accounting information for decision-making
	MAMD 2	Processing and analyzing management accounting information for decision-making
	MAMD 3	Providing management accounting information for decision-making
Firm performance (PER)	PER 1	Revenue growth
	PER 2	Profit growth
	PER 3	Quality of the products
	PER 4	Labor productivity
	PER 5	Research and development

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4. Results Discussion

4.1. Describe the Research Sample

After adjusting the survey questionnaire and identifying the survey object, during 3 months of the survey from April to July 2022, we contacted the enterprises under VAMI and directly sent the survey questionnaires to the survey subjects via email using the googledocs tool. A total of 79/146 enterprises under VAMI in the cities of Hanoi, Hai Phong, Hai Duong and Bac Ninh, Ninh Binh agreed to participate in the survey and ready to provide necessary documents. Of which, there are 55 private enterprises (69.62%) and 24 State-owned (30.38); 30/79 enterprises have capital from 50 billion to 100 billion VND (40.25%), the rest (59.75%) with capital over 100 billion VND.

We distributed 400 questionnaires and received 327 responses (81.75% response rate). However, only 232 questionnaires were valid and suitable for analysis. The classification results are as follows:

Given that the survey targeted mechanical enterprises, a notable gender disparity is observed among respondents, especially in the managerial group. Of the 94 managers surveyed, 78 (83%) were male. In contrast, the gender gap among accountants was smaller, with 64.8% male and 35.2% female representation.

In terms of work experience, 46.9% of respondents have more than 10 years of experience, 37.85% have 5-10 years, and only 15.25% have less than 5 years. Over 60% hold a university degree, and 34.88% have completed postgraduate studies.

4.2. Reliability and Exploratory Factor Analysis

The reliability analysis results indicate that all variables have Cronbach's Alpha values ranging from 0.615 to 0.875. The variable "Application of Information Technology" (ITC) has a Cronbach's Alpha of 0.615, which meets the minimum threshold of 0.6. However, one observed item within this variable (ITC1) has a Corrected Item-Total Correlation of 0.053, which is below the acceptable threshold of 0.3. Removing this item raises the Cronbach's Alpha for the ITC factor to 0.792, improving internal consistency. Therefore, ITC1 was excluded from the ITC factor component.

The Exploratory Factor Analysis (EFA) results, after excluding ITC1, show a KMO coefficient of 0.797, indicating that the data is suitable for factor analysis. Bartlett's test yields a Chi-Square statistic of 3918.354 with a p-value below 0.05, indicating that observed variables are significantly correlated within the population. Based on the Eigenvalue criterion, factors with Eigenvalues ≥ 1 are retained, resulting in seven components aligning with the proposed research model. The Total Variance Explained is 0.7383 (> 0.5), and factor loadings for all observed variables exceed 0.5, indicating good statistical significance without any issues of disturbance, separation, or factor aggregation.

In conclusion, all variables in the research model demonstrate reliability and convergence, meeting the criteria for further analysis in subsequent steps.

4.3. Structural Equation Modeling Analysis and Hypothesis Testing

We conducted Confirmatory Factor Analysis (CFA) to assess the fit of the research model with the collected data. The CFA results demonstrated an acceptable model fit, with Chi-square/df = 2.086 (< 3), indicating a good fit. Additionally, the fit indices CFI = 0.947, TLI = 0.932, and IFI = 0.948 all exceeded the recommended threshold of 0.9, while the RMSEA was 0.074, comfortably below the 0.08 threshold.

The standardized regression weights for each factor were above 0.5, suggesting robust relationships between latent variables and their observed indicators. Composite Reliability (CR) values for all factors exceeded 0.8, confirming high internal consistency and reliability for each factor [34].

For Discriminant Validity, we evaluated the square root of the Average Variance Extracted (AVE) for each factor. Results indicated that the AVE values were greater than 0.5, reflecting strong convergent validity and confirming that the latent variables are well-represented by their observed indicators [35]. These CFA results validate the credibility and reliability of the factors within the research model, supporting their appropriateness for subsequent structural analyses.

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The estimated results of relationships among factors are shown in Figure 3.

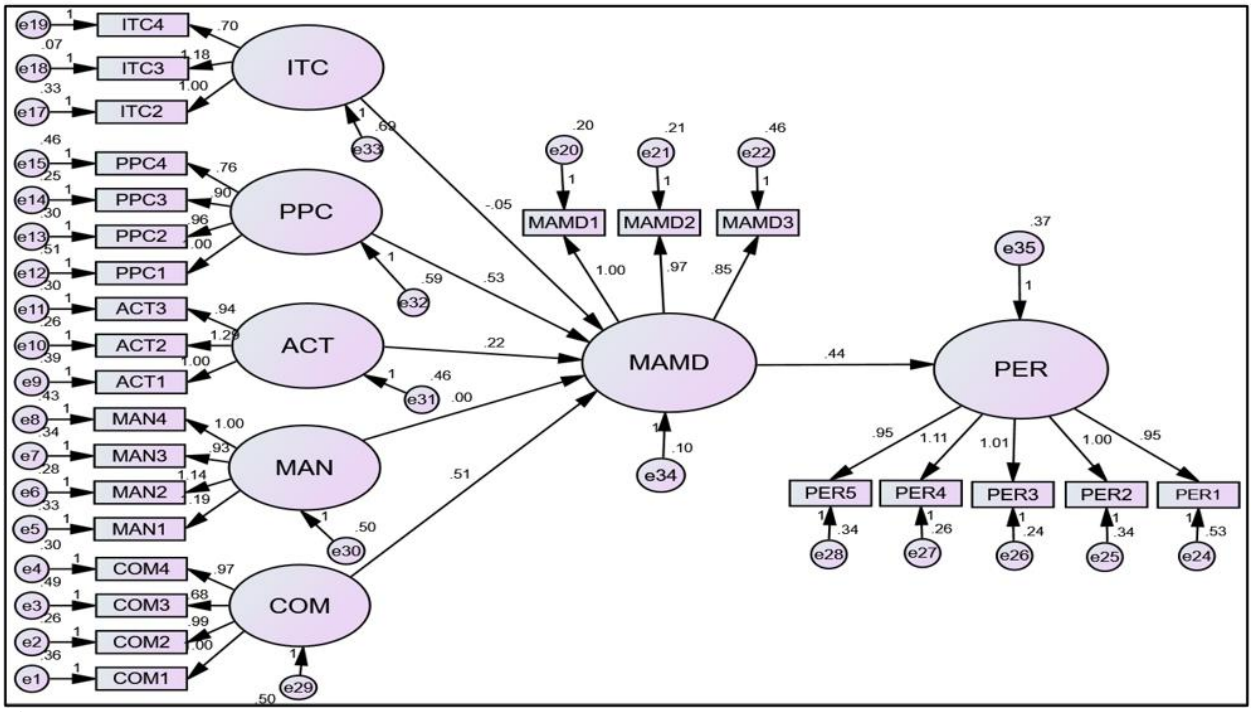

Figure 3.
Standardized structural equation modeling analysis.

Next, we analyze the impact of the independent variables on the dependent ones:

The analysis of factors influencing the application of management accounting for decision-making (MAMD) in Vietnamese mechanical manufacturing enterprises (VMMEs) revealed that Manufacturing Technologies (PPC) is the most impactful factor, with a Beta coefficient of 0.527. This finding aligns well with the distinct characteristics of the mechanical manufacturing sector, where high levels of technological precision are crucial. In this industry, product quality is influenced by various factors, including production conditions and input quality, necessitating effective data collection, processing, and analysis for technological control. This level of management enables firms to make informed decisions for optimal outcomes.

Market Competition (COM) emerges as the second most significant factor driving the adoption of MAMD in VMMEs. This finding is consistent with prior studies on Vietnamese enterprises [17, 23, 32]. Holding other variables constant, a 1-unit increase in market competition promotes a 0.501-unit increase in MAMD application among VMMEs. This result can be attributed to the heightened competition that Vietnamese firms face, especially against joint ventures and foreign-invested companies from Japan, Korea, and other countries. VMMEs compete on various fronts, including input materials, pricing, market share, labor skills, production technology, distribution networks, and product diversification. Additionally, the rapid evolution of consumer preferences, shortening product life cycles, and advancements in production technology have pushed firms to enhance management accounting practices to navigate these complex, competitive landscapes.

Accountants' Competence (ACT) also significantly affects MAMD in VMMEs, with a Beta coefficient of 0.217. With all other factors constant, a 1-unit improvement in accountants' competence results in a 0.217-unit increase in MAMD application. This finding underscores the role of skilled accountants in effectively gathering, analyzing, and communicating management information that is vital for decision-making processes.

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Interestingly, the factors Managers' Participation (MAN) and Application of Information Technology (ITC) did not show significant effects on MAMD, with p-values exceeding 0.05, which fails to support Hypotheses 2 and 5. This outcome diverges from previous findings in other industries and can be attributed to specific characteristics of VMMEs. Managers in these enterprises often advance from technical positions and typically lack formal management training. Although highly experienced in production, they may be less proficient in resource management, which presents a barrier to implementing advanced management tools, including MAMD.

Regarding information technology, IT application in VMMEs is generally limited to financial accounting functions and does not extensively support management accounting. Preparing MAMD reports on standard accounting software is challenging, and specialized software like ERP systems is rarely adopted in this sector. Limited access to ERP and Big Data technologies means that VMMEs often rely on manual data analysis using Microsoft Excel, restricting the scope and depth of their management accounting reports. Additionally, constant changes in hardware and software further complicate IT integration, as these enterprises often underprioritize upgrading their systems.

Finally, the study found that the application of MAMD positively impacts Firm Performance (PER), with a Beta coefficient of 0.444 and a p-value below 0.05. The positive Beta indicates that as MAMD adoption increases by 1 unit, firm performance improves by 0.444 units, underscoring the beneficial role of management accounting in enhancing operational outcomes within VMMEs. This relationship demonstrates that effective MAMD practices contribute significantly to achieving competitive advantages and improving the overall performance of firms in the mechanical manufacturing sector.

5. Conclusions

Based on our multi-structural analysis, we identified three critical factors "manufacturing technologies," "market competition," and "accountants' competence" as having a significant and positive impact on the application of management accounting for decision-making (MAMD) in Vietnamese mechanical manufacturing enterprises (VMMEs). Furthermore, MAMD application within these enterprises is shown to significantly enhance firm performance from both financial and non-financial perspectives. This suggests that VMMEs seeking to leverage MAMD should prioritize investment in advanced manufacturing technology, adopt strategies to bolster market competitiveness, and focus on cultivating high competency among accountants.

To implement MAMD effectively, VMMEs need to integrate advancements from the Fourth Industrial Revolution into their manufacturing technology. By embracing scientific and technological innovations, these enterprises can optimize resource utilization, elevate product quality, and boost labor productivity, which collectively strengthens their competitiveness and firm performance. Additionally, enhancing enterprise competitiveness should be paired with efforts to improve the competence of accountants. Skilled accountants contribute valuable, data-driven insights, empowering managers to make informed decisions. Improving accountants' qualifications also shifts managerial perception, reinforcing the importance of their role. Managers are encouraged to engage in ongoing professional development to stay abreast of modern accounting practices and decision-support techniques, which benefits both individual staff and the organization as a whole.

From a broader policy perspective, supportive policies are essential to maximize the benefits of management accounting and to incentivize enterprises to adopt MAMD. In this regard, professional associations, universities, and training centers play a pivotal role. These institutions should actively promote, disseminate, and guide best practices in management accounting to ensure that enterprises are well-equipped with the tools and knowledge required for effective decision-making. This ecosystem of support will be crucial in embedding MAMD as a competitive advantage for VMMEs.

However, this study has some limitations. First, while the data sample represents more than 50% of VAMI enterprises, it may not capture the full diversity of firms within the Vietnamese mechanical manufacturing sector. Second, this study did not account for potential control variables such as firm age, size, and other organizational characteristics that might influence MAMD application. Future research

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could extend the sample size to encompass a broader range of mechanical enterprises and evaluate the impact of these additional variables within the research model, providing a more comprehensive understanding of MAMD's role in firm performance across different organizational contexts.

Transparency:

The authors confirm that the manuscript is an honest, accurate and transparent account of the study that no vital features of the study have been omitted and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.

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Annex

Table 2.
Result of Confirmatory Factor Analysis (CFA).

Factor	Number of observation variables	Composite Reliability	Average Variance Extracted	Minimum normalized regression weight
Competition (COM)	4	0.831	0.509	0.612
Managers participation (MAN)	4	0.866	0.618	0.733
Accountants' competence (ACT)	3	0.830	0.621	0.736
Manufacturing technologies (PPC)	4	0.839	0.568	0.650
Application of information technology (ITC)	3	0.813	0.622	0.514
Management accounting for decision-making (MAMD)	3	0.800	0,575	0,629
Firm performance (PER)	5	0.872	0,580	0,666

Table 3.
Regression analysis and hypothesis results.

Hypothesis			Estimate	S.E.	C.R.	P	Co
MAMD	<---	COM	0.501	0.061	8.336	***	Accept
MAMD	<---	MAN	0.004	0.048	0.086	0.931	Reject
MAMD	<---	ACT	0.217	0.054	4.033	***	Accept
MAMD	<---	PPC	0.527	0.060	8.813	***	Accept
MAMD	<---	ITC	-0.051	0.040	-1.272	0.203	Reject
PER	<---	MAMD	0.444	0.080	5.567	***	Accept

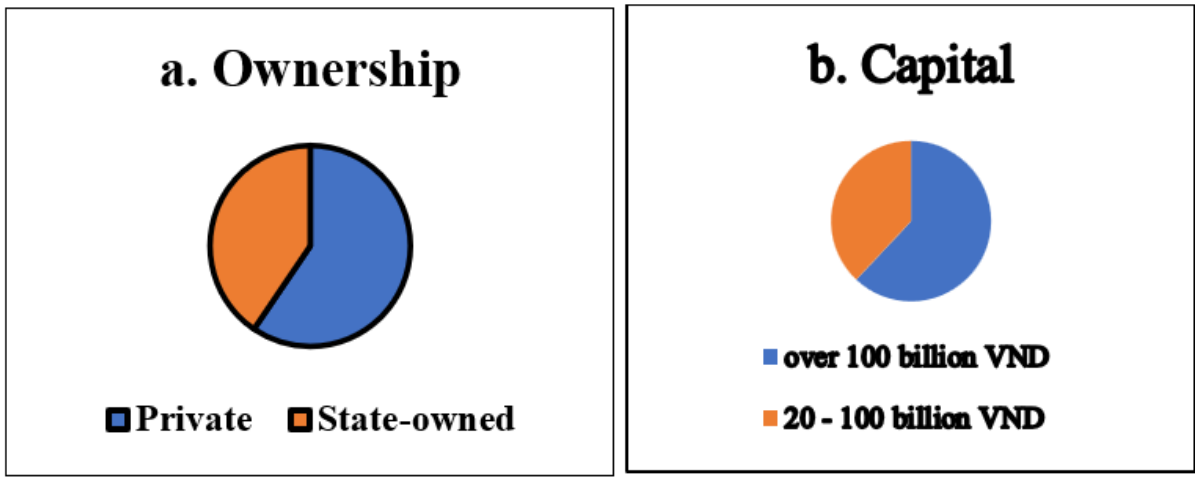

Figure 2.
Classification enterprises.

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