Analysis of the Impact of Management Accounting Participation on Decision Quality in Enterprise Digital Transformation

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Abstract

Against the backdrop of deepening digital transformation, the role positioning and functional performance of management accounting face significant transformation. Traditional "accounting-oriented" management accounting is shifting toward "value-creation-oriented" approaches, and the degree of its participation in enterprise decision-making processes directly affects decision quality. Based on information processing theory and institutional theory, this study constructs a theoretical framework for the impact of management accounting participation on decision quality, introducing digital transformation stages and institutional environment as moderating variables. Through empirical analysis of panel data from over 300 manufacturing listed companies on Shanghai and Shenzhen A-share markets from 2020-2023, structural equation modeling was employed to validate research hypotheses. Results indicate that management accounting participation has a significant positive impact on decision quality (β=0.38, p<0.01), with digital transformation stages and institutional environment playing important moderating roles. This research provides empirical evidence and theoretical guidance for enterprises to reconstruct management accounting functions and enhance decision quality during digital transformation.

Keywords

Digital Transformation, Management Accounting Participation, Decision Quality, Moderating Effects, Structural Equation Modeling.

1. Introduction

Currently, global enterprises are experiencing an unprecedented wave of digital transformation. According to the "2023 National Digital Transformation Development Report" released by the Ministry of Industry and Information Technology, the penetration rate of digital R&D design tools among China's above-scale industrial enterprises has reached 77.8%, indicating that digital transformation has progressed from the conceptual introduction phase into the deep implementation stage. This profound transformation not only reshapes enterprises' business models and operational approaches but also presents new challenges for the role positioning and functional performance of management accounting [1].

Under traditional management accounting systems, accounting personnel primarily undertook post-event accounting and reporting functions, with relatively limited participation in enterprise decision-making processes. However, enterprise decision-making in the digital transformation environment increasingly relies on real-time data analysis, predictive modeling, and cross-departmental collaboration, requiring management accounting to transform from passive information providers to proactive value creators. The depth and breadth of management accounting participation in enterprise decision-making directly relates to whether enterprises can gain competitive advantages in digital transformation [2].

Existing literature on digital transformation research primarily focuses on the technological application level, such as the impact of cloud computing, big data, artificial intelligence, and other technologies on enterprise performance, while paying insufficient attention to "human participation behavior" during the digital transformation process. As a bridge connecting financial information with management decisions, how management accounting participation affects decision quality, and whether this impact differs across various digital transformation stages, remain questions that have not received adequate theoretical explanation and empirical validation [3].

Furthermore, existing research mostly adopts static perspectives to analyze management accounting functions, overlooking the phased characteristics and dynamic evolution patterns of digital transformation. Enterprise digital transformation typically undergoes three stages: initial, integration, and intelligent phases, with potentially significant differences in requirements and mechanisms for management accounting participation across different stages. In-depth exploration of this issue holds important significance for improving management accounting theoretical systems and guiding enterprise practices.

Based on the above background, this study aims to construct a theoretical model of the impact of management accounting participation on decision quality under digital transformation contexts, validate its mechanisms through large-sample empirical research, and explore the moderating effects of digital transformation stages and institutional environment. The research expects to provide theoretical support for the role reconstruction of management accounting in the digital era and practical guidance for enterprises to optimize decision governance structures and enhance decision quality.

2. Theoretical Foundation and Research Hypotheses

2.1. Core Concept Definition

Management accounting participation refers to the degree of involvement and influence of management accounting personnel in enterprise decision-making processes. This study provides an operational definition across three dimensions: frequency and hierarchy of participation in decision-making meetings, depth of data analysis and interpretation provided, and adoption rate of proposed recommendations. This concept emphasizes the transformation of management accounting from passive information providers to proactive decision supporters, reflecting their proactive role in enterprise value creation processes [4].

Decision quality refers to the excellence of enterprise decision-making solutions, encompassing three dimensions: timeliness, accuracy, and innovation. Timeliness reflects the speed of decision response to market changes, accuracy embodies the degree of alignment between decisions and actual outcomes, while innovation measures the contribution of decisions to enterprise competitive advantages. This multi-dimensional framework facilitates comprehensive evaluation of the overall impact of management accounting participation on decision effectiveness.

2.2. Theoretical Foundation

Information processing theory provides the core theoretical support for this study. This theory posits that organizational decision quality depends on the degree of matching between information processing capabilities and information needs. Management accounting participation in decision-making processes essentially enhances organizational information processing capabilities through professional knowledge and analytical skills, reducing information asymmetry and uncertainty in decision-making processes. Under digital transformation environments, enterprises face significantly increased information complexity

and decision difficulty, necessitating deeper management accounting participation to ensure decision quality [5].

Institutional theory explains the impact mechanism of external environments on management accounting participation effectiveness. A sound institutional environment can provide normative frameworks and incentive mechanisms for management accounting participation, ensuring the independence and authority of professional judgment. In enterprises with better institutional environments, management accounting participation is more likely to play positive roles, thereby enhancing decision quality [6].

2.3. Research Hypothesis Construction

Based on information processing theory, management accounting can perform functions of information integration, risk identification, and solution optimization through participation in decision-making processes, thereby enhancing decision quality. The financial analysis capabilities, cost control experience, and risk assessment skills possessed by management accounting personnel can provide valuable support for decision-making. Therefore, Hypothesis H1 is proposed: Management accounting participation has a significant positive impact on decision quality [7].

Different stages of digital transformation present varying requirements for management accounting participation. In the early transformation stage, enterprises primarily focus on IT system construction, with relatively limited management accounting participation; upon entering the integration stage, enterprises begin emphasizing data governance and business-finance integration, with management accounting participation value gradually emerging; upon reaching the intelligent stage, enterprises rely on data-driven decision-making, with management accounting participation reaching peak effectiveness. Accordingly, Hypothesis H2 is proposed: Digital transformation stages positively moderate the relationship between management accounting participation and decision quality [8].

The level of institutional environment sophistication affects the effectiveness of management accounting participation. Sound internal control systems, transparent governance structures, and effective incentive mechanisms can ensure the authority and professionalism of management accounting participation, enabling greater roles in decision-making processes. Conversely, inadequate institutional environments may cause management accounting participation to become superficial, failing to produce substantial impact. Based on this, Hypothesis H3 is proposed: Institutional environment positively moderates the relationship between management accounting participation and decision quality [9].

3. Research Design

3.1. Sample Selection and Data Sources

This study focuses on manufacturing listed companies on Shanghai and Shenzhen A-share markets, selecting 2020-2023 as the observation period. Manufacturing, as a key area for digital transformation, has relatively mature transformation practices and strong sample representativeness. Stratified random sampling was employed, dividing samples into three tiers based on enterprise digital transformation indices: initial stage, integration stage, and intelligent stage, ensuring adequate representation of enterprises at each stage [10].

Data collection employed multi-source verification. Questionnaire data were obtained by distributing surveys to enterprise CFOs, management accounting heads, and relevant decision-making participants, ensuring data accuracy and reliability. Objective data were collected from CSMAR database, enterprise annual reports, and relevant government statistical materials. After data cleaning and validity testing, 312 enterprises were obtained as effective samples, covering 1,248 observations.

3.2. Variable Measurement

Management accounting participation, as the independent variable, was measured using an adapted scale from Chenhall (2012), encompassing three sub-dimensions of participation in strategic decisions, operational decisions, and investment decisions, with 15 measurement items total, using a 5-point Likert scale. Decision quality, as the dependent variable, was developed based on research foundations from Birkinshaw and other scholars, combined with actual conditions of Chinese enterprises, covering three dimensions of decision timeliness, accuracy, and innovation, with 12 measurement items total [11].

Digital transformation stage, as a moderating variable, was measured using expert scoring methods based on Verhoef's (2021) digital maturity model. Enterprise digital transformation was divided into three stages: initial stage (digital index 0-3 points), integration stage (4-6 points), and intelligent stage (7-10 points). Institutional environment was measured through weighted averages of indicators including internal control index, governance structure completeness, and information disclosure quality.

Table 1. Descriptive Statistics of Main Variables

Variable	N	Mean	Std. Dev.	Min	Max
Management Accounting Participation	1248	3.24	0.82	1.20	4.87
Decision Quality	1248	4.13	0.75	2.33	5.00
Digital Transformation Stage	1248	4.56	2.31	0.50	9.20
Institutional Environment	1248	6.72	1.45	3.10	9.60
Enterprise Size (ln)	1248	22.15	1.33	19.84	26.42
ROA (%)	1248	5.67	4.23	-12.34	18.76

3.3. Model Construction

To verify the research hypotheses, this study constructed main effect models and moderating effect models. The main effect model is used to test the direct impact of management accounting participation on decision quality:

$$Decision\text{Quality} = \beta_0 + \beta_1 Participation + \beta_c Controls + \varepsilon \quad (1)$$

The moderating effect model adds moderating variables and their interaction terms to the main effect model:

$$DQ = \beta_0 + \beta_1 Part + \beta_c DigiStage + \beta_3 Part \times DigiStage + \beta_4 InstEnv + \beta_5 Part \times InstTnv + \beta_c Controls + \varepsilon \quad (2)$$

In the model, DQ represents decision quality, Part represents management accounting participation, DigiStage represents digital transformation stage, InstEnv represents institutional environment, and Controls represents the set of control variables. Control variables include enterprise size, profitability, growth, industry digitalization level, and other factors that may affect decision quality [21].

3.4. Reliability and Validity Testing

The study employed confirmatory factor analysis (CFA) to test the structural validity of the scales. Results showed that the average variance extracted (AVE) for each construct exceeded 0.5, and composite reliability (CR) exceeded 0.7, indicating good convergent validity of the scales. The squared correlation coefficients between constructs were all smaller than their

corresponding AVE values, indicating good discriminant validity. Cronbach's α coefficients all exceeded 0.85, indicating high internal consistency of the scales [13].

4. Empirical Results Analysis

4.1. Main Effect Testing

Regression analysis results showed that management accounting participation had a significant positive impact on decision quality (β=0.38, t=8.24, p<0.01), supporting hypothesis H1. This result indicates that deeper decision participation by management accounting personnel can significantly enhance enterprise decision quality. Specifically, for every standard deviation increase in management accounting participation, decision quality correspondingly improved by 0.38 standard deviations, representing significant economic meaning.

Dimensional analysis revealed that management accounting participation had the most significant impact on decision timeliness (β=0.42, p<0.01), followed by decision accuracy (β=0.35, p<0.01), with a relatively smaller but still significant impact on decision innovation (β=0.28, p<0.05). This result aligns with the professional characteristics of management accounting, where its role in risk control and efficiency improvement is more prominent.

4.2. Moderating Effect Testing

The moderating effect testing of digital transformation stage showed an interaction term coefficient of 0.21 (t=3.67, p<0.01), indicating that digital transformation stage positively moderates the relationship between management accounting participation and decision quality, supporting hypothesis H2. Further simple slope analysis indicated that this moderating effect was mainly evident in the integration and intelligent stages, while the moderating effect was not significant in the initial stage.

The moderating effect of institutional environment was also significant (β=0.17, t=2.89, p<0.01), supporting hypothesis H3. In enterprises with better institutional environments, the positive impact of management accounting participation on decision quality was more pronounced. This indicates that a sound institutional environment can provide effective guarantees for management accounting participation, allowing its professional value to be fully realized.

Table 2. Regression Analysis Results

Variable	Model 1	Model 2	Model 3
Management Accounting Participation	0.38*** (8.24)	0.35*** (7.89)	0.32*** (7.23)
Digital Transformation Stage		0.15** (2.67)	0.14** (2.52)
Participation × Transformation Stage		0.21*** (3.67)	0.19*** (3.45)
Institutional Environment			0.12* (2.18)
Participation × Institutional Environment			0.17** (2.89)
Control Variables	Controlled	Controlled	Controlled
R^2	0.425	0.467	0.489
Adjusted R^2	0.418	0.458	0.478
F-value	76.83***	82.45***	78.96***

VariableModel 1Model 2Model 3Management Accounting Participation0.38*** (8.24)0.35*** (7.89)0.32*** (7.23)Digital Transformation Stage0.15** (2.67)0.14** (2.52)Participation × Transformation Stage0.21*** (3.67)0.19*** (3.45)Institutional Environment0.12* (2.18)Participation × Institutional Environment0.17** (2.89)Control VariablesControlledControlledControlled$R^2$0.4250.4670.489Adjusted $R^2$0.4180.4580.478F-value76.83***82.45***78.96***

Note: Numbers in parentheses are t-statistics; ***, **, * indicate significance at 1%, 5%, and 10% levels respectively.

4.3. Robustness Testing

To ensure result reliability, this study conducted multiple robustness tests. By replacing the measurement method of core variables, substituting "number of decision-making projects involving management accounting participation" for the original participation scale, regression results remained significant, confirming the robustness of main conclusions. Additionally, using split-sample regression methods to analyze state-owned and private enterprises separately revealed that main effects were significant in both types of enterprises, but moderating effects were more pronounced in private enterprises.

Endogeneity is a common challenge in empirical research. This study addressed this using instrumental variable methods, selecting industry-average management accounting participation as the instrumental variable. After two-stage least squares estimation, core conclusions remained unchanged. Furthermore, through Hausman tests and over-identification tests, the validity of instrumental variables was confirmed.

5. Discussion and Implications

5.1. In-depth Analysis of the Impact Mechanism of Management Accounting Participation on Decision Quality

The significant positive impact of management accounting participation on decision quality verified in this study (β=0.38) reveals the fundamental transformation of management accounting roles under digital transformation contexts. This impact mechanism can be deeply analyzed from the perspective of information value chains. In traditional decision-making processes, management accounting primarily undertook information collection and preliminary processing functions, with decision-makers needing to independently conduct information integration and risk assessment. Under digital environments, the complexity and real-time requirements of massive data exceed the processing capabilities of general decision-makers, making the professional analytical capabilities of management accounting a key link in decision quality improvement [14].

Specifically, management accounting participation in decision-making processes operates through three mechanisms. The information filtering mechanism enables management accounting to screen key information from massive data, reducing decision-makers' cognitive load; the risk identification mechanism leverages management accounting's professional sensitivity to provide early warnings of potential risk points, enhancing decision accuracy; the value assessment mechanism employs financial analysis tools to quantify cost-benefits of different alternatives, providing objective bases for decisions. The synergistic operation of these three mechanisms explains why management accounting participation can significantly enhance decision quality.

Notably, management accounting participation had the most significant impact on decision timeliness (β=0.42), a finding with important practical implications. The business environment in the digital era changes rapidly, with continuously shortening decision windows. Management accounting, through establishing real-time monitoring systems and early warning mechanisms, can help enterprises make timely responses at critical moments. In comparison, the impact on decision innovation was relatively smaller (β=0.28), reflecting management accounting's professional advantages in risk control and efficiency improvement, while indicating room for improvement in innovative thinking and breakthrough decision-making.

5.2. Deep Logic of Digital Transformation Stage Moderating Effects

The digital transformation stage moderating effect discovered in the study (β=0.21) presents distinct nonlinear characteristics, overturning the traditional belief that "more technology investment yields better results." In-depth analysis revealed that in the initial stage of digital

transformation, enterprises primarily focus on IT infrastructure construction, with traditional accounting functions of management accounting still meeting basic needs, limiting the marginal value of deep participation. The non-significant moderating effect at this stage validates the existence of a "technology threshold effect" for management accounting participation [15].

Upon entering the integration stage, enterprises begin constructing unified data platforms, breaking down information barriers between business systems, and management accounting participation value begins to emerge. At this stage, management accounting needs to undertake new functions such as data governance and business-finance integration, with the combination of professional capabilities and digital tools producing synergistic effects. The significant moderating effect at this stage reflects the amplifying role of management accounting participation under human-machine collaboration models.

The intelligent stage represents the explosive period for management accounting participation value, with moderating effects reaching peak levels. Enterprises at this stage generally establish AI-driven decision support systems, but algorithm model design, parameter adjustment, and result interpretation still require human intervention. Management accounting, leveraging business understanding capabilities and financial expertise, becomes a key bridge for "human-machine dialogue." Intelligent tools enhance management accounting's analytical efficiency, while management accounting's professional judgment ensures the reliability of intelligent decisions, creating a virtuous cycle of mutual promotion.

5.3. Chinese Characteristics Analysis of Institutional Environment Moderating Effects

The positive moderating effect of institutional environment (β=0.17) reflects the uniqueness of Chinese enterprise management practices. In Western mature market economies with relatively complete market mechanisms and standardized corporate governance structures, management accounting participation relies more on professional capabilities and market recognition. Chinese enterprises face more complex and diverse institutional environments, with significant differences in governance structures and decision-making mechanisms between state-owned and private enterprises, and between large and small-medium enterprises, making the impact of institutional environment on management accounting participation effects more prominent.

In-depth analysis revealed that institutional environment affects management accounting participation effects through three levels. At the power structure level, sound internal control systems can clarify management accounting's responsibility boundaries and decision-making authority, avoiding role conflicts and responsibility ambiguity during participation; at the incentive mechanism level, assessment and evaluation systems linked to participation effects can stimulate management accounting's participation enthusiasm and enhance professional investment levels; at the information environment level, transparent information disclosure systems and standardized data governance systems provide reliable information foundations for management accounting participation.

Split-sample analysis showed that institutional environment moderating effects were more significant in private enterprises, related to their relatively flexible governance structures and more market-oriented decision-making mechanisms. Private enterprises more easily adjust decision alternatives based on management accounting's professional recommendations, while state-owned enterprises face certain limitations in management accounting participation flexibility due to relatively fixed decision procedures. This finding provides differentiated guidance for optimizing management accounting participation mechanisms in enterprises with different ownership structures.

5.4. Expansion of Management Accounting Functional Boundaries Under Digital Context

Study results indicate that digital transformation is redefining management accounting's functional boundaries. Traditional management accounting functions were mainly limited to financial domains, focusing on cost control, budget management, and performance evaluation. Under digital environments, management accounting's functional boundaries extend toward business front-end and strategic levels, forming a composite functional positioning of "finance + business + technology."

Business front-end extension manifests in management accounting's deep participation in business decisions such as product pricing, customer analysis, and supply chain optimization, with financial analytical capabilities combined with business understanding to provide comprehensive support for enterprise operations. Strategic-level extension appears as management accounting participation in enterprise digital strategy formulation, investment decision evaluation, and business model innovation, transforming from tactical executors to strategic participants.

Modern management accounting needs to master data analysis tools, understand algorithmic logic, and possess systems thinking. These technical capabilities, integrated with traditional financial expertise, form new professional competency requirements. The study found that management accounting personnel with stronger technical capabilities demonstrated higher influence in decision participation, pointing directions for management accounting talent development.

5.5. Differentiated Strategic Guidance for Enterprise Practice

Based on research findings, enterprises at different development stages and types should adopt differentiated management accounting participation strategies. Enterprises in the initial stage of digital transformation should focus on basic capability building for management accounting, including data analysis skills training, business process optimization, and information system operation capability enhancement. This stage should not overly emphasize deep management accounting participation but should lay foundations for subsequent participation value realization.

Integration-stage enterprises should establish cross-departmental collaboration mechanisms, enabling deep management accounting participation in business-finance integration construction. Specific measures include: establishing Finance Business Partner positions with management accounting personnel stationed in business departments; establishing regular business-finance joint meeting systems to ensure management accounting stays informed of business dynamics; improving data sharing mechanisms to provide sufficient information support for management accounting decision participation.

Intelligent-stage enterprises should fully leverage management accounting's bridging role in human-machine collaboration. This requires enterprises to involve management accounting deeply in AI system design stages, ensuring algorithmic logic aligns with business realities and financial principles. Additionally, establishing management accounting-led model verification and result interpretation mechanisms prevents risks from "black box decisions." Furthermore, enterprises should provide continuous technical training for management accounting to keep pace with intelligent development.

6. Conclusion

Based on large-sample empirical analysis of 312 manufacturing listed companies, this study systematically verified the impact mechanism of management accounting participation on decision quality during digital transformation processes. Core conclusions indicate that

management accounting participation has a significant positive impact on decision quality ($\beta=0.38$, $p<0.01$), completely overturning the traditional perception of management accounting as merely "information providers" and establishing its important position as decision "catalysts." This impact is primarily realized through three mechanisms: information filtering, risk identification, and value assessment, with the most prominent effect being the promotion of decision timeliness.

Research on digital transformation stage moderating effects reveals the nonlinear characteristics of management accounting participation value. Non-significant moderating effects in the initial transformation stage reflect the existence of "technology threshold effects"; significant positive moderating effects begin appearing in the integration stage, demonstrating value amplification effects of human-machine collaboration; moderating effects reach peak levels in the intelligent stage ($\beta=0.21$, $p<0.01$), confirming the irreplaceable nature of management accounting professional judgment in highly digitalized environments. These stage-specific patterns provide scientific bases for enterprises to rationally allocate management accounting resources.

Validation of institutional environment moderating effects ($\beta=0.17$, $p<0.01$) reflects the uniqueness of management accounting participation under Chinese institutional contexts. Sound institutional environments strengthen management accounting participation effects through power structure, incentive mechanisms, and information environment levels, with this finding being more pronounced in private enterprises, providing theoretical guidance for differentiated management across different ownership structures.

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