

Research on the Development of Higher Vocational Competencies in Managerial Accounting in the Context of Financial Digitization

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Abstract: With the advent of the financial digitization era, the cultivation of higher vocational competencies in managerial accounting among higher vocational college students has become an urgent task. This study aims to establish an assessment framework for higher vocational competencies in managerial accounting tailored to higher vocational college students in the context of financial digitization. The fuzzy analytic hierarchy process is employed to determine the weights of various indicators. Through a case study conducted at a higher vocational college in Jiangsu province, it is concluded that the students at this institution possess a commendable level of higher vocational competencies in managerial accounting. Finally, this paper presents a comprehensive strategy for enhancing the higher vocational competencies of higher vocational college students in managerial accounting from four distinct perspectives.

Keywords: financial digitization, higher vocational competencies, managerial accounting, higher vocational college students

1. Introduction

The era of the digital economy has arrived, and the repetitive and labor-intensive accounting tasks are poised to be replaced by robots. The focus of accounting work will shift towards strategic support, value creation, and other managerial responsibilities. With the advent of the financial digitization phase, financial efficiency will improve, and the demand for accounting professional competencies from society will also rise in parallel. In the future, accountants will be required not only to possess a strong understanding of financial accounting but also to cultivate an integrated business and finance mindset, accumulating managerial accounting capabilities across various areas such as predictive planning, performance management, and risk control.

In order to align with economic development, the Ministry of Finance has introduced multiple policy guidelines to deepen accounting reforms. The issuance of the "Guiding Opinions on Comprehensive Promotion of Management Accounting System Construction" in 2014 marked the systematic beginning of official management accounting system construction in our country [1]. In 2016, the Ministry of Finance issued the "Basic Guidelines for Management Accounting," which clarified principles, environment, methods, and more related to management accounting [2]. In 2017,

"Management Accounting Application Guideline No. 100 - Strategic Management" summarized some commonly used management accounting tools in business and how they can be applied in practice. It is evident that accounting work is inevitably undergoing transformation and upgrading. As a crucial component of training managerial accounting talents, higher vocational colleges bear the responsibility of nurturing accounting professionals in their transition and development. Therefore, within the context of financial digitization, researching the aspects to focus on and how to foster higher vocational college students' competencies in managerial accounting holds great urgency in this era.

This paper employs the fuzzy analytic hierarchy process to analyze various indicators of higher vocational college students' competencies in managerial accounting in the context of financial digitization. It identifies key indicators of managerial accounting competencies and provides targeted recommendations accordingly.

2. Construction of the Higher Vocational College Student Managerial Accounting Competency Assessment Framework

Drawing upon literature, the Chinese managerial accounting competency framework, and the characteristics of higher vocational college students, this paper has constructed a comprehensive higher vocational college student managerial accounting competency assessment framework encompassing four major competencies, namely, Professional Competency, Technical Competency, Innovation Competency, and Leadership Competency, as presented in Table 1.

Table 1: Indicators of higher vocational college student managerial accounting competencies.

Managerial Accounting Competency	Specific Competencies	Relevant Explanations
Professional Competency	Financial Accounting Competency	Capable of independently handling tasks associated with a financial accounting position, as demonstrated by successful completion of the junior accountant certification examination.
	Management and Planning Competency	Proficiency in utilizing strategic management tools, budget preparation, cost analysis, operational and performance management analysis, investment and financing decision-making, understanding of risk management, and preparation of managerial accounting reports [3].
Technical Competency	Computer and Systems Software Application Competency	Proficient in computer and systems software, adept at utilizing big data analysis tools and methods for data analysis [4].
	Financial Digitization Application Competency	Proficient in conducting intelligent financial processing and data analysis on financial digitization platforms.

Table 1: (continued).

	Big Data Mining, Screening, and Analysis Competency	Proficiency in data mining, screening, visualization, and analysis [5].
Innovation Competency	Creative Thinking Competency	Proficient in presenting creative perspectives from multiple angles and solving novel problems through innovative thinking.
	Innovative Methods and Tools in Managerial Accounting Competency	Proficient in exploring and enhancing innovative methods and tools for managerial accounting in practical applications.
Leadership Competency	Communication and Coordination Competency	Proficient in effective communication and coordination, capable of articulating ideas clearly and accurately conveying information.
	Team Building Competency	Proficient in fostering trust among team members, enhancing overall team efficiency, and driving collective value creation.
	Decision-Making Competency	Proficient in leading team members in decision-making processes and confronting potential risks associated with decisions.
	Organizational Competency	Proficient in organizing activities and leading teams to collaborate and strive collectively.

3. Evaluation Method and Model Construction for Higher Vocational College Student Managerial Accounting Competencies

3.1. Model Construction

This paper employs the fuzzy analytic hierarchy process (FAHP) to construct a model for research. Following the principle of maximum membership degree, a fuzzy judgment matrix is constructed to comprehensively assess indicator elements. All indicator factors affecting higher vocational college student managerial accounting competencies are categorized according to the specified requirements into the goal layer, criterion layer, and indicator layer for overall indicators, primary indicators, and

secondary indicators. This forms a multi-level and multi-dimensional managerial accounting competency evaluation framework. The higher vocational college student managerial accounting competency evaluation model is reasonably structured, as depicted in Table 2.

Table 2: Managerial accounting competency evaluation index system and weighting results.

Goal Layer	Criterion Layer	Weight	Indicator Layer	Weight	Total Weight
Managerial Accounting Competency M	Professional Competency A	0.47	Financial Accounting Competency A ₁	0.33	0.1551
			Management and Planning Competency A ₂	0.67	0.3149
	Technical Competency B	0.16	Computer and Systems Software Application Competency B ₁	0.16	0.0256
			Financial Digitization Application Competency B ₂	0.54	0.0864
			Big Data Mining, Screening, and Analysis Competency B ₃	0.30	0.0480
	Innovation Competency C	0.10	Creative Thinking Competency C ₁	0.75	0.0750
			Innovative Methods in Managerial Accounting Competency C ₂	0.25	0.0250
	Leadership Competency D	0.27	Communication and Coordination Competency D ₁	0.44	0.1188
			Team Building Competency D ₂	0.28	0.0756
			Decision-Making Competency D ₃	0.10	0.0270
			Organizational Competency D ₄	0.18	0.0486

3.2. Determination of Evaluation Index System Weights

After establishing the model, this paper employs the Saaty scale method, consulting industry experts' opinions to assess the importance of all indicators, and constructs several comparison judgment matrices to subsequently determine the impact levels of criteria-layer indicators on goal-layer indicators and indicator-layer indicators on criteria-layer indicators. Finally, the total weights for elements within the indicator layer are computed.

3.2.1. Calculation of Primary Indicator Weights

Experts invited for this study include higher vocational college accounting professors, senior management personnel from enterprises, and corporate financial directors with profound insights into managerial accounting. Their ratings hold a certain level of authority. The resulting judgment matrix M is depicted in Table 3.

Table 3: Managerial accounting competency judgment matrix M.

M	A	B	C	D
A	1	3	4	2
B		1	2	1/2
C			1	1/3
D				1

The comparison judgment matrix M is then normalized, resulting in:

$$\bar{M} = \begin{bmatrix} 0.48 & 0.46 & 0.40 & 0.52 \\ 0.16 & 0.15 & 0.20 & 0.13 \\ 0.12 & 0.08 & 0.10 & 0.09 \\ 0.24 & 0.31 & 0.30 & 0.26 \end{bmatrix}$$

Where $MW = \lambda W$, where λ is the eigenvalue of M and W is the corresponding eigenvector associated with λ . Through computation, the eigenvector of M is obtained as $W = [0.47 \ 0.16 \ 0.10 \ 0.27]^T$, then $MW = [1.89 \ 0.65 \ 0.39 \ 1.12]^T$. Subsequently, the maximum eigenvalue of the M matrix is calculated to be $\lambda_{\max} = 4.0330$. To verify the consistency of the judgment matrix, consistency index $CI = (\lambda - n)/(n - 1)$ and consistency ratio $CR = CI / RI$ are introduced, with RI representing the average random consistency index standard value (as shown in Table 4). The calculated CI value is 0.011 (< 0.1), and the CR value is 0.0122 (< 0.1), satisfying the consistency requirement. Therefore, no further adjustments are needed for the judgment matrix.

3.2.2. Calculation of Secondary Indicator Weights

Consistent methods are used to calculate the weights of secondary indicators, i.e., the weights of indicator-layer elements corresponding to criterion-layer elements. Comparison judgment matrices A, B, C, and D are constructed through expert ratings, as shown in Tables 4-7.

Table 4: Professional competency judgment matrix A.

A	A ₁	A ₂
A ₁	1	1/2
A ₂	2	1

Table 5: Technical competency judgment matrix B.

B	B ₁	B ₂	B ₃
B ₁	1	1/3	1/2
B ₂	3	1	2
B ₃	2	1/2	1

Table 6: Innovation competency judgment matrix C.

C	C ₁	C ₂
C ₁	1	3
C ₂	1/3	1

Table 7: Leadership competency judgment matrix D.

D	D ₁	D ₂	D ₃	D ₄
D ₁	1	2	3	3
D ₂	1/2	1	3	2
D ₃	1/3	1/3	1	1/3
D ₄	1/3	1/2	3	1

After examination, all four comparison judgment matrices satisfy the consistency requirement. Following normalization, the results are obtained.

$$\begin{aligned} W_1 &= [0.33 \quad 0.67]^T & W_2 &= [0.16 \quad 0.54 \quad 0.30]^T \\ W_3 &= [0.75 \quad 0.25]^T & W_4 &= [0.44 \quad 0.28 \quad 0.10 \quad 0.18]^T \end{aligned}$$

3.2.3. Overall Ranking of the Hierarchy

The weights of each indicator within the indicator layer are multiplied by the corresponding criterion-layer indicator weights to derive total weights. This forms the higher vocational college student managerial accounting competency index system weighting results table, as shown in Table 2. Based on this table, it can be deduced that key factors influencing managerial accounting competencies include Management and Planning Competency A₂, Financial Accounting Competency A₁, Communication and Coordination Competency D₁, Financial Digitization Application Competency B₂, and Team Building Competency D₂.

4. Case Study Analysis of Higher Vocational College Student Managerial Accounting Competency Evaluation in the Context of Financial Digitization

A certain higher vocational college in Jiangsu is a provincially-run public institution known for its high-quality full-time higher vocational education. It ranks among the top in various aspects among national higher vocational colleges specializing in finance and economics. Given its representative status among higher vocational colleges in China, this paper selects it as a case study to conduct an analysis of the managerial accounting competency evaluation system.

4.1. Determination of Indicator Evaluation Set

This paper categorizes managerial accounting competencies into five levels represented by the grades "V5, V4, V3, V2, V1," corresponding to the proficiency levels of "Low (below 60), Fairly Low (60-70), Average (70-80), Fairly High (80-90), High (90-100)." Thus, the evaluation set $[V_1 \quad V_2 \quad V_3 \quad V_4 \quad V_5]$ is used to describe the levels of managerial accounting competency. Higher scores indicate higher levels of professional competency, while lower scores indicate lower levels of professional competency.

4.2. Establishment of Single Factor Evaluation Matrix

Based on the managerial accounting evaluation indicator system and the fuzzy comprehensive evaluation model, calculations are carried out using a case study from a certain higher vocational college in Jiangsu to assess the managerial accounting competencies of its students. A total of 10 individuals, including the Director of the Financial Office, Dean of the School of Accounting and Finance, Accounting Professors, CFOs of corporate partners, management personnel, and accounting professionals, were selected to rate the managerial accounting competencies of accounting students

in the college. The results of the single factor evaluation are compiled in Table 9.

Table 9: Evaluation results of managerial accounting competencies in a certain higher vocational college in Jiangsu.

Competency Indicator \ Evaluation Level	V ₁	V ₂	V ₃	V ₄	V ₅
A ₁	1	7	2	0	0
A ₂	0	4	3	3	0
B ₁	1	4	3	2	0
B ₂	2	4	2	2	0
B ₃	1	2	3	3	1
C ₁	1	5	2	2	0
C ₂	1	2	1	1	5
D ₁	6	3	1	0	0
D ₂	2	3	3	2	0
D ₃	1	2	5	2	0
D ₄	5	3	1	1	0

These values from the table are divided by 10 to create the evaluation set. This forms the single factor evaluation matrix. Synthesis factors are determined, and the weights Ware combined with the established single factor evaluation matrix Q for fuzzy synthesis evaluation. This process generates the evaluation vector to form the evaluation matrix:

$$Q = \begin{bmatrix} B_1 \\ B_2 \\ B_3 \\ B_4 \end{bmatrix} = \begin{bmatrix} 0.033 & 0.499 & 0.267 & 0.201 & 0 \\ 0.154 & 0.340 & 0.246 & 0.230 & 0.030 \\ 0.100 & 0.425 & 0.175 & 0.175 & 0.125 \\ 0.420 & 0.290 & 0.196 & 0.094 & 0 \end{bmatrix}$$

4.3. Determination of Final Evaluation Vector

Further comprehensive fuzzy evaluation is conducted on the aforementioned evaluation matrix to ascertain the level of managerial accounting competencies among students at the higher vocational college in Jiangsu:

$$B = W^T \times Q = [0.47 \quad 0.16 \quad 0.10 \quad 0.27] = [0.164 \quad 0.410 \quad 0.235 \quad 0.174 \quad 0.017]$$

4.4. Analysis and Conclusion

Based on the scores of various levels within the evaluation set, median values are taken and assigned scores of 95, 85, 75, 65, and 55, which form the score vector Z. After performing a singletonization on B, the total score for the level of managerial accounting competencies among students at this higher vocational college is calculated to be 80.30 points, corresponding to the V2 level, indicating a relatively high proficiency. Similarly, for the four primary indicators, the scores are as follows:

Leadership Competency at 85.36 points, indicating a fairly high proficiency; Professional Competency, Technical Competency, and Innovation Competency at 78.64, 78.58, and 77.00 points respectively, indicating an average proficiency. The overall level of managerial accounting competencies among students at this higher vocational college is 80.30 points, indicating a fairly high proficiency.

Based on the above evaluation results, the higher vocational college generally excels in cultivating students' managerial accounting competencies, reflecting a strong emphasis on this aspect of education. However, it is recommended to focus on enhancing competencies at the average proficiency level across various aspects. Attention should be given to the development of professional, technical, and innovation competencies.

5. Pathways for Developing Managerial Accounting Competencies in Higher Vocational College Students

The cultivation of managerial accounting competencies in higher vocational college students must align with the characteristics of higher vocational college students, adhere to the laws of higher vocational education, and meet the demands of the accounting market. To enhance the overall level of managerial accounting competencies [6], measures need to be taken in several areas to intensify the cultivation efforts [7].

5.1. Establishing Clear Management Accounting Talent Development Goals Based on the Occupational Competency Evaluation System

Higher vocational colleges should rely on the higher vocational managerial accounting competency evaluation system constructed based on industry demands [8]. Starting from the four specific competencies—such as strategic planning ability, digital financial application ability, and innovative thinking ability—colleges should align their own characteristics and strengths to further refine the goals of cultivating managerial accounting talents. This approach helps prevent misdirection and misconceptions during the cultivation process.

5.2. Innovating the Model for Developing Managerial Accounting Talents and Updating the Accounting Knowledge System

In response to the requirements of building managerial accounting competencies in the context of financial digitization, it is imperative to promote innovative models for cultivating managerial accounting talents and updating the accounting knowledge system. The transition from accounting calculation proficiency to strategic planning competency requires a restructuring of the traditional knowledge framework, with a shift from accounting courses to managerial accounting. Additionally, to reflect the comprehensive nature of developing managerial accounting competencies, higher vocational colleges should offer targeted training in other competencies, including courses on digital financial applications, big data analysis, innovative thinking, interpersonal communication, and team building. By incorporating the institution's characteristics, scheduling course hours, and employing assessment methods, the overall level of managerial accounting competencies can be further enhanced, catering to society's need for skilled management personnel.

5.3. Elevating the Level of Managerial Accounting Teaching Staff and Forming an Expert Team with Profound Digital Proficiency

Higher education institutions should explore new models for intelligent education within the professional cluster, actively engage in faculty training with a focus on professional leadership, and

form innovative teams for digitalized managerial accounting education. Incorporating modern information technologies such as big data and artificial intelligence, institutions can explore intelligent education models. By nurturing high-level managerial accounting professionals, fostering distinguished teaching staff and skill masters, and attracting doctoral professors with expertise in emerging business disciplines, institutions can establish an exchange mechanism for double employment and dual roles between teachers and high-skilled corporate personnel through industry-academia collaboration. Through the spirit of craftsmanship embodied by master teachers, educational quality can be enhanced, guiding the professional growth and career development of managerial accounting educators, thereby forming an expert team adept in digital competence.

5.4. Promoting Teaching System Transformation to Forge a Practical Teaching System in Financial Intelligence

The creation of a distinctive managerial accounting practical teaching system should be centered around managerial accounting, with supplementary elements like accounting calculations, cost management, taxation, and planning. Collaborative efforts should establish a combined virtual simulation and real project-based environment for managerial accounting practical teaching. Leveraging school-enterprise cooperation and human-computer interaction, these environments can utilize mainstream emerging industries as case studies, integrating virtual environments with practical teaching content. The construction and refinement of this practical teaching system should incorporate advanced practical education philosophies, win-win industry-education integration models, open practical teaching platforms, and robust educational service systems. Over time, it should evolve into a managerial accounting practical teaching system that encompasses "specialized skill practice, professional shared practice, comprehensive professional practice, and cross-disciplinary comprehensive practice," effectively integrating practical teaching and real-world exercises [9].

6. Conclusion

Enhancing the overall level of managerial accounting competencies among higher vocational college students within the context of financial digitization and targeting the enhancement of the four major competencies in alignment with the students' characteristics stands as a pressing issue for current higher vocational colleges. These institutions should utilize the managerial accounting competency evaluation system to guide the cultivation of managerial accounting talents. The fundamental path for cultivating and reforming managerial accounting talents and education within Chinese higher vocational colleges lies in clarifying training objectives, innovating cultivation models, updating the accounting knowledge framework, elevating the competence of managerial accounting teaching staff, and promoting the transformation of practical teaching systems. This strategic approach encapsulates the essential direction for nurturing and educating managerial accounting talents within the higher vocational college landscape under the backdrop of financial digitization.

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