Vol.7 Iss.4 2026 Communication & Education Review
https://doi.org/10.37420/j.cer.2026.053

Research on the Construction of an Intelligent Accounting Talent Training System for the Water and Power Industry

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Abstract:
Driven by the dual forces of the digital economy and the development of new-quality productive forces, the water resources and power industry is accelerating its transition toward intelligence and sustainability. As the core pillar supporting the industry's financial digital transformation, the alignment between talent supply and sectoral demands has become a critical constraint on this transformation. Based on the unique characteristics of the water resources and power industry, this paper identifies the core competency requirements for intelligent accounting professionals, analyzes current talent cultivation practices and outstanding challenges, and establishes a talent development framework aligned with industry needs across four key dimensions—education objectives, curriculum design, practical training, and faculty development—to facilitate high-quality growth in the sector.

Keywords:
Water Resources and Power Industry; Intelligent Accounting; Talent Development System

1.Introduction

The water resources and power industry is a foundational and strategic sector of the national economy, encompassing core areas such as water conservancy project construction, power generation and transmission, water resource management, and new energy development. It is characterized by large investment scales, extensive industrial chains, prolonged operational cycles, and complex financial accounting processes. Its financial operations directly impact the industry's development quality and the security of state-owned assets. With the rapid advancement of digital technologies—including big data, artificial intelligence, and cloud computing—the traditional manual accounting and post-event control model can no longer meet the demands of the industry's intelligent and green transformation. Intelligent accounting, as a product of deep integration of "accounting + technology + industry," enables automated financial accounting, intelligent financial management, and precise risk prevention and control, serving as the core driver for the digital transformation of financial practices in the water resources and power sector.

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2. Characteristics of Talent Demand for Intelligent Accounting in the Water Resources and Power Industry

Based on the actual operational scenarios and financial transformation needs of the water resources and power industry, the demand for intelligent accounting professionals exhibits distinct industry-specific features, primarily centered around three dimensions: competency structure, job requirements, and professional ethics. These characteristics differentiate them from general-purpose intelligent accounting talents, as outlined below:

2.1.Compound Competency Structure: Three-Dimensional Integration

Intelligent accounting professionals in this sector must possess a three-dimensional composite competency encompassing "accounting expertise + digital technology skills + industry-specific expertise." Specifically, accounting expertise should align with the industry's requirements for managing large-scale fund flows, conducting cross-cycle accounting, and coordinating multi-stakeholder collaboration. They must master core skills such as full-cycle accounting for water infrastructure projects (from initiation to completion), regional revenue management in power sectors, cross-regional tax planning, and financial audits of major projects. Digital technology skills should meet the industry's demands for financial digitization and intelligence, including proficiency in big data analytics tools like Python and Power BI for automated cost aggregation in water projects, precise revenue data segmentation, and cross-project financial correlation analysis. Industry-specific expertise requires familiarity with regulatory frameworks and operational workflows, enabling seamless integration of intelligent accounting technologies to address practical challenges such as preventing fund misappropriation in infrastructure projects and ensuring compliance with carbon accounting standards for renewable energy enterprises.

2.2.Diversified Job Requirements Aligned with Industry Operational Needs

With the ongoing financial transformation in the water conservancy and power industry, intelligent accounting-related positions have emerged as increasingly diversified and specialized roles. These encompass core functions such as intelligent financial accounting, financial data analysis, risk management, and carbon accounting, reflecting the sector's differentiated demands for intelligent accounting professionals. The Intelligent Financial Accounting role focuses on automated cost calculation for water conservancy projects and power revenue generation, specializing in cross-cycle infrastructure project amortization and time-of-use electricity pricing. The Financial Data Analysis role analyzes key metrics like return on water conservancy infrastructure investments, providing data-driven support for corporate investment decisions and operational optimization. The Risk Management role monitors risks associated with fund utilization in water conservancy projects and compliance of power revenue, leveraging intelligent tools for precise risk alerts. The Carbon Accounting role handles carbon emission statistics, quota management, and emission reduction benefit calculations for renewable energy enterprises, facilitating integration with carbon trading markets to meet the industry's green transition needs.

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2.3.Professional Competence Specialization Aligned with the Public Welfare Nature of the Industry

The fundamental and public welfare-oriented nature of the water resources and power industry imposes higher demands on the professional competence of intelligent accounting professionals. In addition to possessing the basic accounting virtues of integrity, rigor, and accountability, they must demonstrate strong industry responsibility by strictly implementing policies for water resource fee and power fund collection, and ensuring standardized management of state-owned assets; demonstrate practical innovation capabilities to optimize intelligent accounting workflows tailored to industry scenarios, thereby enhancing financial efficiency; exhibit strong teamwork skills to collaborate effectively with engineering, operations and maintenance, and dispatch departments in obtaining operational data and addressing financial issues; and possess lifelong learning capabilities to rapidly adapt to industry policy changes such as electricity pricing reforms and carbon policy updates, as well as to meet technological evolution requirements including advancements in financial AI tools and specialized software upgrades.

3.Current Status and Challenges in Talent Development for Intelligent Accounting in the Water Resources and Power Industry

3.1.Vague Training Objectives and Insufficient Industry Relevance

Currently, most universities focus their intelligent accounting talent development programs on cultivating generalist digital accounting professionals, emphasizing only the integration of accounting knowledge and digital technologies without clearly defining the positioning of interdisciplinary talents combining "accounting + technology + industry expertise." The programs fail to address the specialized training requirements for industry-specific business knowledge and job skills in the water resources and power sector, resulting in a disconnect between training objectives and actual industry demands. At the corporate level, training objectives primarily aim to enhance existing employees' basic digital technical skills, without aligning with corporate financial transformation strategies to clarify competency development directions or career advancement pathways for intelligent accounting roles. Additionally, no targeted training objectives have been established for industry-specific positions such as infrastructure project accounting and carbon accounting, making training outcomes inadequate for meeting practical job requirements.

3.2. The curriculum system is inadequate, with outdated course content.

The curriculum suffers from structural imbalances, obsolete content, and a lack of industry-specific features, making it ineffective in cultivating interdisciplinary talents. In terms of curriculum structure, general accounting courses and digital technology courses account for an excessively high proportion, while industry-specific courses constitute less than 10%. Most universities do not offer specialized courses such as infrastructure project accounting, carbon accounting, or policies and regulations for the water conservancy and power industries. Consequently, students fail to systematically acquire industry-related knowledge and must relearn industry workflows and financial standards upon employment. Regarding course content, digital technology courses fail to incorporate timely instruction on industry-specific financial software operations or

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practical case studies of intelligent accounting; industry-focused courses lack integration with the latest policy updates, including electricity price market reforms and carbon peak and carbon neutrality initiatives.

3.3. Weak Practical Teaching and Insufficient Integration of Industry and Education

Current intelligent accounting practical teaching in the water conservancy and power industry exhibits significant shortcomings. Universities lack specialized practical training platforms tailored for this sector, failing to simulate real-world financial scenarios such as water conservancy project cost accounting, power revenue analysis, and carbon accounting. Most universities merely sign cooperation agreements with enterprises and designate practice bases, without enterprises' deep involvement in talent cultivation processes—including providing industry-specific cases, sufficient hands-on positions, or industry mentors. This falls short of the ideal tripartite model of "universities + enterprises + intelligent financial service providers." Practical teaching remains predominantly limited to on-campus simulation training, leaving students with limited exposure to actual industry work environments.

3.4. Imbalance in Faculty Composition and Shortage of Multidisciplinary Experts

In university faculty teams, the majority hold traditional accounting backgrounds and lack expertise in digital technologies or practical experience in the water resources and power industry, rendering them inadequate to teach industry-specific content such as intelligent accounting for water infrastructure projects or smart revenue analysis in power generation. While some faculty have undergone digital technology training, their limited exposure to real-world industry operations hinders effective integration of technological applications with professional practices. Corporate training instructors, primarily internal financial staff, possess industry experience but lack systematic teaching methodologies and training capabilities, with incomplete mastery of cutting-edge intelligent accounting technologies like AI-powered financial robots and blockchain applications. Furthermore, the underdeveloped faculty development mechanisms prevent university teachers from gaining practical industry experience through internships, while corporate technical experts rarely participate in academic instruction, hindering the overall enhancement of faculty competence.

3.5. The evaluation and assessment mechanism is unscientific and fails to ensure training quality.

Currently, the evaluation system for cultivating intelligent accounting professionals in the water resources and power industry lacks scientific rigor and fails to align with actual industry job requirements, thereby compromising training quality. Firstly, the evaluation subjects are limited: university assessments are solely conducted by faculty, focusing on theoretical knowledge and basic practical skills without involving enterprises or industry associations, making the results insufficient in reflecting students 'job suitability; corporate training evaluations are handled exclusively by internal finance departments, emphasizing technical operations without objective third-party assessments, resulting in incomplete and biased outcomes. Secondly, the evaluation content is one-sided, prioritizing theoretical knowledge and digital technology skills while neglecting industry-specific competencies, professional ethics, and job relevance, thus failing to comprehensively reflect graduates' actual capabilities. For instance, some students may excel in theoretical exams but struggle with practical cost accounting tasks in water infrastructure projects. Thirdly, the evaluation methods are over-

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ly simplistic, relying predominantly on written tests and online assessments without comprehensive evaluation of practical skills or job adaptability. The absence of simulated workplace scenarios prevents thorough assessment of hands-on abilities and industry alignment, ultimately undermining the match between training outcomes and job demands.

3.6. Inadequate safeguard mechanisms hinder the implementation of the training system.

Currently, the support mechanisms for cultivating intelligent accounting professionals are insufficient, making it difficult to effectively execute the training framework. Firstly, insufficient policy support: The government has not yet issued specialized policies for cultivating intelligent accounting professionals in the water conservancy and power industry. Collaborative talent development between universities and enterprises lacks policy guidance and incentives, with some enterprises showing low enthusiasm for participating in talent cultivation, viewing it as the sole responsibility of universities and unwilling to invest substantial human or material resources. Industry associations have not established clear competency standards for intelligent accounting professionals, resulting in inconsistent norms for talent training and evaluation. Secondly, inadequate financial support: The construction of intelligent accounting training platforms and faculty development requires substantial funding, yet many universities lack sufficient resources, leading to outdated equipment, ineffective faculty training, and the inability to establish industry-specific training platforms. Enterprises also have limited training resources, hindering the creation of specialized training platforms, qualified instructors, and optimized training content and formats. Thirdly, insufficient resource allocation: There is no industry-wide shared talent development resource repository for intelligent accounting, and teaching resources between universities and enterprises cannot be shared, resulting in inefficient resource utilization. Industry-specific textbooks and training manuals are scarce; existing materials are generally generic and lack industry-specific content, failing to meet the demands of specialized talent cultivation. Fourthly, inadequate collaborative mechanisms: Effective communication and cooperation mechanisms among universities, enterprises, and industry associations are lacking, failing to form a unified talent development effort. Regular communication channels between universities and enterprises are absent, making it difficult to promptly align talent demands with training outcomes. Industry associations fail to serve as effective bridges or coordinators, hindering the effective integration of resources across stakeholders.

4.Construction of an Intelligent Accounting Talent Training System for the Water Resources and Power Industry

4.1. Clarifying Training Objectives and Highlighting Industry Characteristics

Establish the overarching training objective of "multi-disciplinary, specialized, and industry-specific," with the core aim of cultivating intelligent accounting professionals who meet the job requirements of the water resources and power industry. This approach balances theoretical knowledge with practical skills, achieving deep integration of accounting expertise, digital technology competencies, and industry-specific knowledge to facilitate the sector's financial digital transformation.

Building on this foundation, a tiered training framework is established to address the distinct needs of high-

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er education and corporate training. Undergraduate programs focus on cultivating applied intelligent accounting professionals, emphasizing the enhancement of students' practical intelligent accounting skills with an emphasis on fundamental roles in the water resources and power sectors, while optimizing curriculum design and hands-on instruction. Corporate training initiatives prioritize the professional transformation of existing traditional accounting staff, delivering customized programs aligned with the core requirements of various positions to ensure employees can swiftly adapt to intelligent accounting roles and transition from traditional accounting professionals to intelligent accounting practitioners.

4.2. Refine the Curriculum System to Promote Integration of Positions, Courses, Competencies, and Certifications

Establish a four-in-one curriculum system comprising "basic modules + core modules + specialized modules + practical modules," balancing foundational knowledge, professional expertise, and industry-specific characteristics. This framework facilitates deep integration among positions, courses, competitions, and certifications, ensuring curriculum content aligns with industry job requirements. The basic module strengthens students 'accounting fundamentals and digital technology skills through courses such as Accounting Fundamentals, Financial Management, and Big Data Basics, while incorporating relevant policies and core operational knowledge from the water resources and power industry to lay a solid foundation for advanced studies. The core module focuses on intelligent accounting core competencies, emphasizing the operation of industry-specific financial software and financial big data analysis, supported by real-world industry cases to enhance students' application of smart technologies. The specialized module integrates industry-specific content through courses like Infrastructure Project Accounting and Carbon Accounting, enabling students to understand industry workflows and financial features while improving industry adaptability. The practical module closely aligns with job requirements and vocational certification standards, offering hands-on training in intelligent accounting operations and role simulation exercises, supplemented by practical training using industry-specific financial software to boost employability.

4.3.Strengthening Practical Education and Deepening Industry-Education Integration

To build a tripartite practical education system encompassing "on-campus training + corporate practice + social engagement," universities should enhance industry-education integration, ensuring close alignment between practical instruction and real-world industry needs. This approach effectively improves students' hands-on skills and shortens talent development cycles. Institutions should increase funding to establish specialized intelligent accounting training laboratories for the water resources and power sector, incorporating industry-specific software and big data analytics tools to simulate authentic financial scenarios for on-campus practical training. These labs should be staffed with interdisciplinary instructors possessing industry expertise.

Furthermore, universities should deepen industry-academia collaboration by establishing robust partnerships with large and medium-sized water resources and power enterprises to co-develop practical training bases. Clear definition of mutual responsibilities will foster a mutually beneficial mechanism of "joint development and collaborative education." Enterprises provide internship opportunities and industry mentors, while universities offer talent support and technical consultation. Additionally, students should participate in industry-related social practices and vocational competitions to apply acquired knowledge, enhance innova-

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tion and teamwork skills, and strengthen their industry awareness and professional identity.

4.4.Optimizing the Faculty Team and Cultivating Multidisciplinary Teaching Teams

By adopting a dual approach of "recruitment and cultivation combined with university-industry collaboration," universities enhance the structure of their faculty teams. They intensify efforts to recruit multidisciplinary educators, prioritizing professionals with digital technology backgrounds and industry expertise, as well as frontline corporate experts, to strengthen the teaching workforce. A systematic faculty development mechanism has been established, organizing university faculty to participate in intelligent accounting technology training, industry-specific workshops, and rotational assignments at enterprises to gain practical experience. Concurrently, a university-industry faculty exchange platform is maintained, facilitating regular collaborations between academic staff and corporate technical experts to share teaching and practical resources. Multidisciplinary teaching teams are formed, comprising university faculty, corporate technical experts, and industry mentors who collaborate in teaching, practical training, and research activities. These teams jointly develop industry-aligned textbooks and training manuals, ensuring curriculum content aligns with real-world industry needs and job requirements, thereby fostering "dual-qualified" teaching teams.

4.5. Improve the evaluation and assessment mechanism to ensure training quality.

Establish an evaluation and assessment mechanism characterized by "multiple stakeholders, comprehensive content, and diverse methods," aligned with the actual job requirements of the industry. This mechanism enables a comprehensive and objective assessment of talent cultivation quality, ensures the achievement of training objectives, and guarantees that graduates are well-suited to industry positions.

Establish an integrated evaluation framework involving universities, enterprises, industry associations, and third-party institutions, clearly defining the respective evaluation responsibilities. Universities are responsible for assessing theoretical knowledge and fundamental practical skills; enterprises evaluate practical competencies and job fit; industry associations assess professional competence and industry recognition; and third-party institutions conduct objective assessments of talent capabilities. This ensures comprehensive and objective evaluation outcomes that align with industry talent assessment standards.

The evaluation covers multiple dimensions including theoretical knowledge, digital technology skills, industry-specific competencies, practical abilities, professional ethics, and innovation capabilities. It moves beyond a singular theoretical assessment approach, emphasizing the evaluation of practical skills and industry relevance to comprehensively reflect individuals 'overall competence and align with actual job requirements. For instance, the practical ability assessment focuses on students' hands-on skills such as accounting for water conservancy infrastructure projects, power revenue analysis, and carbon accounting, while the professional ethics assessment evaluates their sense of industry responsibility, integrity, and teamwork capabilities.

By employing diverse assessment methods such as case analysis, job simulation, and internship evaluations, this approach integrates formative and summative assessments with both quantitative and qualitative evaluations. It comprehensively assesses students' learning outcomes and practical competencies, ensuring that the evaluation results accurately reflect their actual capabilities and thereby guarantees the quality of talent development.

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4.6.Establish a robust safeguard mechanism to facilitate the implementation of the talent cultivation system.

Grounded in industry realities, develop a comprehensive safeguard framework encompassing policy, funding, and resource allocation to provide solid support for the system's execution, ensure orderly progress of training initiatives, and substantially enhance the quality of talent development.

Regarding policy support, it is recommended that relevant government departments introduce specialized policies for cultivating intelligent accounting professionals in the water resources and power sector, clearly defining the objectives, directions, and supporting measures for talent development. Policies should enhance incentives for collaborative talent cultivation between universities and enterprises, encouraging their active participation in this initiative. Industry associations should establish competency standards for intelligent accounting professionals, standardize talent training and evaluation processes, specify job competency requirements to provide a foundation for talent development, and serve as a bridge to coordinate resources among universities, enterprises, and the government, thereby facilitating the orderly advancement of talent cultivation efforts.

Regarding financial support, a diversified funding mechanism should be established to create a collaborative funding system involving the government, enterprises, universities, and society. The government should increase financial support for the development of intelligent accounting programs in universities, the construction of practical training platforms, and faculty training; enterprises should enhance funding for talent training, the establishment of practical training bases, and training resources, incorporating talent development funds into their annual budgets to ensure the orderly implementation of training programs; universities should actively seek social funding to increase investment in practical training platform development and faculty training, thereby improving talent cultivation conditions.

In terms of resource assurance, establish an industry-wide shared repository for cultivating intelligent accounting professionals by integrating university teaching resources, corporate practical resources, and industry training resources to facilitate resource sharing—including shared industry case studies, practical training courseware, faculty resources, and access permissions to financial software training tools. Develop shared platforms for intelligent accounting practical teaching and faculty resources to enhance resource utilization efficiency. Organize universities, enterprises, and industry associations to jointly develop textbooks, case collections, and practical training guides tailored to industry realities, incorporating the latest policies and operational practices to meet talent cultivation needs and address the current shortage of textbooks with industry-specific features.

By establishing a collaborative talent cultivation mechanism among universities, enterprises, and industry associations, clarifying the responsibilities of each party, enhancing communication and cooperation, and pooling efforts for talent development. Regular collaborative education symposiums are held to promptly align talent demands with training outcomes and address challenges in the cultivation process; a feedback mechanism is established to collect timely opinions and suggestions from enterprises and students, continuously optimizing the talent cultivation system to ensure graduates meet industry needs; a two-way talent mobility mechanism between universities and enterprises is implemented, encouraging university faculty to take

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temporary positions in enterprises and enterprise technical experts to teach in universities, thereby promoting faculty exchange and capacity building.

5.Conclusion

In summary, cultivating intelligent accounting professionals in the water resources and power industry serves as a crucial foundation for advancing the sector's financial digital transformation and achieving high-quality development. By defining industry-specific training objectives, refining a curriculum that integrates job requirements, academic courses, competitions, and certification programs, strengthening industry-education collaborative practical training, and building a versatile faculty team, we can effectively address the prominent challenges in current talent development. This approach will foster a greater number of versatile intelligent accounting professionals aligned with industry needs, thereby supporting the sector's sustainable and healthy growth in the digital economy era.

Funding

This work was supported by General Project of the 14th Five-Year Plan for Educational Science in Jiangxi Province (2022): "Research on the Training Path of Intelligent Accounting Talents Under the Background of New Liberal Arts"Project Code: 22YB251)

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