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Using the Delphi Method to Examine Consensus and Confidence Levels in Proposed Solutions for Managing Information Technology Workforce Training Collaboration at Colleges

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ABSTRACT: This study investigates the effectiveness and reliability of management solutions designed to strengthen collaboration between colleges and enterprises in the field of information technology workforce training. Addressing the existing gap in standardized mechanisms, evaluation tools, and coordinated processes within current cooperation practices, the research employs the Delphi expert consultation method to validate the feasibility and relevance of the proposed solutions. The Delphi process, conducted through iterative rounds of expert feedback, enables the refinement and confirmation of key management components, including policy improvement, coordination procedures, resource mobilization, and the development of evaluation criteria for collaborative training activities. The findings reveal a strong level of expert consensus, demonstrating that the proposed solutions are conceptually sound, contextually appropriate, and capable of addressing persistent challenges in educational cooperation management. The study contributes to the literature by offering a scientifically validated set of solutions that can guide educational managers, policymakers, and practitioners in enhancing the quality, accountability, and effectiveness of college–enterprise partnerships. These results also provide a valuable methodological reference for future studies seeking to apply the Delphi approach in educational management research.

KEYWORDS: Delphi method, Expert consensus, IT workforce training, College–enterprise collaboration, Management solutions, Kendall's W coefficient

I. INTRODUCTION

In the context of the Fourth Industrial Revolution and the global wave of digital transformation, the Information Technology (IT) sector has become a key pillar of economic growth, innovation, and national competitiveness. In recent years, Vietnam has identified digital transformation as a strategic priority: Resolution No. 57-NQ/TW dated December 22, 2024 of the Politburo affirms that science, technology, innovation, and national digital transformation are the core drivers for Vietnam to make breakthroughs in the new era, in which IT human resource development is considered central. In addition, Circular No. 02/2025/TT-BGDĐT promulgates the Digital Competency Framework for learners, requiring educational institutions to equip students with technological capabilities, digital skills, and the ability to adapt to modern work environments. These orientations create opportunities but also pose major challenges for colleges in renewing training content, methods, and management models.

The World Bank has issued various policies, programs, and goals for digital economy development to enhance the capacity of data-driven and digital-platform-based economies (World Bank, 2023). Meanwhile, the rapid growth of the digital economy and the increasing demand for technological solutions (AI, cloud, big data, cybersecurity, fintech, enterprise software solutions, etc.) have driven high demand for IT human resources with professional competencies and practical skills.

However, the reality of Vietnam's IT workforce is facing a major paradox: the number of workers in the sector is increasing rapidly, yet still fails to meet market requirements in terms of quality and skill structure. Market reports show that demand for IT personnel rises sharply each year; TopDev notes that Vietnam's IT market has high demand and forecasts significant shortages of specialized positions in the short term — for example, projected shortages may reach hundreds of thousands of personnel at various levels (TopDev, 2023; 2024). This reflects a clear gap between the number of IT workers and their suitability/competence relative to enterprise expectations.

Developing IT human resources is not only a need of the technology sector itself, but also a critical factor for national digital transformation, enterprise competitiveness, labor productivity, and the capacity to absorb new technologies. Specifically, high-quality IT human resources help:

- Promote innovation in products, services, and business models;
- Ensure system safety and security in digital environments;
- Support the implementation of digital transformation programs at enterprise and governmental levels;
- Enhance software export capabilities and IT service value, contributing to the value-added of the digital economy (World Bank, 2023).

Vietnam aims to increase the contribution of the digital economy to GDP, which requires a workforce with deep expertise yet flexible and capable of lifelong learning to adapt to new technologies (Government digital development programs). IT workforce shortages or low workforce suitability lead to higher recruitment and training costs, reduced digital transformation speed, and lower competitiveness of domestic enterprises (Tran, O., 2023, November 1).

In major cities and technology hubs, Vietnam has demonstrated the ability to produce skilled IT workers: many young programmers and software engineers possess good technical foundations, rapid learning capabilities, and creativity; several universities and specialized training centers have provided human resources meeting the needs of outsourcing companies and tech startups (TopDev, 2023). At the same time, the IT labor market is creating abundant career opportunities with competitive salary and benefit levels.

However, many studies and employer surveys indicate that the overall quality of Vietnam's IT workforce remains inconsistent and faces notable issues:

- Lack of practical skills and real project experience: many graduates have theoretical knowledge but lack experience in project implementation, teamwork, configuration management, and industry-standard software development processes. Employers often need to retrain them from the beginning (TopDev, 2023).
- Soft skills and foreign language limitations: communication, teamwork, time management, and English for IT are insufficient for international cooperation and foreign client work (TopDev, 2023).
- Gaps between training programs and enterprise needs: curricula do not keep pace with new technologies (AI, DevOps, cloud-native) and teaching methods insufficiently emphasize practice, resulting in insufficient "job readiness" (MIC, 2024).

As a result, despite high demand and attractive salaries, enterprises still struggle to recruit "qualified" IT workers — those with both technical knowledge, practical experience, and essential soft skills.

Analysis of root causes shows that IT workforce quality shortcomings stem from multiple interacting factors. First, curricula at many higher education and college institutions remain theory-oriented, lacking practice modules tied to enterprise projects and slow to update emerging technologies. This limits students' practical exposure upon graduation (TopDev, 2023; MIC, 2024).

Additionally, limitations in facilities and teaching staff remain critical challenges. Some institutions, particularly in localities or small-scale colleges, lack modern labs and practice rooms, and do not have instructors with industrial experience. The shortage of lecturers knowledgeable about emerging technologies and industry practices directly affects training quality (VJES, 2023).

Furthermore, school–enterprise cooperation models are not yet systematic or effective. Activities such as internships, contract-based training, sponsored labs, visiting lecturers from enterprises, or co-developed programs exist but remain shallow, narrow, or inconsistent, with inadequate incentive mechanisms for both sides. As a result, opportunities for students to access real working environments and participate in actual projects remain limited (Kinh tế và Dự báo, 2024).

Although policies to encourage training–industry linkages exist, gaps in implementation mechanisms, financial support, and incentives for enterprise participation reduce long-term engagement (World Bank, 2023; MIC, 2024).

These issues highlight the critical role of training—particularly training aligned with enterprise requirements—where professional skills, work attitudes, and project experience are developed. Thus, improving curricula, teaching methods, practice infrastructure, and deepening enterprise cooperation is essential to narrow the supply–demand gap in IT human resources.

Amid limitations in training programs, facilities, and school–enterprise collaboration affecting IT workforce quality, colleges (TCĐ) hold particularly important roles. They occupy a unique position in the vocational education system, tasked with training practice-oriented human resources in short to medium timeframes, aiming to produce graduates who are "work-ready" upon completion.

To meet market requirements and help address the IT workforce shortage, colleges can leverage their strengths by designing competency-based programs, enhancing project-based practice, and simulating real work environments. In addition, developing modules aligned with occupational certifications or micro-credentials helps learners meet professional standards quickly; importantly, deepening cooperation with enterprises in developing learning outcomes, inviting industry experts as visiting lecturers, conducting internships, and recruiting graduates is essential (VACC, 2024).

For enterprises, as direct users of training outputs and providers of real work environments, their role in IT human resource training is indispensable. Enterprises may participate in curriculum design and occupational skill standards, provide real projects, offer paid internships or post-internship employment opportunities, support equipment, scholarships, or employee retraining. Especially, software outsourcing companies and tech startups have strong motivations to participate in training to meet recruitment needs and align early-stage talent pipelines with industrial requirements.

However, enterprise participation in vocational education in Vietnam remains uneven and unsustainable, due partly to inadequate incentive mechanisms and unclear long-term benefits. In this context, harmonious coordination between colleges and enterprises not only enhances graduate quality but also reduces retraining costs for businesses and creates a stable human resource supply for the digital economy.

In practice, cooperation between colleges and enterprises has made progress but remains uneven and unsystematic. Common models include MOUs, contract-based programs, corporate internships, lab sponsorship, visiting lecturers from industry, and direct recruitment of interns. Industry reports and assessments show that some colleges have established strong partnerships, particularly in contract-based training programs with clear recruitment pathways, yielding positive effects on employment outcomes (VJES, 2023; VACC, 2024). However, many others maintain only superficial cooperation (e.g., organizing seminars or job fairs), lacking deep curriculum integration or real project involvement, leaving students without meaningful professional experience (Kinh tế và Dự báo, 2024).

Enterprise size also influences cooperation levels: large firms or FDI companies tend to have greater resources for training collaboration (sponsorships, paid internships, internal training), while SMEs participate less due to limited resources. To expand participation, experts recommend clearer legal frameworks, financial incentives, and supportive policies for school–enterprise collaboration.

Academically, several domestic studies highlight the importance of school–enterprise cooperation in vocational training, propose cooperation models, and analyze enabling or inhibiting factors (e.g., lack of incentive mechanisms, differing objectives between schools and enterprises, school management capacity) (VJES, 2023). Some studies also focus on contract-based training and evaluate its effectiveness in improving employment outcomes. However, research specifically on managing cooperation in IT training at the college level—especially governance models, evaluation criteria sets, and coordination mechanisms—remains limited and fragmented. This underscores the need for further research to develop a management framework tailored to the characteristics of IT occupations and college-level realities in Vietnam.

Nevertheless, in practice, the effectiveness of school–enterprise cooperation currently lacks a unified evaluation mechanism, resulting in each institution or enterprise applying its own approach, without clear bases for comparison, improvement, or standardization. The absence of evaluation tools means that cooperation management often relies on subjective experience or qualitative reports rather than comprehensive, evidence-based indicators.

Therefore, developing a criteria set for evaluating cooperation management between colleges and enterprises carries special significance. First, it provides a scientific, systematic reference framework that helps schools and enterprises identify the core components of effective cooperation—from planning, implementation, monitoring, to outcome evaluation. Second, it enables education managers to identify strengths and weaknesses within the cooperation process to propose suitable improvements. Third, it acts as a governance benchmark for measuring the quality and responsiveness of IT human resource training to labor market demands. Finally, in a dynamic school–enterprise ecosystem, such a criteria set becomes a tool for standardizing management, ensuring quality, assessing sustainability, and scaling effective cooperation models.

However, for the criteria set to be truly feasible and highly applicable, it must be developed and validated through a reliable scientific method ensuring objectivity and expert consensus in vocational education and IT. Among methods used to construct scales and evaluation frameworks, the Delphi method is particularly appropriate due to its multi-round expert consultation, feedback, adjustment, and consensus-building structure. Therefore, this study adopts the Delphi method to validate the criteria set for evaluating cooperation management between colleges and enterprises in IT human resource training, ensuring both scientific robustness and practical relevance in the digital transformation era.

II. METHODOLOGY AND RESEARCH METHODS

A. Methodology

***1) System Approach*:** This approach identifies the management of cooperation activities between colleges and enterprises in IT human resource training as a system encompassing planning, process, organization, and evaluation. In addition, the study approaches the characteristics of the components of training cooperation activities (colleges, enterprises, training programs, management staff, teaching staff, students, etc.). The research also demonstrates system characteristics through the examination of college–enterprise relationships in IT human resource training cooperation. At the same time, the study approaches the research on cooperation models and processes, managing cooperation activities according to the PDCA model to clarify the contents of managing college–enterprise cooperation in IT human resource training. The interaction between

colleges and enterprises not only aims to maintain the college's educational function or the enterprise's business function but also creates "growth" in IT human resource training cooperation.

2) ***CIPO Approach:*** The CIPO approach is applied to the implementation of components in the cooperation between colleges and enterprises in IT human resource training. The training cooperation process following the CIPO approach occurs through the sequence {Context – Input – Process – Outcome}, which is a typical model for university training and a common approach. The efficiency achieved at the output depends on the educational process operated within a system, which is only carried out through the management of the organization running the system.

Applying the CIPO approach helps managers evaluate the effectiveness of education, control the implementation process, and consider other influencing factors. According to the CIPO model, managing college–enterprise cooperation in IT human resource training is a purposeful and directed intervention by managers (principals) through managing input, process, and output within a specific context on the management subjects.

3) ***PDCA Approach:*** PDCA (Plan-Do-Check-Act) is a quality management and continuous improvement approach widely used in various fields. This model is often used to improve performance and quality in organizations and enterprises due to its streamlined nature. The goal of PDCA is to solve problems systematically and improve product quality in the field of application (Deming, W. E, 1950). The quality management system of training based on the PDCA cycle is built and oriented toward PDCA requirements and customer satisfaction, continuously improving; it mobilizes stakeholder participation and emphasizes the formation of quality and organizational culture in each training institution. This model is commonly applied to enhance performance and quality in organizations due to its efficiency. PDCA is a suitable approach for all educational institutions because of its convenience, rigor, ability to analyze strengths and limitations, and forecast issues. At the same time, it helps propose solutions to overcome difficulties or limitations realistically within the context of each institution.

Applying PDCA helps clearly identify coordination among departments, which not only enhances performance but also promotes organizational harmony and sustainable development. It also ensures objectivity and accuracy in data collection and analysis.

4) Labor Market Supply–Demand Approach: This method focuses on the relationship between the supply of IT human resources (from training institutions) and enterprises' recruitment demand. It ensures that training programs are aligned with practical needs. Cooperation between colleges and enterprises helps adjust training programs, promote internships, recruitment, and support students' access to the IT labor market. At the same time, education must anticipate and align with labor usage requirements to ensure that graduates' competencies meet enterprises' current demands. Furthermore, college training should closely integrate with enterprises to ensure the training programs reflect IT industry realities. Additionally, through cooperation with enterprises, colleges can apply cooperation management models to improve teaching quality and the institution's reputation in IT human resource training.

5) Collaborative Approach: The collaborative approach in studying the management of cooperation between colleges and enterprises in IT human resource training focuses on bidirectional linkage, emphasizing synchronous, proactive, and practical integration between both parties to improve training quality and human resource utilization. Specifically, the integrated approach of the CIPO process (context, input, process, output) and PDCA cycle (plan, do, check, act) allows comprehensive control and evaluation of each step of cooperation. Coordinating the CIPO management model with the PDCA cycle ensures comprehensive management and evaluation of the cooperation process, guaranteeing quality and adaptability to labor market requirements.

B. Research Methods

1) Graph Method: The graph method is a scientific approach using diagrams to describe objects and activities, allowing a visual representation of relationships among elements in the structure of an object or the logical structure of a process (i.e., the path from the start to the end of an activity), which helps optimize planning and control. Graphs have advantages in modeling structures of objects and activities from simple to complex, and from small to large scale. They visually represent relationships among elements without considering their actual size or proportion.

2) Expert Method – Delphi Technique: This method uses the intelligence of a group of experts with relevant qualifications in educational management to collect scientific information and record evaluations of a scientific product as a basis for refining research problems. Expert surveys are conducted multiple times with anonymity to avoid influence among opinions and to reach the highest consensus. a) **Delphi Round 1:** (1) Construct the questionnaire; (2) Send it to experienced experts for feedback on content and usage, then revise; (3) Identify and select experts; (4) Conduct a pilot survey to finalize the questionnaire; (5) Test different information collection methods to select the most suitable; (6) Collect expert opinions; (7) Complete Round 1 report to provide indicators for Round 2. b) **Delphi Round 2:** Sequentially similar to Round 1, but some steps differ: (1) Construct closed-ended questions, mainly choice and ranking questions; (2) Build the participant list, including Round 1 respondents and additional participants. c) **Data aggregation and analysis:**

Question ratio = number of respondents to the question / total participants. Response ratio for options = number of respondents agreeing / total respondents to that question. Choice questions sum to 100%. Ranking questions are scored 1–10; unselected options receive average points. The lowest score represents the least important option.

3) ***Mathematical Statistics Methods:*** Statistics are used to describe the state of training cooperation and management between colleges and enterprises in IT human resource training, and factors affecting cooperation management. Statistical methods also analyze correlations between scales to test consensus and reliability of proposed solutions.

Descriptive statistical indicators include:

Mean score to calculate each opinion and factor;

Standard deviation to assess score dispersion around the mean.

Inferential statistical analyses include:

Comparative analysis;

Bivariate correlation to explore the relationship between two variables;

Multivariate correlation to analyze relationships among multiple variables and compare qualitative differences;

Confirmatory Factor Analysis (CFA) for multivariate data to test model fit and determine measurement variable impact.

III. PRACTICAL BASIS

The author has conducted a comprehensive systematization and analysis of the current status of cooperation activities as well as the management of cooperation between colleges and enterprises in Vietnam. The research results were compared with international experience to identify achievements, limitations, and causes, serving as a foundation for proposing solutions.

1) ***Lessons from international practice:*** A review of vocational education experiences in developed countries (Germany, Russia, New Zealand) and the region (Malaysia) highlights the central role of management mechanisms and the level of enterprise participation. A typical example is the Dual Vocational Education and Training (Dual VET) model in Germany, where learners spend up to 70% of their time practicing in enterprises. The core of this model is that enterprises not only accept interns but also directly participate in program development, competency assessment, and recruitment. Experiences from Malaysia and New Zealand further reinforce the view that the success of cooperation activities primarily depends on establishing a robust legal framework, clearly defining roles and responsibilities, and having an effective monitoring and evaluation (M&E) system.

2) ***Lessons from practice in Vietnam:*** The lesson for Vietnam is to shift from short-term cooperation relationships to strategic, sustainable partnerships, where enterprises participate extensively throughout the entire training cycle – from program design to output assessment. To ensure objectivity and scientific rigor, the study used a mixed-methods approach, including quantitative surveys and in-depth interviews. The survey sample included 6 colleges and 20 partner enterprises across the Northern, Central, and Southern regions, with participation from 548 respondents including students, lecturers, and management staff. The survey instruments were rigorously validated using Cronbach's Alpha. Results showed very high internal consistency of the scales: College group: α\alphaα ranged from 0.958 to 0.984; Enterprise group: α\alphaα ranged from 0.803 to 0.993. These results confirm that the collected data are highly reliable and suitable for further statistical analysis.

Assessment of the current status of cooperation activities (according to the CIPO model): Survey results indicate that cooperation activities are generally rated as fairly good. However, a detailed analysis using the CIPO model reveals a mix of strengths and weaknesses:

Input: Student recruitment and cooperation agreement signing are effectively conducted (Enterprise mean score: 4.31). However, enterprise participation in developing training program content is still limited (College mean lowest: 3.91), leading to a gap between theoretical training and practical production.

Process: The most notable activity is organizing internships and enterprise visits (College mean: 4.35; Enterprise: 4.31). While the roles of stakeholders are highly rated (4.22 – 4.27), inconsistency in methods and management regulations between the two parties remains a major barrier (College mean lowest: 4.04).

Output: Effectiveness in providing post-graduation employment opportunities is highly valued by both sides (College mean: 4.34; Enterprise: 4.38). Conversely, the development of joint evaluation criteria with enterprise participation has not been given adequate attention (College mean lowest: 4.01).

Assessment of the current status of cooperation management (according to the PDCA cycle): Cooperation management is rated at fairly good levels (overall mean: 4.01 – 4.19), specifically:

Planning (Plan): Mobilizing enterprises to support employment is well planned (mean: 4.34). However, "Institutionalizing regulations on the responsibilities of stakeholders" is the lowest-rated criterion (4.03), indicating gaps in the internal legal framework of the cooperation relationship.

Implementation (Do): Colleges have made efforts to facilitate lecturers' participation in cooperation (4.15). However, enterprises rated the mechanism for supporting resources for these activities lower (4.12), reflecting a shortage of material and financial investment from partners.

Checking (Check) and Acting (Act): Publicizing tasks and reward policies is performed relatively well (4.19 – 4.26). Nevertheless, planning for coordination and effective use of financial resources remains a weak point (mean: 4.12), which needs improvement to ensure sustainability.

Influencing factors and conclusion: Regression analysis shows that both subjective and objective factors strongly affect cooperation effectiveness (overall mean: 4.25 – 4.29). Among them, "Lecturers' professional competence and expertise" (mean: 4.31 – 4.42) and "Training program quality" (mean: 4.31) are the most influential variables.

Based on the above data, cooperation between colleges and enterprises in IT human resource training has achieved notable accomplishments, especially in providing practical opportunities and employment for students. However, the current model still has basic "bottlenecks" such as the absence of specific binding regulations, inconsistencies in management processes, and the lack of standardized evaluation tools.

IV. SURVEYING THE LEVEL OF CONSENSUS AND LEVEL OF CONFIDENCE IN THE PROPOSED SOLUTIONS USING THE DELPHI EXPERT CONSULTATION METHOD

Purpose of the Survey

The purpose of conducting an expert survey is to collect professional opinions, evaluations, and comments from individuals with deep knowledge and practical experience in the specific research field. Specifically, the objectives include:

Collecting professional information: Expert surveys help the study gather accurate and reliable information from individuals with in-depth knowledge in the research field, contributing to supplementing and enriching the research content.

Evaluating and confirming research reliability: Opinions and evaluations from experts can help verify the accuracy and reliability of information, methods, and conclusions in the dissertation. This enhances the credibility and value of the research.

Checking and ensuring appropriateness: Expert surveys aim to examine and ensure that the proposed solutions in the study are appropriate, convincing, and practically applicable, thereby improving the quality and value of the research.

Process of Selecting and Listing Experts: The author selected experts who are competent to provide accurate, objective, and reliable information for the study, based on the following criteria:

1) ***Education:*** PhD degree or higher.
2) ***Experience:*** At least 5 years of work in a higher education environment (university or college).
3) ***Professional competence:*** Continuous participation in teaching/research/program development/enterprise training cooperation over the last 5 years; ability to analyze data, evaluate information, and draw accurate conclusions.
4) **Ethical qualities:** Honest, objective, and responsible in providing information and research results.

A. **Survey Implimentation Process**

1) **Round 1:** *Aimed to gather expert opinions on the set of criteria for evaluating the effectiveness of cooperation between colleges and enterprises in IT human resource training to develop a closed questionnaire for Round 2. The survey asked experts to assess the importance of causes leading to the current state of cooperation management based on three content aspects: activity content (1), methods and forms (2), institutionalization of implementation principles (3). Experts answered based on pre-defined options and rated the importance level from 1 (most important) to 3 (least important)*

2) .**Round 1 Results:** *Evaluations from 16 experts on the causes of the current state of cooperation management between colleges and enterprises in IT human resource training were generally high, as follows:The cooperation activities between colleges and enterprises are not diverse, mostly following enterprise orders: 11/16 rated very important, 1/16 rated medium, 4/16 rated less important. The system of documents regulating cooperation management with enterprises is insufficient and inconsistent: 8/16 very important, 6/16 medium, 2/16 less important. The college's training cooperation process is unclear or absent, leading to overlapping tasks for stakeholders: 9/16 very important, 4/16 medium, 3/16 less important.The college has not paid much attention to promoting cooperation relationships and effectiveness: 6/16 very important, 8/16 medium, 2/16 less important. The college lacks tools/criteria to evaluate the effectiveness of cooperation between colleges and enterprises in IT human resource training: 8/16 very important, 6/16 medium, 2/16 less important. The college has not focused on organizing training for mid-level management staff to improve cooperation management capacity: 6/16 very important, 8/16 medium, 2/16 less important. Based on these causes, an open-ended question was asked: "From the above evaluations, please propose solutions to improve the management effectiveness of cooperation between colleges and enterprises in IT human resource training." Common responses included:Completing policies related to training cooperation and establishing specialized departments for cooperation activities: 8/16.*

Developing cooperation processes and evaluation criteria for cooperation effectiveness: 5/16.
Strengthening college-enterprise cooperation and mobilizing coordination with other forces: 13/16.
Organizing training activities for lecturers and management staff in cooperation activities: 5/16.
Collecting feedback and surveying enterprises and stakeholders to evaluate cooperation activities: 4/16.

3) ***Round 2:*** Based on the practical research and synthesis of Round 1 expert opinions, the open-ended questions were converted into closed questions for Round 2. Experts were asked to rank their agreement with each statement by scoring from 1 (strongly disagree) to 10 (completely agree) for the 5 proposed solutions (including solution name, objectives, significance, content, and implementation process). Round 2 received 20 completed questionnaires.

4) The results of Round 2 are summarized in the following chart:

Table 1: Statistical results of analysis for each question

	Question	*Number of Experts (person)*	*Mean Score*	*Standard Deviation*	*Minimum Score*	*Maximum Score*	*Quartile*		
							25%	*50%*	*75%*
Title	Question 1.1	20	8.75	1.372	6	10	8	9	10
Objectives	Question 1.2	20	8.85	1.137	6	10	8.25	9	10
Significance	Question 1.3	20	8.65	1.348	6	10	8	9	10
Content	Question 1.4	20	8.70	1.261	6	10	8	9	10
Process	Question 1.5	20	8.45	1.468	6	10	8	9	10
Title	Question 2.1	20	9.10	1.071	7	10	9	9	10
Objectives	Question 2.2	20	9.00	1.376	6	10	9	9	10
Significance	Question 2.3	20	8.95	1.276	6	10	8.25	9	10
Content	Question 2.4	20	8.75	1.293	6	10	7.25	9	10
Process	Question 2.5	20	8.50	1.433	6	10	7.25	9	10
Title	Question 3.1	20	8.70	1.174	6	10	8	9	9.75
Objectives	Question 3.2	20	8.85	1.137	7	10	8	9	10
Significance	Question 3.3	20	8.90	1.119	7	10	8	9	10
Content	Question 3.4	20	8.70	1.218	7	10	7.25	9	10
Process	Question 3.5	20	8.60	1.231	6	10	7.25	9	9.75
Title	Question 4.1	20	8.80	1.240	6	10	8	9	10
Objectives	Question 4.2	20	8.95	1.234	6	10	8	9	10
Significance	Question 4.3	20	8.80	1.322	6	10	8	9	10
Content	Question 4.4	20	8.45	1.432	6	10	7.25	9	10
Process	Question 4.5	20	8.45	1.317	6	10	7.25	9	9.75
Title	Question 5.1	20	9.05	.999	7	10	8.25	9	10
Objectives	Question 5.2	20	9.15	.933	7	10	8.25	9	10
Significance	Question 5.3	20	9.05	1.099	6	10	8	9	10
Content	Question 5.4	20	8.80	1.152	7	10	8	9	10
Process	Question 5.5	20	8.80	1.196	6	10	8	9	10

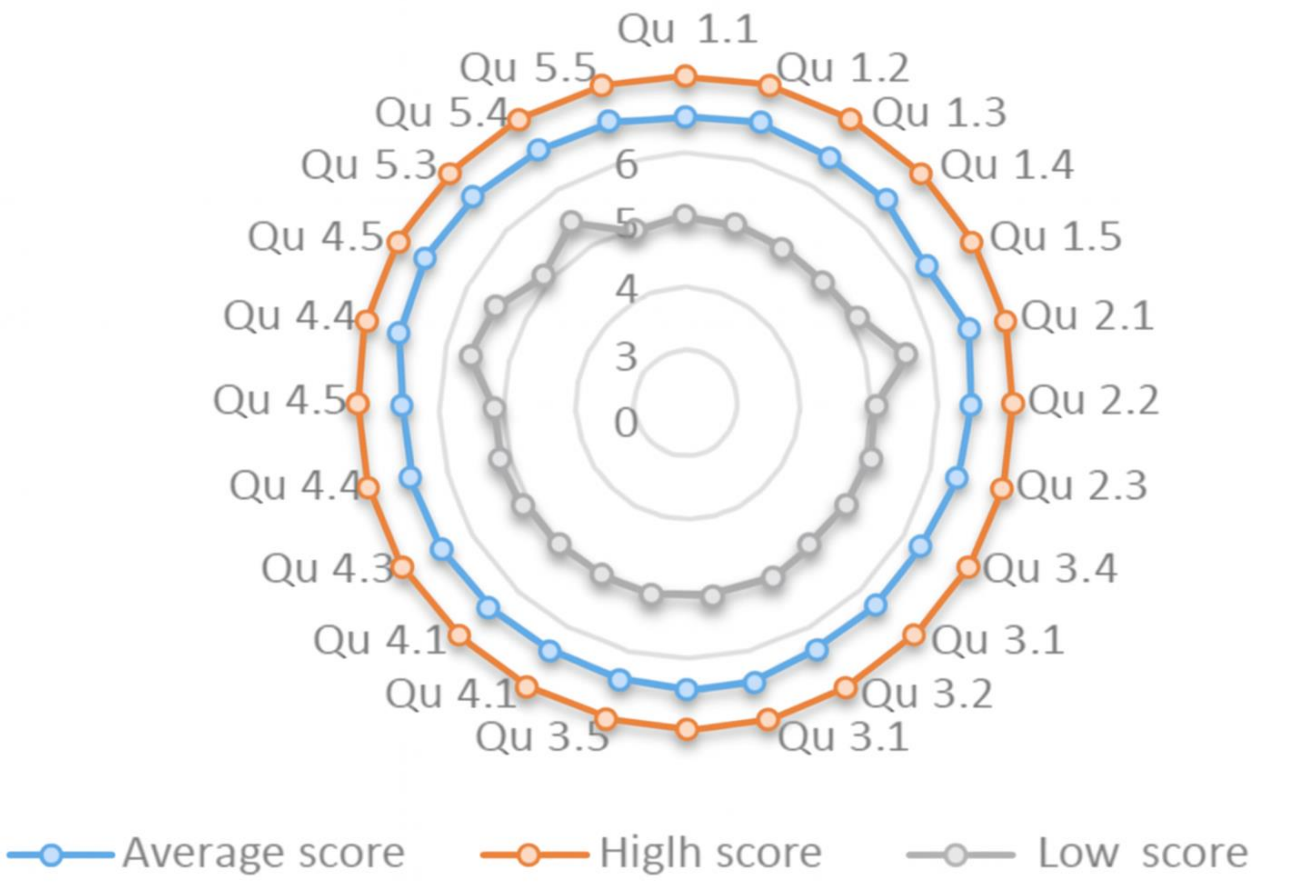

Chart 1: Average scores of expert agreement on solutions for managing cooperation activities between colleges and enterprises in IT human resource training

The table and chart above show that Question 5.2 has the highest average score of 9.15. This corresponds to the objective of Solution 5: "Develop, guide, and evaluate the effective use of the evaluation criteria set for IT human resource training cooperation activities, mobilizing feedback channels from learners, lecturers, enterprises, employers, and other stakeholders", which received the highest consensus.

Question 1.5 corresponds to the process of Solution 1: "Establish a coordination mechanism and complete the system of directive coordination processes among functional departments, college faculties/lecturers, and enterprises in the process of IT human resource training cooperation". Question 4.4 is the content of Solution 4, and Question 4.5 is the process of Solution 4: "Mobilize coordination and support from internal and external forces of the college and enterprises in IT human resource training cooperation", which has the lowest average score of 8.45. According to in-depth interview results, this lower score is due to the need for more detailed explanations.

Next, the number of expert responses for each question in Round 2 was aggregated and analyzed using SPSS software to calculate the mean score, standard deviation for each question, evaluate the level of expert consensus (Kendall's coefficient), and assess the reliability of the Delphi survey method. Kendall's coefficient ranges from 0 to 1. This coefficient is a measure of the level of consensus achieved and the degree of reliability.

Table 2: Level of consensus and reliability according to Kendall's coefficient

Kendall's W	***Level of Consensus***	***Level of Reliability***
0.0 – 0.1	Very Weak	None
0.1 – 0.3	Weak	Low
0.3 – 0.5	Average	Moderate
0.5 – 0.7	Strong	High
0.7 – 1.0	Very Strong	Very High

The calculation results of Kendall's coefficient regarding the level of consensus and reliability of experts on the proposed solutions are presented in the following table:

Table 3. Kendall's Coefficient Calculations

N	25
Kendall's W	.701
Chi-Square	332.78
Df	19
Asymp. Sig.	0

It can be observed that Kendall's coefficient is 0.701, which falls within the range of 0.5 – 0.7, indicating a strong level of consensus among the experts and a high level of reliability.

Conclusion: The proposed solutions for managing cooperation activities between colleges and enterprises in IT human resource training have achieved a strong level of consensus and a high level of reliability.

V. CONCLUSIONS

The results of testing the proposed solutions for managing cooperation activities between colleges and enterprises in IT human resource training using the Delphi method have confirmed the scientific validity, appropriateness, and feasibility of the solution system proposed in the study. In the context of vocational education facing strong pressures for innovation due to labor market shifts, rapid digital technology development, and the need to improve the quality of human resource training, using Delphi as a scientific verification tool becomes particularly important. The testing process not only aimed to collect expert opinions but, more importantly, mobilized collective intelligence to assess the reliability, consensus level, and rationality of the entire solution system according to objective and transparent standards.

The study implemented a two-round Delphi process involving experts with deep experience in educational management, vocational training, management science, and enterprise cooperation. In the first round, experts focused on evaluating the causes of existing issues in cooperation management and proposed priority solutions based on practical experience. The synthesis of Round 1 opinions revealed a high degree of agreement on the urgency of improving mechanisms, processes, evaluation criteria, coordination mechanisms, and capacity development of personnel; this formed the basis for developing detailed assessment content for the next round.

In Round 2, experts continued to evaluate the necessity, rationality, and feasibility of each solution using a 10-point scale, covering objectives, significance, content, and implementation process. Data analysis results indicated that the average scores of all solutions ranged from 8.45 to 9.15, reflecting a very high level of consensus. The solution on developing a set of evaluation criteria for IT training cooperation achieved the highest score, confirming the key role of standardizing and quantifying cooperation activities in vocational education management. Some aspects of the solutions related to mobilizing coordination forces were noted by experts as requiring more detailed explanations of implementation mechanisms, demonstrating that Delphi also played an important role in refining and perfecting content before practical application.

Notably, the Kendall W consensus coefficient reached 0.701 with high statistical significance (sig. = 0.00), proving strong and unified agreement among the experts. This is an important statistical evidence confirming the reliability of the testing results. Such a high convergence of opinions not only demonstrates the persuasiveness of the solution system but also reflects the solutions' suitability to practical needs and the developmental orientation of vocational education in the context of digital transformation.

From the testing results, it can be affirmed that the system of solutions for managing IT training cooperation between colleges and enterprises has been scientifically, comprehensively, and objectively verified. The use of Delphi has strengthened the reliability of the solutions while providing valuable theoretical and practical arguments for improving the solution system. In addition to confirming the correctness of the approach, the Delphi results also highlighted areas that require supplementation or clarification, ensuring that the solutions are not only theoretically sound but also applicable in the practical context of training institutions and enterprises.

Thus, it can be concluded that the solution system proposed in the study has passed rigorous expert evaluation, achieving a high level of consensus and reliability, providing a solid foundation for proposing practical implementation in managing cooperation activities in colleges. These results contribute not only to improving the quality of IT human resource training but also to expanding research directions on managing cooperation between vocational education institutions and enterprises, aiming to build a more modern, efficient, and sustainable management model in the future..

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