

# **Analysis of the Factors Influencing the Quality of Logistics Talent Training in Vocational College in Zhejiang Province, with the application of PDCA Quality Management Theory in the Theoretical Framework**

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## **Abstract**

The study investigates elements that influence the quality of logistics talent training in vocational institutions in Zhejiang Province as influenced by the PDCA model. The study aims to provide ideas for improving training and aligning it with industry priorities. A quantitative research approach is used in this study. The questionnaires were delivered to 50 students and 20 professors from various vocational colleges in Zhejiang Province. The goal is to understand the acquired data and evaluate them through SPS. The descriptive statistics and correlations helped establish the trends in the data. The study established a strong correlation among variables like curriculum design, faculty qualification, technological integration, and practical training. The difficulties connected with implementing the PDCA model in the vocational training environment are evident in the mixed perspectives on its efficiency. The study suggests improving the curriculum to meet industry expectations and prioritizing faculty development, including providing enough funding and infrastructure improvements. Promoting student participation and encouraging practical training experiences through interactive learning approaches can improve logistics talent training in vocational colleges. Also, resolving the problems associated with adopting the PDCA model is critical for realizing its potential benefits in training.

**Keywords:** Logistics, Talent training, Curriculum, Faculty expertise, PDCA model

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## **1. Introduction**

### **1.1 Background of the Study**

The Chinese province of Zhejiang has undergone fast economic growth, resulting in the rapid expansion of the logistics industry. Generally, the logistics M&A market had 110 deals valued at RMB 58.4 billion in 2022, according to PwC CN (2023). PwC CN (2023) further provided that the busiest areas for domestic deals in China were the Jiangsu-Zhejiang-Shanghai region, the Greater Bay Area (referred to as “GBA”), and Beijing, which collectively accounted for approximately 74% of the deal value and 73% of the deal volume in 2022. According to recent statistics, the Zhejiang province’s logistics sector has grown by 10% annually over the last five years (Zheng et al., 2022). The GDP of Zhejiang province was estimated to be 7.7 trillion yuan as of 2022, compared to 7.4 trillion yuan in 2021 (Textor, 2023). The rise in the logistics value in the province has contributed significantly to the region’s overall GDP. However, the expansion has stressed the need for trained staff to satisfy the increased demand for domestic and international logistics services. Thus, to

keep up with changing industrial demands and technological improvements, today's workforce requires specialized training, particularly in vocational colleges.

Also, Zhejiang Province has established itself as a vital logistics hub in China. The province's strategic location aids regional and worldwide trade and business. According to statistics, the province's logistics infrastructure has been steadily expanding, with many logistics' companies establishing regional operations. For instance, the province has ports like Ningbo, Zhoushan, Zhapu, Haimen, and Wenzhou and boasts 34 seaports, which provide 44 docks for ships with more than 10,000 tons (China.org.cn, 2022). The mentioned trend has heightened the need for a strong training framework in vocational colleges that aligns with the industry's developing needs. According to Yang and Chia (2023), Zhejiang province had 450 secondary vocational schools attended by more than 765,000 students and another 301,000 attending the 46 higher vocational institutions. Incorporating the PDCA Quality Management Theory into the training process is expected to close current gaps and ensure that the logistics professionals generated have the skills and knowledge required to survive in this competitive field. With the mentioned trends, this study aims to examine the factors impacting the quality of logistics talent training at vocational institutions in Zhejiang Province. Hence, the study intends to provide actionable recommendations for improving the training curriculum and faculty development programs, including practical training activities supported by PDCA Quality Management Theory popularized by Dr. W. Edwards Deming, an American engineer, statistician, and management consultant. Therefore, the ultimate goal is to contribute to the progress of the logistics industry in Zhejiang Province by generating a competent workforce capable of meeting the evolving global logistics landscape.

## **1.2 Statement of the problem**

The main issue noted is a lack of appropriate quality in logistics talent training within Zhejiang Province's vocational colleges. In most cases, the problem is worsened by obsolete training techniques and insufficient resources, including a lack of alignment with industry requirements (Msibi, 2021). Therefore, addressing the mentioned difficulties will help ensure that the Zhejiang Province's logistics industry can access well-trained staff.

## **1.3 Research Objectives**

- To identify the key factors influencing the quality of logistics talent training in vocational colleges in the Zhejiang Province
- To assess the effectiveness of the PDCA Quality Management Theory in enhancing the training process and improving the quality of logistics talent training
- To provide practical recommendations for optimizing the logistics talent training process in vocational colleges based on the findings.

## **1.4 Significance of the Study**

The significance of this study goes beyond educational research and growth. The study presents a practical application of quality management principles in the vocational education sector through the PDCA Quality Management Theory as the theoretical framework. Hence, the findings

of this study can be used as a resource by other vocational colleges and educational institutions looking to improve their training programs and align them with industry needs. Also, the study's recommendations may assist Zhejiang Province policymakers and educational authorities in implementing important improvements in the vocational education system. Potential gains from implementing these ideas can help the region's economic development as a competent and trained workforce in the logistics industry can be produced. Further, the study's significance may extend beyond Zhejiang Province, providing a model for other regions confronting comparable talent training and education issues. Hence, the study underlines the critical role of vocational education in preparing students for successful employment in the logistics sector through a well-designed and industry-aligned training curriculum.

### 1.5 Limitations of the Study

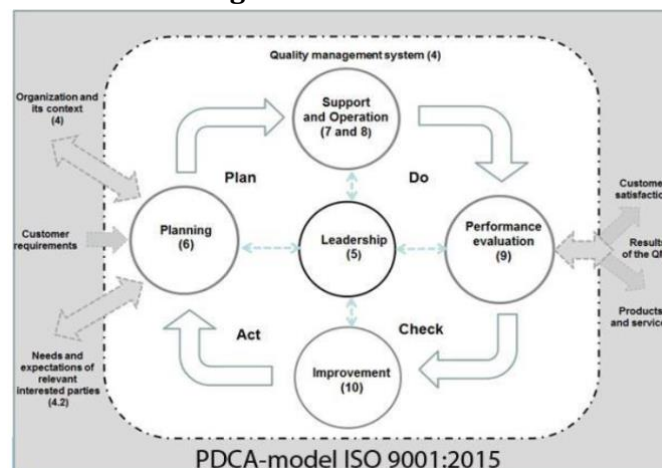
The study's scope may be limited to the specific context of logistics talent training in vocational colleges within the Zhejiang Province. Additionally, the availability of comprehensive data and the constraints of the research methodology employed may impact the depth of the study's findings.

## 2 Literature Review

### 2.1 Theoretical Framework

According to Mishra's (2021) description, PDCA (plan-do-check-act) is a cyclical, four-stage model for continuous improvement (CI) in business process management. The author also argues that PDCA enhances the quality and efficiency of various business processes like product lifecycle and project management, including HRM and SCM. The four sequential stages in the PDCA cycle are Plan, Do, Check, and Act, and it is closely associated with the principles of TQM and ISO 9001 quality standards (Figure 1).

**Figure 1 PDCA model**



Source: [Link](#)

The PDCA model was developed by Walter Shewhart and popularized by William Edwards Deming (Roper & Rooney, 2023). In their studies, Roper and Rooney (2023) argued that PDCA is an all-inclusive paradigm that promotes continuous improvement and problem-solving within organizational processes. According to Habibie and Kresiani (2019), initially created as a

statistical control tool, the PDCA cycle acquired significance in quality management due to its iterative structure and emphasis on improving efficiency and effectiveness. Koskela et al.'s (2019) paper explores the historical and theoretical foundations of quality management. The article acknowledges the importance of Shewhart's original definition of quality as value generation theory and the Plan-Do-Check-Act (PDCA) cycle. However, Koskela et al. (2019) noted that succeeding advancements frequently ignored or rejected these principles. The rejection resulted in the erosion of the theoretical foundation. Hence, Koskela et al.'s (2019) article recommends a renewed emphasis on strengthening quality management's theoretical and philosophical foundations.

In his study, Mishra's (2021) noted that the "Plan" phase of the PDCA cycle calls for carefully identifying goals and objectives and developing an inclusive strategy, including a detailed action plan. As analyzed in Ariyani and Kosasih's (2022) article, the plan phase points to the need for the implementers in the vocational training centers to understand the industry's specific skill requirements and the existing gaps in current vocational college training programs, including expectations of logistics stakeholders. On the other hand, the "Do" phase advises carrying out the action plan and applying the suggested adjustments to the logistics talent training program (Isniah, Purba & Debora, 2020). Thus, active student participation and practical hands-on experiences are required throughout this phase to prepare students for real-world logistics business issues appropriately.

Also, Mishra (2021) provides that the effectiveness of the implemented improvements is thoroughly examined during the "Check" phase using systematic assessment techniques and data analysis. According to Chojnacka-Komorowska and Kochaniec (2019), data help individuals or organizations make informed decisions regarding a given issue. Hence, the "Check" phase calls for evaluating student performance and tracking their achievement of established learning outcomes. Further, assessing industry partners' general satisfaction with the quality of the taught workforce would equally strengthen the development of the phase, as provided in Ariyani and Kosasih (2022). Also, the "Act" phase ensures that the feedback gathered during the evaluation stage is used to make the necessary adjustments and improvements (Koskela et al., 2019).

Additionally, the "Act" phase requires a hands-on approach to fixing identified inadequacies and developing the logistics talent training program that can assist in incorporating new industry best practices to ensure the curriculum's relevance and efficiency within the Zhejiang Province institutions. Scholars (Chen et al., 2021; Ariyani and Kosasih, 2022; Kaleeva, 2022) laud PDCA theory for its adaptability to various organizational contexts and equally support continuous improvement. The PDCA, according to the mentioned authors, further argues that the PDCA model can build a culture of hands-on problem-solving. However, Chen et al. (2021) note that PDCA mode is limited due to its oversimplification of complicated issues. Chojnacka-Komorowska and Kochaniec (2019) also point out the necessity for long-term commitment from all stakeholders and the difficulties associated with aligning the theory with continuously changing industrial requirements as the key lamination that may equally face the implementors in the case of Zhejiang Province institutions. Therefore, understanding the model's aspects would effectively help apply the PDCA theory to improve logistics talent training in Zhejiang vocational colleges.

## **2.2 Conceptual Framework**

A conceptual framework is an abstract and foundational structure that outlines the fundamental concepts and principles underlying a system (Garcia et al., 2019). A conceptual framework in the context of vocational training could be a structured blueprint that defines the essential concepts and components of the program as outlined in Rosli et al. (2023). Hence, a conceptual framework establishes the essential principles and rules for curriculum development, training methodologies, skill acquisition, and assessment procedures. The goal of the conceptual framework would be to provide a complete and cohesive framework for effective vocational education and skill development. This study's conceptual framework includes examining the various aspects influencing the quality of logistics talent training in vocational colleges. The factors include curriculum design, faculty qualifications, industrial relevance, technological integration, and practical training components.

### **H1: Curriculum Design and Relevance**

The first hypothesis suggests that an updated and industry-relevant curriculum design positively influences the quality of logistics talent training. Smith and Johnson (2019) found that a curriculum personalized to the dynamic needs of the logistics sector resulted in increased student engagement and job placement rates. Similarly, Abbas's (2020) study also supports that a well-structured and modern curriculum that promotes practical skill development and enhances graduates' employability within the logistics industry should be adopted in learning institutions. According to BPA (2021), vocational education at junior secondary school is under the nine-year compulsory education system. BPA (2021) adds that primary school graduates are often required to study for between 3 and 4 years on both general and technical skills subjects. The majority of the vocational training centers are often located in rural areas. Thus, the curriculum established supports the educational levels within the vocational training centers.

### **H2: Faculty Qualifications and Expertise**

The second hypothesis proclaims that the proficiency and qualifications of faculty members significantly influence the delivery of high-quality logistics education. Brown et al. (2019) insisted that faculty members need industry experience and advanced logistics knowledge to provide students with a comprehensive and practical learning experience. Additionally, the research conducted by Li and Yu (2022) depicted that faculty expertise positively influenced students' engagement levels and their ability to grasp complex logistics ideas. Therefore, the expertise and qualifications of faculty members represent the independent variables in this case, while the delivery of quality logistics education is the dependent variable.

### **H3: Technological Integration in Training**

Integrating modern technologies within the logistics training program significantly enhances students' technical skills. Papapanou et al. (2022) have noted that currently, many schools are engaging in simulating-based learning like Augmented reality (AR), virtual reality (VR) and flipped classroom learning educational resources (OER). Also, adaptive learning, gamification, and blockchain currently dominate the learning institutions' learning environments. According to Adel's (2022) research, introducing simulation tools and modern software improved students'

adaptability to technological changes in the logistics business. Besides, a study by Xu and Ouyang (2022) found that students gained a better grasp of complicated logistical processes after being exposed to cutting-edge logistics management systems and data analysis tools. In this hypothesis, technology integration is the independent variable, while technical competence enhancement is the dependent variable.

#### **H4: Practical Training and Industry Exposure**

The fourth hypothesis suggests that immersive practical training and exposure to real-world industry scenarios significantly contribute to cultivating competent logistics professionals. Internships and joint projects with logistics organizations, according to Hu et al. (2023), play a significant role in improving students' problem-solving abilities and offering useful ideas for industry methods. Additionally, Pang et al. (2023) found that hands-on training experiences improved students' readiness for the complicated nature of the logistics sector and equally equipped them for successful integration into the workforce. Therefore, in this case, practical training and industry experience are the independent variables in this context. At the same time, the development of competent logistics professionals is the dependent variable.

#### **H5: Industry Relevance and Alignment**

The fifth hypothesis suggests that a strong alignment between the vocational college curriculum and the logistics industry's current needs positively impacts graduates' employability. According to Tang et al. (2022), logistics industry standards that applicants must be aware of include product and goods sourcing, manufacturing standards, good inventory management, and proper handling and sorting of goods. Additionally, the author continues to add that the applicants must be aware of the principles like the right quantity, right place, right time, right products, and the right customer. Piróg and Hibszer (2023) provide that there is a need for an industry-aligned curriculum in learning institutions to improve the graduates' practical skills and capacity to overcome the dynamic problems in the logistics sector. On the other hand, Pang et al. (2023) found that graduates with training customized to industry expectations displayed a greater level of adaptability and were more easily incorporated into the workforce. The independent variable in this hypothesis is the alignment of the curriculum with industry needs, while the dependent variable is graduate employability.

#### **H6: Resource Allocation and Infrastructure**

The sixth hypothesis postulates that adequate resource allocation and modern infrastructure within vocational colleges contribute to an improved learning environment for logistics students. Lo' (2021) study points to the disparities in resources among vocational schools in China, whereby the rural and economically disadvantaged areas experience significant underfunding. Lo' (2021) further argues that while national guidelines exist, resource availability often limits their implementation. Thus, the concept of 'key national schools' signifies a standard many schools cannot meet due to insufficient resources. Guo, Huang, and Zhang (2019) also note a lack of clear minimum standards for equipment and teaching staff, including the other vital resources in vocational education nationwide. According to Guo, Huang, and Zhang (2019), having access to modern facilities and enough learning resources increases students' interest and performance in various logistics-related jobs. Besides, Xu and Ouyang (2022) found that universities with sophisticated technology and adequate learning resources helped students better understand complicated logistical operations. The independent factors in this hypothesis are resource

allocation and infrastructure, while the dependent variable is the learning environment for logistics students.

### **H7: Student Engagement and Motivation**

Encouraging high levels of student involvement and motivation through interactive learning methodologies and extracurricular activities improves the overall effectiveness of logistics talent training. According to Chiu (2023), information becomes accessible to the students whenever it engages their cognition. Hence, it becomes important to give the students both autonomy to select how to engage with the various learning materials and a diversity of methods for them to learn and assess their skills. Yang et al. (2019) revealed that active student engagement in logistics-related competitions and seminars significantly increased their critical thinking and problem-solving skills. Chen et al. (2021) discovered that motivated and engaged students showed a greater interest in logistics theory and practical applications, resulting in improved learning outcomes. The independent factors in this hypothesis include student involvement and motivation, while the dependent variable is the overall success of logistics talent training.

## **3 Research Methodology**

### **3.1 Research Method**

This study's research methodology is mainly quantitative. The study settles on quantitative methodology due to its systematic and data-driven character (Wu et al., 2021). The study also settled on surveys as the primary data-gathering strategy. The survey thoroughly examines the numerous aspects influencing the quality of logistics talent training in vocational colleges. Hence, surveys enable the collection of measurable data, facilitating statistical analysis and identifying significant patterns and correlations among the discovered variables (Sheikh et al., 2022). Hence, the adoption of the above strategy will seek to provide objective ideas into the factors influencing logistics talent training in Zhejiang Province. Hence, the method will help the production of data-backed recommendations for improvement.

### **3.2 Data Collection Methods**

Surveys will be distributed to 50 students and 20 professors from Zhejiang Province vocational institutions, including Zhejiang Industry Polytechnic College Shaoxing, Huzhou Vocational and Technical College, Wenzhou Vocational and Technical College, Lishui Vocational Technical College, and Jiaxing Vocational Technical College. Participants will be chosen based on their direct participation in logistics-related courses and activities. The students will equally be selected based on their assurance of personal knowledge and industry experience. Participants will be encouraged to offer responses based on their experiences and observations in Internet and print surveys. Specific insights about the specified factors, like curriculum design, faculty qualifications, industry relevance, technological integration, practical training, resource allocation, infrastructure, student engagement, and motivation, are captured in the survey questions.

### 3.3 Data Analysis

The survey is subjected to quantitative analysis with statistical tools like SPSS (Statistical Package for the Social Sciences). The study will use descriptive statistics and correlations, including regression analysis, to identify significant patterns, relationships, and potential areas for improvement in the logistics talent training process. The data analysis process yields understanding and relevant conclusions. Hence, the data allows the formulation of data-based suggestions and plans for improving the quality of logistics talent training in Zhejiang Province.

### 4 Results and Discussion Analysis

**Table 1** Descriptive statistics on Student's response

|                |         | Statistics                                                                                               |                                                                                                                                                  |                                                                                                                                       |                                                                                                                       |                                                                                                                                                           |                                                                                                                     |                                                                                                                                               |                                                                                                                                  |
|----------------|---------|----------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|
|                |         | How would you rate the relevance of the current logistics curriculum to the industry's evolving demands? | To what extent do you think the faculty members' expertise and industry experience have contributed to your understanding of logistics concepts? | How would you rate the integration of modern technologies (such as simulation tools and software) in enhancing your technical skills? | Do you feel that the curriculum is adequately aligned with the current needs and standards of the logistics industry? | How beneficial has the practical training and exposure to real-world industry scenarios been in preparing you for the challenges of the logistics sector? | How satisfied are you with the availability of resources and infrastructure for logistics training in your college? | How do you assess the overall effectiveness of the logistics talent training program in preparing you for a career in the logistics industry? | How engaged do you feel in the logistics talent training program, and what factors contribute to your motivation in the program? |
| N              | Valid   | 50                                                                                                       | 50                                                                                                                                               | 50                                                                                                                                    | 50                                                                                                                    | 50                                                                                                                                                        | 50                                                                                                                  | 50                                                                                                                                            | 50                                                                                                                               |
|                | Missing | 0                                                                                                        | 0                                                                                                                                                | 0                                                                                                                                     | 0                                                                                                                     | 0                                                                                                                                                         | 0                                                                                                                   | 0                                                                                                                                             | 0                                                                                                                                |
| Mean           |         | 3.40                                                                                                     | 2.94                                                                                                                                             | 1.32                                                                                                                                  | 3.52                                                                                                                  | 1.38                                                                                                                                                      | 3.24                                                                                                                | 2.84                                                                                                                                          | 2.48                                                                                                                             |
| Median         |         | 4.00                                                                                                     | 3.00                                                                                                                                             | 1.00                                                                                                                                  | 4.00                                                                                                                  | 1.00                                                                                                                                                      | 3.00                                                                                                                | 3.00                                                                                                                                          | 3.00                                                                                                                             |
| Mode           |         | 4                                                                                                        | 3                                                                                                                                                | 1                                                                                                                                     | 4                                                                                                                     | 1                                                                                                                                                         | 3                                                                                                                   | 3                                                                                                                                             | 3                                                                                                                                |
| Std. Deviation |         | .808                                                                                                     | .913                                                                                                                                             | .551                                                                                                                                  | .505                                                                                                                  | .567                                                                                                                                                      | .591                                                                                                                | .548                                                                                                                                          | .677                                                                                                                             |
| Sum            |         | 170                                                                                                      | 147                                                                                                                                              | 66                                                                                                                                    | 176                                                                                                                   | 69                                                                                                                                                        | 162                                                                                                                 | 142                                                                                                                                           | 124                                                                                                                              |

Table 1 displays the descriptive statistics on the students' perceptions of many areas of the logistics talent training program. According to Table 1's mean ratings, students believe the current logistics curriculum to be moderately relevant to industry expectations by presenting a mean of 3.40. Similarly, the use of modern technology to develop technical abilities presented a low mean rating of 1.32. The low mean in developing technical skills indicates space for progress in this area. Besides, the mean rating for practical training and exposure to real-world industrial settings was equally very low, 1.38. the mean shows that students do not feel adequately equipped for the logistics sector's issues.

On the other hand, the evaluations for curriculum conformity with industry demands had a mean of 3.52, and the availability of resources and infrastructure for logistics training showed a mean of 3.24, implying that they are generally good. Hence, a more positive perception of the availability of resources in the institutions. Since the overall effectiveness of the logistics talent training program in the schools is moderate, with a mean of 2.84, there is room for improvement to better prepare students for careers in the logistics industry. Therefore, better practical training experiences and resource allocation could considerably improve students' readiness for logistical obstacles. This would ultimately contribute to their overall engagement and motivation within the program. Thus, the result points to the need to resolve the disparities between perceived curriculum efficacy and practical training experiences, including incorporating current technologies. The findings suggest a revised curriculum that better represents contemporary industrial demands and uses technology to provide a more thorough and practical learning experience. Also, practical training experiences and resources should be improved.

**Table 2** Descriptive statistics on professionals

| Statistics             |         |                                                                                                                            |                                                                                                           |                                                                                                                                                       |                                                                                                                              |                                                                                                                                                                                |                                                                                                                                                                       |                                                                                                                                           |
|------------------------|---------|----------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|
|                        |         | In your opinion, how crucial is the alignment of the logistics talent training program with current industry requirements? | What key skills or knowledge gaps have you observed in recent graduates entering the logistics workforce? | What improvements do you think are necessary in the current logistics talent training programs to better prepare students for the industry's demands? | How do you rate the competency level of graduates from the vocational colleges in Zhejiang Province in the logistics sector? | What specific challenges have you encountered in implementing the PDCA Quality Management Theory in the context of logistics talent training, and how have you addressed them? | In your experience, how effective is the application of the PDCA Quality Management Theory in improving the logistics talent training process in vocational colleges? | How important is it for vocational colleges to have adequate resources and infrastructure to support effective logistics talent training? |
| N                      | Valid   | 20                                                                                                                         | 20                                                                                                        | 20                                                                                                                                                    | 20                                                                                                                           | 20                                                                                                                                                                             | 20                                                                                                                                                                    | 20                                                                                                                                        |
|                        | Missing | 0                                                                                                                          | 0                                                                                                         | 0                                                                                                                                                     | 0                                                                                                                            | 0                                                                                                                                                                              | 0                                                                                                                                                                     | 0                                                                                                                                         |
| Mean                   |         | 1.2500                                                                                                                     | 2.4000                                                                                                    | 2.1500                                                                                                                                                | 2.3000                                                                                                                       | 1.7500                                                                                                                                                                         | 1.5000                                                                                                                                                                | 1.3000                                                                                                                                    |
| Median                 |         | 1.0000                                                                                                                     | 2.0000                                                                                                    | 2.0000                                                                                                                                                | 2.0000                                                                                                                       | 2.0000                                                                                                                                                                         | 1.0000                                                                                                                                                                | 1.0000                                                                                                                                    |
| Mode                   |         | 1.00                                                                                                                       | 2.00                                                                                                      | 1.00                                                                                                                                                  | 2.00                                                                                                                         | 2.00                                                                                                                                                                           | 1.00                                                                                                                                                                  | 1.00                                                                                                                                      |
| Std. Deviation         |         | .44426                                                                                                                     | 1.09545                                                                                                   | 1.08942                                                                                                                                               | .65695                                                                                                                       | .63867                                                                                                                                                                         | .68825                                                                                                                                                                | .47016                                                                                                                                    |
| Variance               |         | .197                                                                                                                       | 1.200                                                                                                     | 1.187                                                                                                                                                 | .432                                                                                                                         | .408                                                                                                                                                                           | .474                                                                                                                                                                  | .221                                                                                                                                      |
| Skewness               |         | 1.251                                                                                                                      | .149                                                                                                      | .488                                                                                                                                                  | .842                                                                                                                         | .253                                                                                                                                                                           | 1.076                                                                                                                                                                 | .945                                                                                                                                      |
| Std. Error of Skewness |         | .512                                                                                                                       | .512                                                                                                      | .512                                                                                                                                                  | .512                                                                                                                         | .512                                                                                                                                                                           | .512                                                                                                                                                                  | .512                                                                                                                                      |
| Range                  |         | 1.00                                                                                                                       | 3.00                                                                                                      | 3.00                                                                                                                                                  | 3.00                                                                                                                         | 2.00                                                                                                                                                                           | 2.00                                                                                                                                                                  | 1.00                                                                                                                                      |
| Sum                    |         | 25.00                                                                                                                      | 48.00                                                                                                     | 43.00                                                                                                                                                 | 46.00                                                                                                                        | 35.00                                                                                                                                                                          | 30.00                                                                                                                                                                 | 26.00                                                                                                                                     |

Table 2 shows a mean rating of 1.25, in which the professionals appear to call for integration of the logistics personnel training program with current industry requirements. Also, the professionals discovered many critical skills and knowledge gaps among recent graduates. The gaps in skills show the need for a more thorough and industry-relevant curriculum. Also, professionals have expressed moderate satisfaction with graduates' proficiency levels, indicating possible areas for development in the vocational education system. Despite recognizing the importance of the PDCA model, the mean rating of 1.5 indicates a mixed opinion of its efficiency in improving the logistics talent training process in vocational colleges. Besides, the data indicates that experts agree on the proper resources and infrastructure to enable effective logistics talent training in vocational institutions.

**Table 3** Correlations between the variables

| Correlations                                                                                                                                              |                     |                                                                                                          |                                                                                                                                                  |                                                                                                                                       |                                                                                                                       |                                                                                                                     |                                                                                                                                               |                                                                                                                                  |                                                                                                                                                           |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|----------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                                           |                     | How would you rate the relevance of the current logistics curriculum to the industry's evolving demands? | To what extent do you think the faculty members' expertise and industry experience have contributed to your understanding of logistics concepts? | How would you rate the integration of modern technologies (such as simulation tools and software) in enhancing your technical skills? | Do you feel that the curriculum is adequately aligned with the current needs and standards of the logistics industry? | How satisfied are you with the availability of resources and infrastructure for logistics training in your college? | How do you assess the overall effectiveness of the logistics talent training program in preparing you for a career in the logistics industry? | How engaged do you feel in the logistics talent training program, and what factors contribute to your motivation in the program? | How beneficial has the practical training and exposure to real-world industry scenarios been in preparing you for the challenges of the logistics sector? |
| How would you rate the relevance of the current logistics curriculum to the industry's evolving demands?                                                  | Pearson Correlation | 1                                                                                                        | .310                                                                                                                                             | .165                                                                                                                                  | -.170                                                                                                                 | -.077                                                                                                               | .055                                                                                                                                          | -.246                                                                                                                            | .107                                                                                                                                                      |
|                                                                                                                                                           | Sig. (2-tailed)     |                                                                                                          | .029                                                                                                                                             | .252                                                                                                                                  | .238                                                                                                                  | .596                                                                                                                | .703                                                                                                                                          | .085                                                                                                                             | .460                                                                                                                                                      |
|                                                                                                                                                           | N                   | 50                                                                                                       | 50                                                                                                                                               | 50                                                                                                                                    | 50                                                                                                                    | 50                                                                                                                  | 50                                                                                                                                            | 50                                                                                                                               | 50                                                                                                                                                        |
| To what extent do you think the faculty members' expertise and industry experience have contributed to your understanding of logistics concepts?          | Pearson Correlation | .310                                                                                                     | 1                                                                                                                                                | .039                                                                                                                                  | -.064                                                                                                                 | -.086                                                                                                               | -.060                                                                                                                                         | .048                                                                                                                             | .124                                                                                                                                                      |
|                                                                                                                                                           | Sig. (2-tailed)     | .029                                                                                                     |                                                                                                                                                  | .788                                                                                                                                  | .660                                                                                                                  | .551                                                                                                                | .677                                                                                                                                          | .743                                                                                                                             | .392                                                                                                                                                      |
|                                                                                                                                                           | N                   | 50                                                                                                       | 50                                                                                                                                               | 50                                                                                                                                    | 50                                                                                                                    | 50                                                                                                                  | 50                                                                                                                                            | 50                                                                                                                               | 50                                                                                                                                                        |
| How would you rate the integration of modern technologies (such as simulation tools and software) in enhancing your technical skills?                     | Pearson Correlation | .165                                                                                                     | .039                                                                                                                                             | 1                                                                                                                                     | .123                                                                                                                  | -.366                                                                                                               | .241                                                                                                                                          | .127                                                                                                                             | .060                                                                                                                                                      |
|                                                                                                                                                           | Sig. (2-tailed)     | .252                                                                                                     | .788                                                                                                                                             |                                                                                                                                       | .394                                                                                                                  | .009                                                                                                                | .092                                                                                                                                          | .380                                                                                                                             | .679                                                                                                                                                      |
|                                                                                                                                                           | N                   | 50                                                                                                       | 50                                                                                                                                               | 50                                                                                                                                    | 50                                                                                                                    | 50                                                                                                                  | 50                                                                                                                                            | 50                                                                                                                               | 50                                                                                                                                                        |
| Do you feel that the curriculum is adequately aligned with the current needs and standards of the logistics industry?                                     | Pearson Correlation | -.170                                                                                                    | -.064                                                                                                                                            | .123                                                                                                                                  | 1                                                                                                                     | -.016                                                                                                               | -.062                                                                                                                                         | -.148                                                                                                                            | -.348                                                                                                                                                     |
|                                                                                                                                                           | Sig. (2-tailed)     | .238                                                                                                     | .660                                                                                                                                             | .394                                                                                                                                  |                                                                                                                       | .910                                                                                                                | .669                                                                                                                                          | .305                                                                                                                             | .013                                                                                                                                                      |
|                                                                                                                                                           | N                   | 50                                                                                                       | 50                                                                                                                                               | 50                                                                                                                                    | 50                                                                                                                    | 50                                                                                                                  | 50                                                                                                                                            | 50                                                                                                                               | 50                                                                                                                                                        |
| How satisfied are you with the availability of resources and infrastructure for logistics training in your college?                                       | Pearson Correlation | -.077                                                                                                    | -.086                                                                                                                                            | -.366                                                                                                                                 | -.016                                                                                                                 | 1                                                                                                                   | -.383                                                                                                                                         | .063                                                                                                                             | -.095                                                                                                                                                     |
|                                                                                                                                                           | Sig. (2-tailed)     | .596                                                                                                     | .551                                                                                                                                             | .009                                                                                                                                  | .910                                                                                                                  |                                                                                                                     | .006                                                                                                                                          | .663                                                                                                                             | .512                                                                                                                                                      |
|                                                                                                                                                           | N                   | 50                                                                                                       | 50                                                                                                                                               | 50                                                                                                                                    | 50                                                                                                                    | 50                                                                                                                  | 50                                                                                                                                            | 50                                                                                                                               | 50                                                                                                                                                        |
| How do you assess the overall effectiveness of the logistics talent training program in preparing you for a career in the logistics industry?             | Pearson Correlation | .055                                                                                                     | -.060                                                                                                                                            | .241                                                                                                                                  | -.062                                                                                                                 | -.383                                                                                                               | 1                                                                                                                                             | .046                                                                                                                             | .199                                                                                                                                                      |
|                                                                                                                                                           | Sig. (2-tailed)     | .703                                                                                                     | .677                                                                                                                                             | .092                                                                                                                                  | .669                                                                                                                  | .006                                                                                                                |                                                                                                                                               | .750                                                                                                                             | .165                                                                                                                                                      |
|                                                                                                                                                           | N                   | 50                                                                                                       | 50                                                                                                                                               | 50                                                                                                                                    | 50                                                                                                                    | 50                                                                                                                  | 50                                                                                                                                            | 50                                                                                                                               | 50                                                                                                                                                        |
| How engaged do you feel in the logistics talent training program, and what factors contribute to your motivation in the program?                          | Pearson Correlation | -.246                                                                                                    | .048                                                                                                                                             | .127                                                                                                                                  | -.148                                                                                                                 | .063                                                                                                                | .046                                                                                                                                          | 1                                                                                                                                | -.006                                                                                                                                                     |
|                                                                                                                                                           | Sig. (2-tailed)     | .085                                                                                                     | .743                                                                                                                                             | .380                                                                                                                                  | .305                                                                                                                  | .663                                                                                                                | .750                                                                                                                                          |                                                                                                                                  | .965                                                                                                                                                      |
|                                                                                                                                                           | N                   | 50                                                                                                       | 50                                                                                                                                               | 50                                                                                                                                    | 50                                                                                                                    | 50                                                                                                                  | 50                                                                                                                                            | 50                                                                                                                               | 50                                                                                                                                                        |
| How beneficial has the practical training and exposure to real-world industry scenarios been in preparing you for the challenges of the logistics sector? | Pearson Correlation | .107                                                                                                     | .124                                                                                                                                             | .060                                                                                                                                  | -.348                                                                                                                 | -.095                                                                                                               | .199                                                                                                                                          | -.006                                                                                                                            | 1                                                                                                                                                         |
|                                                                                                                                                           | Sig. (2-tailed)     | .460                                                                                                     | .392                                                                                                                                             | .679                                                                                                                                  | .013                                                                                                                  | .512                                                                                                                | .165                                                                                                                                          | .965                                                                                                                             |                                                                                                                                                           |
|                                                                                                                                                           | N                   | 50                                                                                                       | 50                                                                                                                                               | 50                                                                                                                                    | 50                                                                                                                    | 50                                                                                                                  | 50                                                                                                                                            | 50                                                                                                                               | 50                                                                                                                                                        |

\*, Correlation is significant at the 0.05 level (2-tailed).

\*\*, Correlation is significant at the 0.01 level (2-tailed).

In Table 3, there is a moderate positive correlation between students' ratings of the current logistics curriculum's relevance to the industry's evolving demands and their perception of faculty members' expertise, including the industry experience contributing to their understanding of logistics concepts ( $r = 0.310$ ,  $p = 0.029$ ). Since students see the relevance of the curriculum, they are more likely to attribute their understanding of logistical topics to faculty expertise. Also, the use of current technology to improve students' technical abilities has a weak positive link with students' perceptions of the curriculum's relevance ( $r = 0.165$ ,  $p = 0.252$ ) and faculty members' expertise ( $r = 0.039$ ,  $p = 0.788$ ). On the other hand, practical training and exposure to real-world industry circumstances show a modest negative connection with the perceived alignment with industry demands and standards ( $r = -0.348$ ,  $p = 0.013$ ). The findings imply that focusing on practical training and exposure may result in a perceived misalignment of the curriculum with industry needs. Hence indicating potential areas for improvement in the logistics talent training program. Besides, dissatisfaction with the availability of logistical training resources and infrastructure corresponds highly with the integration of current technologies ( $r = -0.383$ ,  $p = 0.006$ ), including the overall effectiveness of the training program ( $r = -0.383$ ,  $p = 0.006$ ). The result stresses the importance of proper resources and infrastructure in facilitating effective training.

**Table 4** Correlations between the variables on Professional's response

| Correlations                                                                                                                                                                   |                                                                                                                            |                                                                                                           |                                                                                                                                                       |                                                                                                                              |                                                                                                                                                                       |                                                                                                                                                                                |                                                                                                                                           |  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|--|
|                                                                                                                                                                                | In your opinion, how crucial is the alignment of the logistics talent training program with current industry requirements? | What key skills or knowledge gaps have you observed in recent graduates entering the logistics workforce? | What improvements do you think are necessary in the current logistics talent training programs to better prepare students for the industry's demands? | How do you rate the competency level of graduates from the vocational colleges in Zhejiang Province in the logistics sector? | In your experience, how effective is the application of the PDCA Quality Management Theory in improving the logistics talent training process in vocational colleges? | What specific challenges have you encountered in implementing the PDCA Quality Management Theory in the context of logistics talent training, and how have you addressed them? | How important is it for vocational colleges to have adequate resources and infrastructure to support effective logistics talent training? |  |
| In your opinion, how crucial is the alignment of the logistics talent training program with current industry requirements?                                                     | 1                                                                                                                          | .216                                                                                                      | .027                                                                                                                                                  | -.271                                                                                                                        | -.086                                                                                                                                                                 | .046                                                                                                                                                                           | .126                                                                                                                                      |  |
| Sig. (2-tailed)                                                                                                                                                                |                                                                                                                            | .360                                                                                                      | .909                                                                                                                                                  | .249                                                                                                                         | .718                                                                                                                                                                  | .846                                                                                                                                                                           | .597                                                                                                                                      |  |
| N                                                                                                                                                                              | 20                                                                                                                         | 20                                                                                                        | 20                                                                                                                                                    | 20                                                                                                                           | 20                                                                                                                                                                    | 20                                                                                                                                                                             | 20                                                                                                                                        |  |
| What key skills or knowledge gaps have you observed in recent graduates entering the logistics workforce?                                                                      | .216                                                                                                                       | 1                                                                                                         | -.318                                                                                                                                                 | -.249                                                                                                                        | -.419                                                                                                                                                                 | .301                                                                                                                                                                           | -.347                                                                                                                                     |  |
| Sig. (2-tailed)                                                                                                                                                                | .360                                                                                                                       | .172                                                                                                      | .290                                                                                                                                                  | .290                                                                                                                         | .066                                                                                                                                                                  | .197                                                                                                                                                                           | .133                                                                                                                                      |  |
| N                                                                                                                                                                              | 20                                                                                                                         | 20                                                                                                        | 20                                                                                                                                                    | 20                                                                                                                           | 20                                                                                                                                                                    | 20                                                                                                                                                                             | 20                                                                                                                                        |  |
| What improvements do you think are necessary in the current logistics talent training programs to better prepare students for the industry's demands?                          | .027                                                                                                                       | -.318                                                                                                     | 1                                                                                                                                                     | .007                                                                                                                         | .175                                                                                                                                                                  | .359                                                                                                                                                                           | .216                                                                                                                                      |  |
| Sig. (2-tailed)                                                                                                                                                                | .909                                                                                                                       | .172                                                                                                      |                                                                                                                                                       | .975                                                                                                                         | .459                                                                                                                                                                  | .120                                                                                                                                                                           | .361                                                                                                                                      |  |
| N                                                                                                                                                                              | 20                                                                                                                         | 20                                                                                                        | 20                                                                                                                                                    | 20                                                                                                                           | 20                                                                                                                                                                    | 20                                                                                                                                                                             | 20                                                                                                                                        |  |
| How do you rate the competency level of graduates from the vocational colleges in Zhejiang Province in the logistics sector?                                                   | -.271                                                                                                                      | -.249                                                                                                     | .007                                                                                                                                                  | 1                                                                                                                            | .233                                                                                                                                                                  | -.188                                                                                                                                                                          | .375                                                                                                                                      |  |
| Sig. (2-tailed)                                                                                                                                                                | .249                                                                                                                       | .290                                                                                                      | .975                                                                                                                                                  |                                                                                                                              | .323                                                                                                                                                                  | .427                                                                                                                                                                           | .103                                                                                                                                      |  |
| N                                                                                                                                                                              | 20                                                                                                                         | 20                                                                                                        | 20                                                                                                                                                    | 20                                                                                                                           | 20                                                                                                                                                                    | 20                                                                                                                                                                             | 20                                                                                                                                        |  |
| In your experience, how effective is the application of the PDCA Quality Management Theory in improving the logistics talent training process in vocational colleges?          | -.086                                                                                                                      | -.419                                                                                                     | .175                                                                                                                                                  | .233                                                                                                                         | 1                                                                                                                                                                     | -.060                                                                                                                                                                          | .163                                                                                                                                      |  |
| Sig. (2-tailed)                                                                                                                                                                | .718                                                                                                                       | .066                                                                                                      | .459                                                                                                                                                  | .323                                                                                                                         |                                                                                                                                                                       | .802                                                                                                                                                                           | .493                                                                                                                                      |  |
| N                                                                                                                                                                              | 20                                                                                                                         | 20                                                                                                        | 20                                                                                                                                                    | 20                                                                                                                           | 20                                                                                                                                                                    | 20                                                                                                                                                                             | 20                                                                                                                                        |  |
| What specific challenges have you encountered in implementing the PDCA Quality Management Theory in the context of logistics talent training, and how have you addressed them? | .046                                                                                                                       | .301                                                                                                      | .359                                                                                                                                                  | -.188                                                                                                                        | -.060                                                                                                                                                                 | 1                                                                                                                                                                              | .263                                                                                                                                      |  |
| Sig. (2-tailed)                                                                                                                                                                | .846                                                                                                                       | .197                                                                                                      | .120                                                                                                                                                  | .427                                                                                                                         | .802                                                                                                                                                                  |                                                                                                                                                                                | .263                                                                                                                                      |  |
| N                                                                                                                                                                              | 20                                                                                                                         | 20                                                                                                        | 20                                                                                                                                                    | 20                                                                                                                           | 20                                                                                                                                                                    | 20                                                                                                                                                                             | 20                                                                                                                                        |  |
| How important is it for vocational colleges to have adequate resources and infrastructure to support effective logistics talent training?                                      | .126                                                                                                                       | -.347                                                                                                     | .216                                                                                                                                                  | .375                                                                                                                         | .163                                                                                                                                                                  | .263                                                                                                                                                                           | 1                                                                                                                                         |  |
| Sig. (2-tailed)                                                                                                                                                                | .597                                                                                                                       | .133                                                                                                      | .361                                                                                                                                                  | .103                                                                                                                         | .493                                                                                                                                                                  | .263                                                                                                                                                                           |                                                                                                                                           |  |
| N                                                                                                                                                                              | 20                                                                                                                         | 20                                                                                                        | 20                                                                                                                                                    | 20                                                                                                                           | 20                                                                                                                                                                    | 20                                                                                                                                                                             | 20                                                                                                                                        |  |

The correlation analysis (Table 4) among professional responses depicts a moderately negative correlation between the professionals' stress on the logistics talent training program's alignment with current industry requirements and their assessment of the competency level of graduates from Zhejiang Province vocational colleges in the logistics sector ( $r = -0.271$ ,  $p = 0.249$ ). Also, recent logistics graduates' perceptions of essential skills or knowledge gaps correlate somewhat with obstacles experienced in implementing the PDCA model regarding logistics talent training ( $r = 0.301$ ,  $p = 0.197$ ). The findings imply that professionals' opinions of graduates' competency and the difficulties in implementing quality management theories are linked. The linkage points to the potential need for a more thorough and successful training program. Besides, professionals' assessment of the importance of adequate resources and infrastructure for effective logistics talent training correlates moderately with their emphasis on improving current training

programs to better prepare students for industry demands ( $r = 0.216$ ,  $p = 0.361$ ). The link points to the critical significance of adequate resources and infrastructure in facilitating an event.

The findings depict key elements determining the quality of logistics talent training in Zhejiang Province vocational colleges. The study reveals a positive association between curriculum alignment and industry expectations (Table 3), underscoring the importance of customizing educational content to match the increasing needs of the logistics sector. The observation is consistent with Smith and Johnson's (2019) research, which supports that curriculum should be linked to the changing demands of the business. The links will improve student engagement and higher job placement rates. Another factor is the faculty member's competencies. The study identified a positive association (Table 3) between faculty members' competence and industry experience, which calls for the use of skilled educators in providing comprehensive and practical logistics instruction in vocational institutes. Li and Yu's (2022) study established that instructor knowledge and increasing students' engagement and understanding of complicated logistics concepts are directly linked.

Resources and infrastructure are other factors that influence the quality of educational training. The negative correlation (Table 1) between the availability of logistics training resources and infrastructure and the overall effectiveness of the logistics talent training program supports the role of adequate resources in facilitating an effective learning environment. The findings of Guo, Huang, and Zhang (2019) call for the relevant stakeholders to ensure adequate facilities and learning resources to increase students' performance in logistics-related subjects. From the result, all the Professionals have mixed feelings about the efficiency of the PDCA model in improving the training process and the quality of logistics talent training (Table 4). The result suggests that, while the theory is acknowledged as significant, its application may not be as effective as hoped. Furthermore, the difficulties experienced in implementing the PDCA model indicate that certain challenges must be addressed to maximize the theory's impact on the logistics talent training process, as equally expressed by Xu and Ouyang (2022).

## 5 Conclusion

The paper also acknowledged the conflicting views on the efficiency of the PDCA paradigm and noted the difficulties connected with its implementation need to be addressed. Thus, the alignment of curriculum with industry expectations impacts student engagement and success in logistics talent training. Also, faculty members' expertise and industry experience significantly improve students' understanding and engagement with logistics concepts. Further, adequate resources and infrastructure are required to create a successful learning environment for logistics students.

The study recommends that the institutions adopt a curriculum that meets current industrial demands to boost student involvement and employability. Also, the institutions should prioritize faculty development to guarantee comprehensive and practical logistics education delivery. The institutions and educational stakeholders in China should invest in modern tools and facilities to offer an improved learning environment for logistics students. The devices will help them improve their technical skills and market readiness. Hence, implementing the named recommendations will enhance the quality of logistics talent training in vocational colleges in

Zhejiang Province. Improved quality of training will lead to the development of a skilled workforce that can effectively contribute to the growth and competitiveness of the region's logistics industry.

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