

CIPP model evaluation of ISO 9001 standardized practical learning for vocational school quality enhancement

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ABSTRACT

Ensuring the quality and industry relevance of practical learning in vocational schools is a critical challenge. This study evaluates the effectiveness of International Organization for Standardization (ISO) 9001-based practical learning programs in three Indonesian vocational high schools using the context, input, process, product (CIPP) evaluation model. A convergent parallel mixed-methods design was employed, involving surveys (N=144 stakeholders), in-depth interviews, and document analysis. The evaluation revealed the program's strengths in establishing a strong policy foundation, fostering a quality culture, and improving graduate competencies. However, critical weaknesses were identified in human resource capacity and inconsistent corrective action mechanisms. The research contributes theoretically by systematically integrating ISO 9001 with the CIPP model, offering a holistic evaluation framework. Practically, it provides stakeholders with an evidence-based diagnostic tool and recommendations to strengthen teacher capacity, optimize resources, and deepen industry collaboration for more relevant and sustainable vocational education.

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1. INTRODUCTION

Vocational education plays a strategic role in preparing skilled human resources to meet the demands of the rapidly changing job market, while supporting economic growth and national competitiveness. In developing countries such as Indonesia, the role of vocational high schools (SMK) is very central to produce graduates who are ready to enter the world of work [1]. However, various challenges still arise, especially in ensuring that the competencies of vocational graduates are truly aligned with the standards and expectations of the dynamic industrial world [2]. This misalignment not only has an impact on the rate of labor absorption, but also on the effectiveness and relevance of the vocational education system itself.

To answer these challenges, many vocational schools have adopted a quality management system based on the International Organization for Standardization (ISO) 9001 international standard. The implementation of this system is intended to ensure that learning practices, especially practical learning that is the heart of vocational education, take place in a standardized, consistent, and accountable manner [3]. ISO 9001 certification has been widely recognized as a tool to improve transparency and accountability, and build a framework for continuous improvement in educational institutions [4]–[6]. In the context of practical

learning, the principles of ISO 9001 are manifested in a structured cycle: starting with planning that refers to competency standards, followed by implementation that follows standard operating procedures, ending with evaluation and corrective actions for quality improvement.

In the era of industry 4.0, the demands on vocational graduates are increasingly complex and require rapid adaptation. The practical learning paradigm must also adapt to technological advances and evolving industry needs [7]. In such situations, a comprehensive evaluation of educational programs is key to assessing whether an educational initiative is achieving the desired results while ensuring its relevance to the current context [8]. Among the various evaluation models available, the context, input, process, product (CIPP) model developed by Stufflebeam [9] offers a holistic framework. In contrast to the evaluation model that focuses only on the final outcome, the CIPP model comprehensively examines four dimensions: contextual relevance, resource adequacy, implementation suitability, and results achieved [1], [10]. This multidimensional approach is particularly relevant for vocational education, where the quality of a program is determined not only by the final product, but also by alignment with industry needs and optimization of resource utilization [11]–[13].

However, a literature review reveals a significant gap. Although many studies have explored the application of ISO 9001 in education [6], [14], and many have used the CIPP model for program evaluation [10], [15], research that systematically integrates the two frameworks to evaluate ISO 9001-based practical learning programs in vocational schools is still very limited [16]. Previous studies tend to focus separately; some review ISO quality assurance mechanisms or only evaluate educational programs with the CIPP model [17], [18]. In fact, the integration between the systemic rigor of ISO 9001 and the diagnostic breadth of the CIPP model can provide a more complete and in-depth evaluation. This integration allows the evaluation not only to look at administrative compliance with standards, but also how they contribute to improving the quality of processes and practical learning outcomes at the classroom level—aspects that have often been overlooked in previous research [19]. Therefore, this study is here to explicitly fill this gap by evaluating ISO 9001-based practical learning programs in vocational schools using the CIPP evaluation model.

Based on the above background and identification of research gaps, the main objective of this study is to evaluate the effectiveness of ISO 9001-based practical learning programs in SMK using the CIPP evaluation model. More specifically, this study is designed to answer the following research questions: i) context-how is the contextual alignment of ISO 9001-based practical learning programs with the demands of the industrial world and school goals? ii) input-how adequate and ready are the input resources (such as teacher human resources, practice facilities, and documentation systems) supporting the program? iii) process-what is the quality of the process of implementing practical learning in the workshop/laboratory, including conformity with continuous improvement procedures and mechanisms? and iv) product-what are the results (products) of the program in the form of student competence, stakeholder satisfaction, and improvement of the school's quality culture?

By combining a mixed-methods approach that includes surveys, interviews, and document analysis in three certified vocational schools, this study is expected to provide a comprehensive and nuanced evaluative picture. Furthermore, the integration between the ISO 9001 standard and the CIPP model in this study not only provides a practical contribution in the form of diagnostic tools for school managers but also contributes to the development of an integrated evaluation model in the treasure trove of vocational education research.

2. RESEARCH BACKGROUND

A thorough evaluation of ISO 9001-based practical learning programs requires a solid theoretical foundation. Therefore, this literature review addresses three main pillars underlying the research: i) program evaluation in the context of vocational education; ii) the implementation of the ISO 9001 quality management system in vocational schools; and iii) the CIPP evaluation model. In the final part, a synthesis was carried out to establish the rationality of integration between ISO 9001 and the CIPP model, as well as to emphasize the research gaps to be filled.

2.1. Program evaluation in vocational education

Evaluation of an educational program is a systematic process of collecting, analyzing, and using information to determine the value, effectiveness, and feasibility of an educational initiative [20], [21]. In the context of vocational education that aims to prepare graduates for the world of work, the evaluation function is very crucial and complex. Evaluations are no longer just a measure of academic achievement but must be able to guarantee that the entire program is aligned with the real needs and evolving industry competency standards [1], [22].

A good evaluation process requires clear and measurable criteria and indicators of success. These criteria must include dimensions such as the relevance of the material to the industry, the quality of the

learning process, the efficiency of resource utilization, and the final impact on the mastery of competencies and work readiness of graduates [23]. Finally, evaluation in the vocational field needs to involve various stakeholders, including representatives from the business and industrial world (DUDI). This involvement ensures that the attributes of the graded graduates are indeed in accordance with expectations and needs in the workplace [24]. Thus, the evaluation of vocational programs is essentially an effort to ensure the accountability and relevance of education, as well as a basis for continuous improvement.

2.2. ISO 9001 quality management system in vocational schools

The ISO 9001 standard from the International Organization for Standardization is a globally recognized quality management framework that has been adopted by various sectors, including education. Its application in vocational schools is motivated by the desire to create a standardized, well-documented, and quality-oriented process in a sustainable manner [4]. ISO 9001's core principles such as customer focus, process approach, and evidence-based decision-making, when implemented appropriately, can foster a culture of quality across the school organization's levels.

In the context of practical learning, the implementation of ISO 9001 manifests itself in a rigorous operational cycle. This cycle starts from the planning stage, where schools prepare learning tools such as syllabus and learning implementation plans (RPP) that refer to the Indonesian National Work Competency Standards (SKKNI) and conduct an analysis of the needs of practical facilities and infrastructure [25], [26]. Furthermore, at the implementation stage (do), practical activities in workshops or laboratories must follow the standard operating procedures that have been set, with teachers acting as facilitators and quality supervisors who ensure work safety and procedural discipline of students [27]. The check stage is carried out through evaluation of student work results, internal audits, and satisfaction monitoring. The findings from this stage then become input for the action stage (act), in the form of process improvement, facility improvement, or teacher competence improvement [7], [8]. Ideally, this cycle forms a mechanism of continuous improvement that is embedded in the school's work culture.

Several empirical studies have examined the impact of the implementation of ISO 9001 in vocational schools. Positive findings include increasing the consistency of teaching quality, administrative efficiency, and increasing stakeholder trust in the institution [14]. However, on the other hand, many studies have also revealed various challenges and limitations. These challenges include the swelling of the administrative burden due to documentation, the emergence of resistance from teachers to change, and the existence of procedural formalisms where compliance with SOPs does not automatically guarantee a substantive improvement in the quality of learning [16], [28]. Another key factor in success is the strong commitment of school leadership and the availability of adequate resources, which unfortunately are not always met [14], [17]. This reality shows that ISO 9001 certification is not a guarantee of success; real value lies in how its principles are brought to life in everyday learning practice.

2.3. CIPP evaluation model

To assess the complexity of an educational program such as practical learning, a comprehensive evaluation model is needed. The CIPP model developed by Daniel Stufflebeam is one of the widely used models due to its broad scope and decision-making oriented for improvement [9]. This model evaluates four interrelated components: context, input, process, and product.

Context evaluation aims to analyze the needs, opportunities, and objectives that are the foundation of a program. Feedback evaluation focuses on assessing alternative strategies, work plans, and the adequacy of resources such as budgets, teachers, and facilities to be used. Process evaluation monitors program implementation directly, identifies constraints, and ensures its fit with the plan. Finally, outcome evaluation measures the achievement of programs, both intended and unintended, to assess their effectiveness and impact [29]–[31]. The main advantage of the CIPP model lies in its formative and holistic nature. This model not only provides evaluation at the end of the program (summative), but it also provides valuable feedback during the program's run, thus allowing for immediate improvement [5], [10].

In the context of vocational education, the CIPP model is considered very relevant because it is able to capture the multi-dimensionality of the program. A successful vocational training program is measured not only by students' test scores (product), but also by the suitability of the curriculum with industry needs (context), the feasibility of the workshop and the qualifications of the instructor (input), and the effectiveness of the teaching method in the classroom (process) [12], [32]. Several studies have applied the CIPP model to evaluate programs in vocational schools and have succeeded in comprehensively uncovering the strengths and weaknesses of programs [18], [33]. The flexibility and depth of this model's analysis make it a more powerful tool than other evaluation models that may focus solely on participant satisfaction levels or outcomes [34], [35].

2.4. Integration of ISO 9001 and the CIPP model: bridging the theoretical and practical gaps

A separate review of the literature on ISO 9001 and the CIPP model reveals that these two frameworks have great potential for synergies, but their integration in research is still limited. On the one hand, ISO 9001 provides a structured system for procedural and administrative quality assurance. However, the system is often criticized for risking getting caught up in bureaucratic formalism and lacking touch on deeper pedagogical aspects, such as the relevance of content and the quality of teaching-learning interactions [36], [37]. On the other hand, the CIPP model offers a rich and education-centric evaluation lens, capable of diagnosing contextual problems and learning processes. However, this model does not inherently provide the same operational standards or structured documentation system as ISO 9001 has [30].

The integration of these two approaches offers complementary solutions. The ISO 9001 framework can strengthen the Input and Process dimension in CIPP evaluations by providing a clear structure for resource documentation, work procedures, and monitoring records. In contrast, the CIPP model can enrich the ISO 9001 system by providing a methodology to critically evaluate the context (does the program really address the needs of stakeholders?) and outcomes (does the procedural standard really result in superior graduate competencies?). In other words, ISO 9001 answers the question: is the process doing things, right? while CIPP helps answer: are we doing the right things? and how well are the results? [38]–[40].

Some researchers have begun to advocate for this kind of integration. Guzmán Murillo and González Sánchez [39] argue that this combination can result in a balanced evaluation model, blending administrative rigor with educational relevance. However, empirical studies that explicitly and systematically apply the CIPP model to evaluate the effectiveness of ISO 9001 implementation, especially in practical learning settings in vocational schools, are still very rare [14], [18]. This absence is the main research gap. The majority of research so far addresses ISO 9001 or the CIPP model separately. Therefore, research that uses the CIPP model as the main evaluation framework to test how the ISO 9001 quality system operates and has an impact on the micro (learning process) and macro (graduate outcomes) levels in vocational schools is a necessity. This kind of research is expected to provide empirical evidence and a useful framework for schools to not only maintain certification but actively use their quality systems as tools to achieve more substantive educational goals.

3. RESEARCH METHOD

3.1. Research design and approach

This study uses mixed-methods research design. This approach was chosen to provide a comprehensive understanding of the effectiveness of the program, implementation challenges, and contextual relevance of the ISO 9001-based practical learning program. The integration of quantitative and qualitative data is intended to complement and triangulate, thereby strengthening the validity and reliability of the findings [41]. Quantitative data is used to objectively measure stakeholder perceptions and trends in learning outcomes, while qualitative data offers in-depth insights and narratives related to implementation practices and institutional dynamics. Figure 1 illustrates the overall flow of the evaluation process, starting from CIPP-based planning, parallel data collection, analysis, to integration of findings.

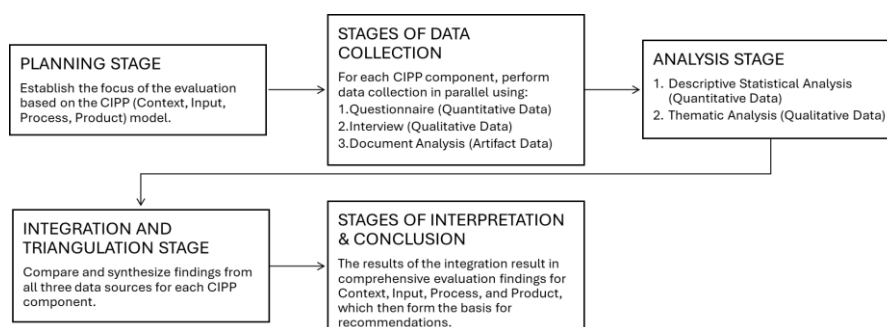


Figure 1. program evaluation process flow with CIPP model and mixed-methods approach

3.2. Research context and participants

The research was carried out in three SMK in the Special Region of Yogyakarta that have maintained ISO 9001:2015 certification for at least three years. The selection of these three schools was carried out purposively with the following considerations: i) depth of implementation: a minimum certification period of

three years is considered sufficient to pass the initial adoption phase, so that the quality system is considered to have been embedded in school operations; ii) research eligibility: the number of three schools allows for in-depth research while maintaining limited time and resources for comparative analysis; and iii) contextual variation: all three schools represent slightly different contexts (geographic location, access to industry, resource profile), which is expected to provide data variety that enriches the analysis. The schools are SMK Negeri II Depok Sleman (SMK A), SMK Negeri III Yogyakarta (SMK B), and SMK Negeri Pengasih Kulonprogo (SMK C). The research participants were key stakeholders of the ISO 9001-based practical learning program, with a total of 144 participants. Sampling techniques vary according to the strategic role of each group to ensure the representativeness and depth of information, as detailed in Table 1.

Table 1. Composition, sampling techniques, and rationale of research participants

Stakeholder groups	Number per school	Total	Sampling technique	Rationale
Principal	1	3	Purposive (total population)	The ultimate policy determinant and the main person responsible for the implementation of the quality system
Vice principal for curriculum	1	3	Purposive (total population)	The person in charge of integrating quality principles into learning design
Vice principal for quality	1	3	Purposive (total population)	Responsible for the operation and audit of the ISO 9001 quality management system
Head of expertise program	3	9	Purposive (total population)	The person in charge of the technical implementation of practical learning in certain competencies
Practical subject teacher	10	30	Simple random from the list of practical teachers	Implementers directly in the field; Random picking minimizes bias and captures the variety of experiences
Students (class XII engineering program)	30	90	Randomly stratified per skill program	Direct recipients (end-users) of the program; stratification ensures representation of different areas of practice
Industry partners/DUDI	2	6	Purposive based on partnership intensity	Provides a critical external perspective on the relevance and outcomes of the program
Grand total	48	144		

Notes: purposive sampling of the total population was applied to the leadership and management groups (Nos. 1-4) because they were limited in number and each held a unique role that was crucial to the research. Meanwhile, samples from groups of teachers and students (No. 5-6) were taken at random to generalize the findings at the level of implementers and students in each school. Industry partners are purposively selected based on the depth of their involvement with the school.

3.3. Data collection procedures and justification

The data was collected over an 18-month period, from January 2024 to June 2025. This long duration is necessary to observe the plan-do-check-act (PDCA) cycle that is at the core of the ISO 9001 quality management system. In addition, this period allows observation of internal and external audit processes, as well as school corrective responses, resulting in comprehensive and contextual data. Three main methods of data collection are used, namely surveys, interviews, and document analysis.

The survey used a structured questionnaire with a five-point Likert scale to measure stakeholder perceptions of the four dimensions of CIPP. Semi-structured interviews were conducted with a selected sample of each stakeholder group to dig into their experiences and in-depth views. Document analysis is carried out on institutional records such as quality manuals, standard operating procedures, audit reports, and curriculum materials to confirm and enrich primary data.

3.4. Research instruments and measurement

This research instrument was developed based on the evaluation framework of the CIPP model and the principles of the ISO 9001:2015 quality management system. The three main instruments used were questionnaires, semi-structured interview guides, and document analysis sheets. To measure stakeholders' perceptions of the four dimensions of CIPP, the survey questionnaire used a Likert scale from 1 to 5, where 1 means strongly disagree and 5 means strongly agree. The items in the questionnaire are compiled based on operational indicators derived from CIPP components and ISO 9001 principles. For example, a key statement for the context dimension is "An ISO 9001-based practical learning program is designed based on an analysis of competency needs from the industrial world." For the Input dimension, an example of a statement would be "The school provides practical equipment in the workshop that meets the latest industry standards." In the process dimension, there are statements such as "Corrective actions identified in internal audits are implemented consistently to improve the quality of learning." As for the product dimension, one of the statements is "I believe the implementation of ISO 9001 has increased the work readiness of graduates of this school."

The second instrument is a semi-structured interview guide that contains open-ended questions. These questions are specifically designed for each stakeholder group to dig into their experiences, challenges, and deep understanding. For example, for the principal or vice principal for quality, the guiding question asked is “How is the evaluation and improvement mechanism (PDCA) of the ISO 9001 quality system operationalized in the context of practical learning?” For teachers, the question is “Can you explain how ISO documentation (such as standard operating procedures or SOPs) affects the planning and execution of your teaching activities in the workshop?” Students were asked about “What do you feel are the advantages and disadvantages of a highly structured practical activity with fixed procedures?” While industry partners get questions like “From the experience of accepting interns or graduates, do you observe a change in their competencies or work attitudes in line with the implementation of quality systems in schools?”

The third instrument is a document analysis sheet designed to extract qualitative and quantitative data from various official school documents. The documents analyzed include quality system documents such as quality books, SOP of workshops, and internal and external audit reports. In addition, academic documents including syllabus, learning implementation plan, and teaching materials were also analyzed. The third group of documents is the result document, which consists of the student competency test score record, certificate, and alumni placement report.

The relationship between the components of CIPP evaluation, aspects assessed, data sources, and instruments used are systematically summarized in Table 2. Furthermore, the conceptual relationship between the four components of CIPP evaluation, the National Education Standard, and the ISO 9001 quality assurance system which is the basis for the development of this research instrument is visualized in Figure 2.

Table 2. Data collection planning matrix based on CIPP model

Components CIPP	Evaluation aspects (examples)	Data source	Data collection instruments
Context	Alignment of program objectives with industry needs; the policy basis for the implementation of ISO 9001	Policy documents, interview with the principal and vice principal	Document analysis, interview
Input	Availability and adequacy: teacher human resources, practice facilities, and SOP documents	Teacher registration and training, workshop inventory, SOP documents, teacher and program head interview	Document analysis, observation; questionnaire, interview
Process	Implementation of learning according to SOP; effectiveness of evaluation and improvement mechanisms (PDCA)	Observation of workshop activities, audit reports, teacher and student interviews	Observation, questionnaire, interviews, document analysis (audit report)
Product	Achievement of student competencies; stakeholder satisfaction; quality culture	Competency test scores, alumni absorption data, satisfaction questionnaire, industry interviews	Questionnaire, document analysis (grades, certificates), interview

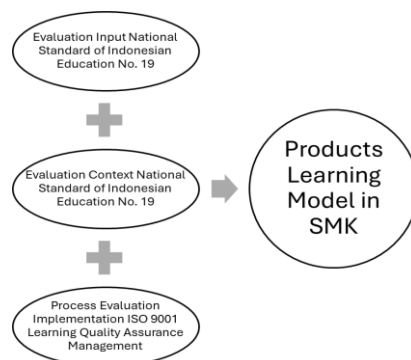


Figure 2. Data collection methods and procedures in the CIPP evaluation framework

3.5. Data analysis techniques

Data analysis was carried out separately for the quantitative and qualitative parts before being integrated. In terms of the quantitative data analysis, survey data is analyzed using descriptive statistics (such as mean, percentage) to identify trends and patterns of stakeholder response. This analysis provides an overview of program performance on each dimension of the CIPP. For the qualitative data analysis, interview data was transcribed and analyzed using thematic analysis [42]. The process includes familiarization with the data, initial code creation, grouping code into themes, and theme review. The emerging themes are then mapped into the

four-component framework of the CIPP to facilitate contextual interpretation. Findings from surveys, interviews, and document analysis are then triangulated. For example, quantitative findings about low resource readiness will be checked against interview narratives and budget documents. Final interpretation is done by combining and comparing evidence from various sources to build a strong and credible conclusion [43].

To increase the credibility of the findings, this study applied triangulation by comparing and synthesizing evidence from different data sources. This process is operationalized through a convergence matrix during the data analysis stage. For example, in evaluating the aspect of “compliance with SOPs” that are included in the process dimension, the integration of three types of data is carried out. Quantitative data was obtained from the average score of teacher and student responses to survey statements regarding the implementation of SOPs. Qualitative data was collected from narratives and excerpts of interviews with teachers as well as students describing their first-hand experiences of implementing or sometimes deviating from such standard procedures. Furthermore, document data is checked through the results of direct observation in the work workshop or findings of non-conformities recorded in the internal audit report. By juxtaposing and confirming these three sources of evidence in one analytical framework, this study aims to build a more complete and reliable understanding of the phenomenon studied.

These three data sets were then compared. Convergence occurs if, for example, survey scores are high, the interview narrative supports compliance, and there are no negative findings in the audit. Complementarity occurs if, for example, survey scores are moderate, but the interview reveals specific reasons why SOPs are sometimes not followed. If there are contradictions (e.g., a high survey score but a full audit of findings), this will be explored further in the interpretation to understand the discrepancies. In this way, triangulation is not only for validation, but also for deepening understanding. Figure 3 illustrates the principle of triangulation by using various methods to confirm data from the same source.

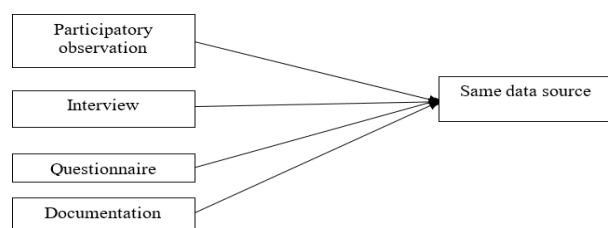


Figure 3. Concept of triangulation method

3.6. Validity, reliability, and trustworthiness

Several steps are taken to ensure the methodological rigor of the research. The validity of the questionnaire content is guaranteed through expert review by three vocational education and quality assurance experts. The reliability of the instrument is measured using the Cronbach alpha coefficient. The Alpha value for all CIPP dimensions was above 0.80, indicating strong internal consistency [44]. The results of the validity and reliability tests are presented in Table 3 and Table 4, respectively. For qualitative strands, credibility is maintained through member checking, where a summary of findings is confirmed by several participants. Peer debriefing and trail audit during the analysis process are also carried out to ensure transparency and accountability.

Table 3. Validity test

No	Components	Instrument	Validity	Note
1	Context	User answers	0.436	Valid
2	Input	Student achievement and	0.355	Valid
		Performance teacher competency	0.359	Valid
3	Process	Instrumen implementation	0.311	Valid
		Teacher, student, and industry response	0.507	Valid
4	Product	User response	0.373	Valid

Table 4. Reliability test

No	Components	Cronbach's	Reliability	Note
1	Context	User	0.86	Reliabel
2	Input	Competency	0.96	Reliabel
3	Process	Instrument implementation	0.75	Reliabel

4. RESULTS AND DISCUSSION

This chapter presents and discusses the findings of the evaluation of the ISO 9001-based practical learning program using the CIPP model. The analysis was carried out on four evaluation dimensions: context, input, process, and product. Before presenting the findings, Table 5 defines the aspects and success criteria used to evaluate the practical learning program in vocational schools, which are the reference in data collection and analysis. The discussion began with a context evaluation and ended with a thorough synthesis using radar diagrams.

Table 5. Aspects and evaluation criteria for practical learning programs at vocational schools

Variable	Aspects evaluated	Success criteria
Learners	Learning activities in the laboratory; utilization of the library	Conduct of scheduled practical sessions (KBM) in the lab; minimum number of library visits recorded
Curriculum	Availability of curriculum documents, syllabus, and RPP	Existence of updated curriculum documents, syllabi, and RPPs
Teaching and learning activities	Suitability of the material with competence; Quality of teaching preparation; level of interaction in learning; use of media/modules	Teaching materials match competency standards; lesson plans are prepared; active interaction observed during learning; learning media/modules are utilized
Learning outcome assessment	Implementation of mid-term (UTS) and final (UAS) assessments	UTS and UAS assessments are systematically conducted and documented
Learning facilities	Availability of books and learning media	Adequate books and functional learning media are available
Educators	Ability to make lesson plans, develop media, conduct evaluations, and assign tasks/exams	Teachers consistently develop lesson plans, create media, evaluate, and provide assignments/exams
Learning outcomes	Achievement in daily tests, UTS, and UAS	Evidence of student assessment results from daily tests, UTS, and UAS

4.1. Context evaluation: policy foundations and industry alignment

Contextual evaluation focuses on the analysis of needs, institutional objectives, and alignment of the program with external demands, particularly industry.

4.1.1. Context evaluation findings

Analysis of documents and interviews revealed that the implementation of ISO 9001 in all three schools was driven by the need to improve the consistency of the quality of practical learning and ensure its alignment with industry standards. A formal quality policy has been set by the school leadership. Survey data shows that 88.3% of teachers understand the policy basis of implementing ISO 9001 in their schools. In terms of alignment with industry, most principals (87%) and teachers (82%) agree that ISO adoption helps align school practices with the needs of the job market. However, assessment before implementation varies. SMK A and SMK B show a comprehensive approach by involving internal and external stakeholders, while SMK C is more limited to administrative aspects. This strategic intention was affirmed by the principal, who stated, “*The application of ISO in practical learning aims to ensure consistency in the quality of the process and learning outcomes, so that the competence of graduates is in accordance with industry standards and meets the expectations of graduate users*” (Principal, SMK A). The survey’s quantitative data for the context component resulted in an average score of 3.78 (on a scale of 1-5) which was categorized as “Good”. Among the three aspects, policy foundations obtained the highest score (4.21), followed by program objectives (3.86), and needs analysis (3.54). This score comparison is visualized in Figure 4.

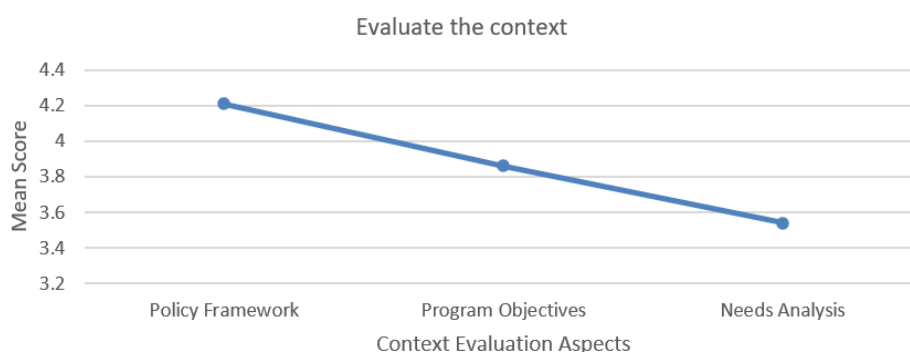


Figure 4. Results of the context evaluation of the ISO 9001 standard practical learning program

4.1.2. Discussion of context findings

These findings are in line with clause 5.3 of ISO 9001:2015 which emphasizes the importance of top management's commitment in establishing and communicating quality policies [6]. A high score for policy foundations indicates strong institutional commitment, which Li *et al.* [25] refer to as a prerequisite for total quality management. However, variations in needs analysis, particularly in SMK C, reveal weak points. As Rochmawati *et al.* [45] reveal, inadequate needs analysis can lead to misalignment between program implementation and actual needs. This gap becomes even more critical when industry partners report that the curriculum in some programs (e.g., business) is lagging behind digital transformation trends. This shows that despite a strong policy framework, feedback mechanisms and curriculum updates that are responsive to industry changes still need to be strengthened. Contextual evaluation thus successfully identifies key strengths (policy commitments) as well as critical areas for improvement (dynamic needs analysis and curriculum relevance).

4.2. Input evaluation: resource adequacy and teacher readiness

Evaluation of inputs assesses the adequacy and readiness of resources that support the implementation of the program.

4.2.1. Input evaluation findings

There is a variation in the readiness of resources in the three schools. In terms of human resources, the percentage of practical subject teachers who have received ISO 9001 training is 85% at SMK A, 72% at SMK B, and only 53% at SMK C. Interviews revealed that some teachers, especially at SMK C, have not fully understood how to integrate ISO principles into learning planning and implementation. On the other hand, the workshop infrastructure at SMK A and B is considered more complete and reflects industry standards than SMK C. All schools have developed a comprehensive documentation system, albeit with different levels of technological adoption (electronic, hybrid, and manual). This understanding gap among teachers was acknowledged by the deputy head of quality, who explained, *"Not all practical teachers understand well how to integrate the principles of ISO 9001 in the planning, implementation, and evaluation of practical learning. Some still consider ISO 9001 to be just an administrative matter"* (vice principal for quality, SMK B). The average score of the feedback evaluation is 3.62 (Good). Infrastructure received the highest score (3.89), followed by documentation (3.67), funding (3.51), and human resources (3.41). This comparison is shown in Figure 5.

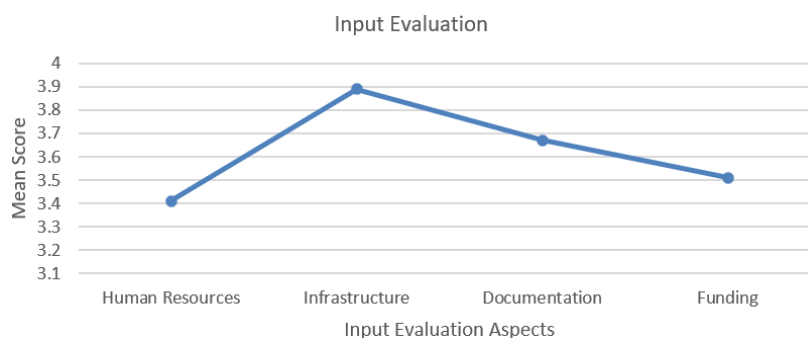


Figure 5. Evaluation results of input for ISO 9001 standard practical learning programs

4.2.2. Discussion of input findings

The inequality between physical infrastructure readiness and human resource capacity confirms the findings of Saputro *et al.* [10] that human resource capacity is often a major challenge in the implementation of ISO 9001 in education. Teacher readiness is a determining factor for the successful transfer of quality management principles to pedagogical practices [32]. The low human resource score, especially in SMK C, hints at the urgent need for continuous professional development that is not only administrative, but also pedagogical. Meanwhile, a robust documentation system complies with Clause 4.2 of ISO 9001 and is a pillar for audits and improvements [14]. Differences in documentation management, especially the adoption of electronic systems in SMK A, reflect better readiness for digital transformation, which is essential in the era of industry 4.0 [17]. These findings show that ISO 9001 certification has successfully encouraged

documentation standardization and infrastructure improvements, but has not evenly ensured teacher capacity building, which is the most crucial input in the education process.

4.3. Process evaluation: implementation fidelity and continuous improvement

Process evaluation investigates the quality of program implementation, including planning, learning implementation, evaluation, and improvement mechanisms.

4.3.1. Process evaluation findings

Practical learning planning in all three schools has followed standard procedures and involved industry partners (especially SMK A and B) in the preparation of the curriculum. The head of expertise program explained this collaboration, “*We always involve industry partners in curriculum development workshops and practical learning planning. This ensures that the materials and competencies taught are in accordance with the latest industry needs*” (head of expertise program, SMK A). Observations show that teachers generally adhere to SOPs during learning, and 82.3% of students state the instructions in the worksheets are clear. However, only 68.7% of students were satisfied with the feedback they received during the practice sessions, indicating weaknesses in formative assessments. In terms of continuous improvement actions, the implementation of the PDCA cycle varies. SMK A implements it fully, SMK B partially, while SMK C has difficulties in comprehensive implementation. The average score for the process evaluation was 3.73 (Good). Planning achieved the highest score (3.92), followed by learning evaluation (3.84), implementation (3.68), and corrective actions (3.48). Figure 6 visualizes this comparison.

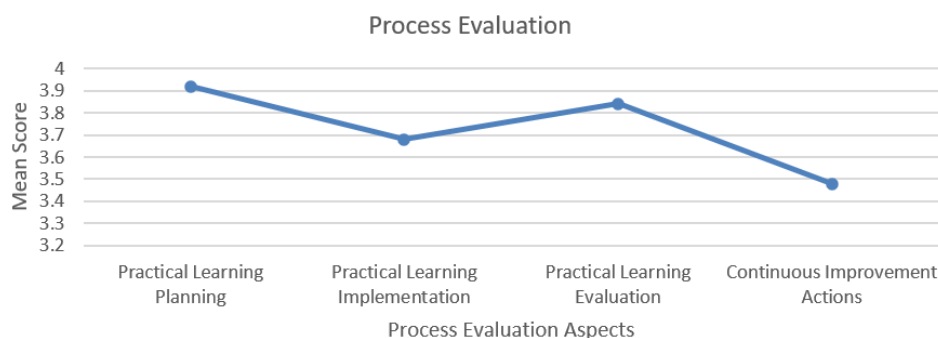


Figure 6. Results of the evaluation of the ISO 9001 standard practical learning program process

4.3.2. Process findings discussion

The pattern of findings in which planning is stronger than corrective action is consistent with the report of Setiawan *et al.* [43]. This reflects the challenges of closing the PDCA cycle, particularly in the “act” phase. In fact, as emphasized in Deming’s philosophy, this cycle must be fully implemented to achieve true sustainable improvement [41]. The industry’s involvement in planning is a manifestation of the “customer-focused” principle of ISO 9001 and a key factor of vocational education relevance [46], [47]. However, student satisfaction with low feedback and variations in the implementation of corrective actions reveals that quality principles have not been fully internalized in daily pedagogical practice in all schools. Widodo *et al.* [22] affirms that the effectiveness of ISO 9001 in education depends on contextualizing its principles into the teaching process. The findings of this process highlight that procedural standardization (through SOPs) has been achieved, but building a culture of evidence-based reflection and improvement at the grade level requires deeper effort and commitment.

4.4. Product evaluation: graduate competence and quality culture

The evaluation of results measures the impact of the program on graduate competence, stakeholder satisfaction, quality culture, and industry collaboration.

4.4.1. Product evaluation findings

The implementation of the program shows a positive impact. In two years, the average score of the practical exam increased by 11.3% and the pass rate of the vocational competency test increased from 89.7% to 96.5%. Industry representatives stated that graduates are more job-ready and familiar with standard procedures. A representative of industry partners detailed this increase, “*Graduates from these vocational*

schools have improved practical competencies in recent years. They are familiar with the standard procedures and documentation that we apply in the industry, so that their adaptation in the workplace is faster” (DU/DI representative). Stakeholder satisfaction levels are high: students (83.2%), teachers (87.5%), and industry partners (85.8%). Observations and interviews also reveal a significant development of quality culture in schools, characterized by increased awareness of standards, documented work, and systematic problem-solving approaches. Industry collaborations are also growing, with an average increase in the number of formal collaborations (MoUs) of 32.7% in three years. The average score of the evaluation of the results is 4.02 (Excellent). Quality culture scored highest (4.25), followed by graduate competence (4.12), stakeholder satisfaction (3.95), and industry collaboration (3.87). Figure 7 shows this comparison.



Figure 7. Evaluation results of ISO 9001 standard practical learning program products

4.4.2. Discussion of product findings

The improvement of graduate competencies shows that the program has succeeded in achieving the core goal of vocational education, which is to prepare a competent workforce [34]. The highest score for a quality culture is an important indicator of success, as it is this culture that will ensure the sustainability of the quality management system [26]. These findings are in line with Li *et al.* [25] that ISO 9001 plays an important role in shaping institutional quality culture. High stakeholder satisfaction, especially from industry, reflects increased relevance and external trust in institutions [23]. However, the relatively lower (although still good) industry collaboration score suggests that partnerships need to be deepened from simply providing a place for industrial work practice (*prakerin*) to involvement in curriculum development, applied research, and more strategic quality assurance. Overall, the evaluation of the results proves that ISO 9001-based practical learning has a measurable positive impact on both hard outcomes and the development of a quality-oriented learning environment (soft outcomes).

4.5. Synthesis and comparative analysis using the CIPP radar chart

To provide a comprehensive overview of the program's strengths and weaknesses, all findings from the four components of CIPP are synthesized. Table 6 summarizes the average and category scores for all aspects of the evaluation, providing a solid quantitative database. A comparative analysis across the three schools reveals a clear and consistent performance pattern, aligning with the qualitative narratives. SMK A demonstrated the most comprehensive implementation, characterized by strong leadership commitment, the highest rate of teacher training (85%), full adoption of the PDCA cycle, and advanced electronic documentation systems. SMK B showed a solid, intermediate level of implementation with notable strengths in curriculum planning involving industry. In contrast, SMK C faced significant challenges, particularly in building teacher capacity (only 53% trained), conducting in-depth needs analysis, and executing sustained corrective actions, indicating a more administrative approach to the ISO 9001 system. Based on the data in Table 6 and this comparative profile, a more intuitive visual analysis is presented using radar diagrams as in Figure 8. These diagrams allow for quick identification of the program's strengths and weaknesses patterns.

Analysis of the radar diagram reveals consistent patterns. Aspects related to policy, quality culture, and graduate competencies (policy foundation, quality culture, and graduate competencies) are in the strongest quadrant. This shows that the program is highly successful in building a managerial foundation and achieving the desired result. On the other hand, the aspects of human resources, corrective actions, and needs analysis are in a relatively lower position. This pattern is most pronounced in SMK C, while SMK A exhibits a more balanced profile across all quadrants.

This synthesis reinforces previous discussions. The strength of the program lies in its ability to create standardization and consistency (reflected in good process and product scores), as well as build quality commitment at the institutional level. The weakness lies in the aspect that requires sustained capacity and commitment at the individual (teacher) level and in adaptive feedback mechanisms. These findings are in line with criticism that ISO 9001 can be strong in systems but weak in human development and pedagogical innovation [16], [48]. Therefore, improvement recommendations should be focused on strengthening the aspects that are in the weak quadrant of this radar diagram.

Table 6. Results of the evaluation of all CIPP components

Component	Aspect	Average score	Category
Context	Policy foundation	4.21	Very good
Context	Program objectives	3.59	Good
Context	Needs analysis	3.54	Good
Input	Human resources	3.41	Good
Input	Infrastructure	3.89	Good
Input	Documentation	3.65	Good
Input	Funding	3.73	Good
Process	Learning planning	3.92	Good
Process	Learning implementation	3.68	Good
Process	Learning evaluation	3.84	Good
Process	Corrective actions	3.48	Good
Product	Graduate competencies	4.12	Very good
Product	Stakeholder satisfaction	3.95	Very good
Product	Quality culture	4.25	Very good
Product	Industrial collaboration	3.87	Good

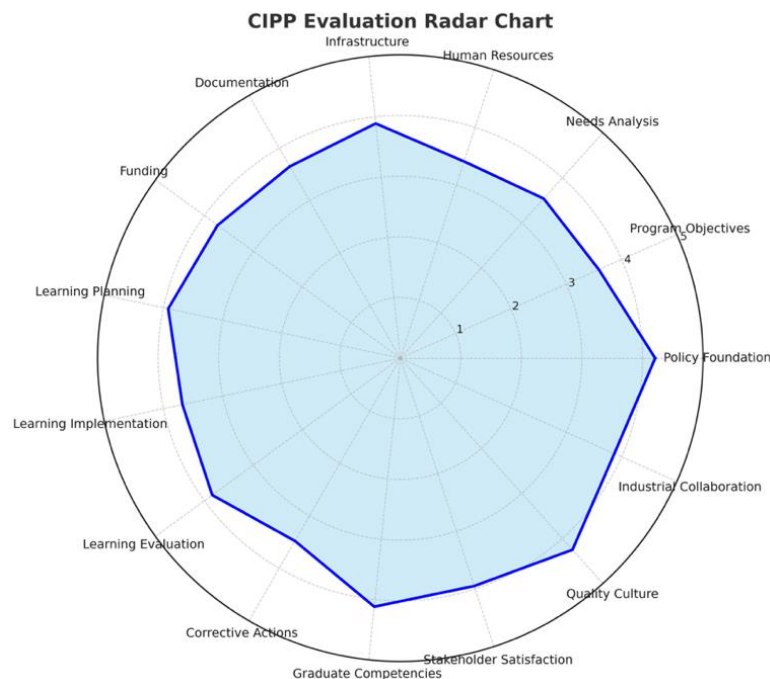


Figure 8. Radar chart of CIPP evaluation aspects

5. CONCLUSION

This study concludes that the implementation of ISO 9001-based practical learning programs in three vocational schools has generally been successful, supported by strong policy alignment and industry-oriented objectives. However, challenges remain in conducting systematic needs analyses, updating curricula, strengthening teachers' capacity to integrate quality principles into pedagogy, and institutionalizing the PDCA cycle, particularly the action phase. While the program has positively contributed to graduate competence, stakeholder satisfaction, and the development of a quality culture, collaboration with industry should evolve into more strategic partnerships.

The study contributes theoretically by demonstrating that integrating the ISO 9001 quality management framework with the CIPP evaluation model provides a more comprehensive approach to evaluating educational quality, encompassing contextual relevance, implementation processes, and learning outcomes. Empirically, the findings highlight both the benefits and the implementation challenges of ISO 9001 in vocational education.

Practically, the findings suggest that school leaders should prioritize continuous teacher professional development and strengthen feedback-based quality improvement systems, teachers should use ISO 9001 as a tool for reflective practice rather than administrative compliance, and policymakers should support post-certification mentoring, performance-based incentives, and stronger school-industry partnerships.

This study is limited by its focus on public vocational schools in selected technical fields, its reliance on partially self-reported data, and its cross-sectional design. Future research should include a broader range of school types and disciplines, employ longitudinal and comparative approaches, and examine effective professional development models that integrate quality management with innovative pedagogical practices.

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C : Conceptualization

M : Methodology

So : Software

Va : Validation

Fo : Formal analysis

I : Investigation

R : Resources

D : Data Curation

O : Writing - Original Draft

E : Writing - Review & Editing

Vi : Visualization

Su : Supervision

P : Project administration

Fu : Funding acquisition

CONFLICT OF INTEREST STATEMENT

The authors state there is no conflict of interest.

DATA AVAILABILITY

The data supporting this study's findings are available from the corresponding author, [GW], upon reasonable request.

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