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FROM COMPLIANCE TO PERFORMANCE: EVALUATING THE IMPLEMENTATION GAP OF ISO 9001:2015 IN INDONESIAN VOCATIONAL HIGH SCHOOLS

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Abstract
This study examines the implementation gap of ISO 9001:2015 in certified Vocational High Schools (VHS) in Indonesia using a cross-sectional, evaluative-quantitative design. Results show an overall implementation rate of 90%, with significant disparities across dimensions: Awareness (100%), Improvement (96%), and Evaluation (94%) demonstrated strong performance, while Resources showed the lowest implementation (75%). Three critical gaps were identified: problem-solving tools (44%), knowledge management (34%), and communication of urgency (33%). The study uncovers a systematic "documentation-practice gap" phenomenon of 22% across multiple indicators, reflecting challenges in translating formal compliance into operational practice within resource-constrained environments. To address these findings, we developed a three-phase strategic roadmap: technical capability development (0-6 months), system integration (6-12 months), and sustainable quality culture creation (12-24 months). This research contributes to the field by identifying the documentation-practice gap phenomenon, developing a systematic evaluation framework for vocational education, and establishing an achievable 90% implementation benchmark in developing countries. These findings provide an empirical foundation for vocational education quality policies in contexts with limited resources strategies to advance the quality and relevance of vocational education in developing contexts.

Keywords: Quality Management Systems, Vocational Education, Performance Gap Analysis, Documentation-Practice Gap, Problem-Solving Tools

1. INTRODUCTION

In today's era of technological disruption and global industrial transformation, quality assurance in vocational education has evolved beyond administrative procedure to become a strategic imperative that determines national economic competitiveness in the Industry 4.0 landscape (Ngatiman et al., 2023; Wafudu et al., 2022). The global shift toward standardized quality management systems reflects the growing recognition that educational quality directly impacts economic competitiveness and social development outcomes (Chaiwichit & Na, 2020; Widodo et al., 2025). This phenomenon is especially relevant in developing countries, where policymakers view vocational education as key to bridging the gap between educational systems and evolving industry demands (Vyas et al., 2023).

Indonesia's vocational education system presents a complex context for ISO 9001:2015 implementation, with significant diversity in school characteristics, ranging from Vocational High Schools (VHS) with modern facilities

in urban areas to schools with limited infrastructure in remote regions (Purwanto et al., 2020). This disparity is reflected in varying levels of management, facilities, and community support that influence educational quality across different regions (Legowo et al., 2020). Limitations in training and teaching experience in remote areas also negatively impact teachers' pedagogical competencies (Fairman et al., 2019). This diversity makes Indonesia a representative case study for understanding the challenges and opportunities of implementing international quality standards in developing country settings with high regional disparities (Oroh et al., 2020).

Despite many Indonesian VHSs having adopted ISO 9001:2015, preliminary evidence indicates substantial gaps between certification achievement and actual implementation (Nurcahyo et al., 2019). Feedback from industry points to persistent quality issues, while variations in graduate quality across certified institutions demonstrate inconsistencies in standards application (Meirani & Intania, 2023). These gaps underscore the need for more systematic empirical research on the depth and effectiveness of ISO 9001:2015 implementation in Indonesian VHSs (Gamit et al., 2024).

Previous studies also tend to document ISO 9001:2015 adoption rates without providing a systematic analysis of implementation depth. These studies rarely examine all quality dimensions simultaneously (Jingura et al., 2019). A significant research gap lies in the limited comprehensive analysis of disparities between system documentation ownership (compliance) and actual field implementation (performance), particularly in vocational education contexts (Villegas, 2022). This challenge is especially evident in resource-constrained institutions where ISO 9001:2015 implementation often faces obstacles in sustainability and organizational culture adaptation to change (Cabreros & Barbacena, 2024).

Moreover, few studies have specifically examined the implementation of ISO 9001:2015 (latest version) in VHSs using a systematic and comprehensive evaluative approach (da Fonseca et al., 2019). This gap becomes critical because ISO 9001:2015 introduces paradigmatic changes in quality management approaches, including risk-based thinking, stronger leadership, and focus on organizational context, aspects requiring specific research in vocational education settings (Jasmine, 2020). Systematic literature reviews reveal that the implementation of risk-based thinking in ISO 9001:2015 still shows fragmented perspectives and requires an integrated approach combining extensive methods with daily practices embedded in organizational culture (Martins et al., 2022).

This research is designed to contribute to the international discourse on educational quality management by: (1) providing empirical evidence on ISO 9001:2015 implementation patterns in developing country contexts; (2) identifying systematic barriers that may be common in similar educational environments; and (3) developing an evidence-based framework for quality improvement that can inform policy in comparable global settings. Thus, this research has relevance not only for the Indonesian context but also for practitioners and policymakers in other developing countries facing similar challenges.

Specifically, this research aims to: (1) identify and analyze the implementation status of ISO 9001:2015 QMS in VHSs across seven main dimensions—organizational context, leadership, planning, resources, operations, performance evaluation, and improvement; (2) measure and analyze implementation gaps between system documentation ownership and actual field application; (3) identify inhibiting and supporting factors for ISO 9001:2015 QMS implementation in VHSs; and (4) formulate strategic recommendations to optimize ISO 9001:2015 QMS implementation in VHSs.

The results of this research are expected to provide significant contributions in several aspects. First, providing an empirical basis for formulating more effective vocational education quality improvement policies. Second, providing a reference for other VHSs that are currently implementing or planning to implement ISO 9001:2015 to anticipate challenges and optimize implementation approaches. Third, offering important insights on bridging the gap between theory and practice in quality management system implementation in vocational education contexts. Fourth, providing realistic implementation benchmarks for educational institutions in developing countries with limited resources.

Thus, this research serves not only as an evaluation of current practices but also as a potential contributor to developing quality management system implementation theory in the context of vocational education in developing countries. Through a systematic and evidence-based approach, the results of this research are expected to facilitate more effective adoption of international standards and are anticipated to contribute to improving vocational education quality globally.

2. LITERATURE REVIEW

Previous research on the implementation of Quality Management Systems (QMS) in vocational education institutions reveals diverse approaches and varying outcomes. Despite significant increases in formal adoption of quality standards, many vocational education institutions struggle to integrate these standards into daily operational practices (Iqbal, 2024). Empirical studies demonstrate substantial differences between institutions that merely obtain ISO 9001 certification and those that genuinely internalize its principles into their organizational culture (Tian, 2023).

Systematic reviews of ISO 9001 implementation studies in educational settings reveal several consistent gap patterns. Excessive documentation requirements lead to "compliance fatigue," whereby staff allocate disproportionate time and energy to fulfilling formal documentation requirements (Silaeva & Semenov, 2018). Additionally, institutions encounter difficulties translating abstract principles such as "leadership" and "process approach" into concrete operational practices (Krooi et al., 2024). Research also indicates resistance from teaching staff who perceive QMS as an additional administrative burden that diverts focus from their primary teaching responsibilities (Rincón-Moreno & Gordillo-Ramírez, 2025).

The Implementation Science Framework offers a comprehensive approach for analyzing innovations such as ISO 9001:2015 implementation in complex organizational contexts (Irsyada et al., 2018). Unlike conventional linear implementation models, this framework conceptualizes implementation as a dynamic process influenced by interacting factors at micro (individual), meso (organizational), and macro (contextual) levels. Implementation success is determined not only by the innovation's characteristics but also by implementer characteristics, implementation strategies, and implementation context (Mielke et al., 2022).

At the individual level, technical competence serves as a critical determinant in QMS implementation. Limited proficiency in problem-solving tools such as Fishbone Diagrams and Plan-Do-Check-Act (PDCA) cycles constitutes a significant barrier to effective quality management system implementation in educational institutions (Ward et al., 2024) Longitudinal studies indicate that intensive training in problem-solving methodologies can significantly enhance ISO 9001 implementation effectiveness in schools, highlighting technical competence as an implementation predictor (Fernández-Cruz et al., 2019). These findings align with the Implementation Science Framework's postulate that implementer characteristics, including knowledge and skills, influence implementation quality (Scott et al., 2022).

At the organizational level, resource management emerges as a critical factor in QMS implementation. Educational institutions frequently experience difficulties allocating resources effectively to support QMS implementation, particularly regarding staff competency development and supporting infrastructure (Sherstobitova & Iskoskov, 2020). The primary challenge lies not in absolute resource limitations but in optimizing available resource utilization (Shen, 2023). The Implementation Science Framework emphasizes that while resource availability constitutes a strong predictor of implementation success, resource allocation strategies aligned with implementation objectives are even more crucial (Palmieri, 2023).

Phased implementation approaches have proven effective in vocational education contexts with various limitations. Studies examining QMS implementation across educational institutions reveal that institutions adopting a phased approach with initial focus on capacity development demonstrate more sustainable implementation levels compared to those implementing comprehensive simultaneous approaches (Aamer et al., 2021). These studies identify three critical phases: foundational capacity development, system integration, and quality culture institutionalization. This approach aligns with the "staged implementation" concept in the Implementation Science Framework, which emphasizes the importance of proper sequencing and timing in complex innovation implementation (Sherwani et al., 2025).

While the documentation-practice gap phenomenon has been identified in various studies, it remains underexplored as a theoretical construct. Although several researchers have identified this phenomenon, systematic efforts to operationalize and measure it are lacking (Parast & Safari, 2023). The Theory of Planned Behavior can help explain this phenomenon by highlighting how perceived behavioral control influences the gap between intention (reflected in documentation) and actual behavior (Sørlie, 2021). Within the implementation science context, this gap can be understood as a fidelity implementation issue requiring specific strategies to bridge conceptual and operational aspects (Stewart et al., 2023).

A comprehensive evaluation of existing research reveals several significant literature gaps. Most studies employ

one-dimensional approaches that fail to capture dynamic interactions among implementation dimensions (Agmon et al., 2022). Furthermore, quantitative exploration of the documentation-practice gap as a measurable phenomenon remains limited. Another gap concerns the scarcity of studies applying comprehensive theoretical frameworks, such as the Implementation Science Framework, to analyze QMS implementation in vocational education institutions with resource constraints. The literature also indicates limited research developing evidence-based staged implementation models contextualized for vocational education settings (Zhang et al., 2023).

The Implementation Science Framework offers a comprehensive approach for understanding QMS implementation complexity in vocational education institutions. This framework integrates various analysis levels (individual, organizational, contextual) while simultaneously considering implementation processes and outcomes (Cann et al., 2024). With its focus on bridging the research-practice gap, this framework can facilitate a deeper understanding of the documentation-practice gap phenomenon and identify more effective implementation strategies (Hofmann & Ilie, 2022). Utilizing the Implementation Science Framework, supported by insights from the Theory of Planned Behavior for specific implementation gap aspects, provides a comprehensive theoretical approach for analyzing and optimizing QMS implementation in vocational education contexts (Vasiliou et al., 2021).

3. RESEARCH METHOD

3.1 Research Design

We employed an evaluative-quantitative research design with a cross-sectional approach to assess the implementation of ISO 9001:2015 Quality Management System in Vocational High Schools. We selected the evaluative design for its capability to systematically assess implementation effectiveness and gaps based on established standard criteria. The research workflow consisted of five interconnected phases, beginning with a preparation phase that included instrument development based on ISO 9001:2015 clauses, instrument validity and reliability testing, and research sample determination. Subsequently, the data collection phase was conducted through questionnaire distribution to all respondents to obtain comprehensive information. In the data analysis phase, all information was tabulated and analyzed using descriptive statistics and content analysis to produce a holistic overview of QMS implementation.

Based on these analysis results, the gap identification phase was conducted by analyzing disparities between document ownership and actual implementation, which then formed the basis for the final phase: evidence-based recommendation formulation for QMS implementation optimization. To ensure comprehensive evaluation, this research utilized the Context, Input, Process, Product (CIPP) evaluation model developed by Stufflebeam as an analytical framework, with modifications aligned to ISO 9001:2015 dimensions, thus enabling thorough evaluation of all QMS implementation aspects, from organizational context to continuous improvement processes.

3.2 Research Subject Characteristics

This research was conducted at eight Vocational High Schools in West Java, Indonesia, that had implemented and obtained ISO 9001:2015 certification. We selected research subjects using purposive sampling, with three inclusion criteria: ISO 9001:2015 certification status, presence of a Management Representative, and willingness to participate in the study. As primary respondents, we involved eight Management Representatives, each representing one VHS.

The selection of Management Representatives as respondents was based on their strategic role in implementing and maintaining quality management systems in educational institutions. These respondents possessed adequate qualifications, demonstrated by their participation in ISO 9001:2015 internal auditor training and direct experience in conducting internal audits at their schools, enabling them to provide accurate data regarding quality management system implementation.

3.3 Data Collection Process

We collected data using a structured questionnaire based on the eight dimensions of the ISO 9001:2015 quality management system. This questionnaire consisted of 88 items distributed across the dimensions of Quality Management System Awareness (7 items), Organizational Context (8 items), Leadership (6 items), Planning (5 items), Resources (17 items), Operations (8 items), Evaluation (25 items), and Improvement (11 items). Each

questionnaire item was designed with a Yes/No question format that distinguished between document ownership aspects ("Possessed") and actual implementation ("Applied"), and was supplemented with open-ended questions to identify specific field practices.

To ensure data quality and accuracy, we took several important measures, including providing direct assistance during questionnaire completion to clarify questions that might be insufficiently understood by respondents, and assigning specially trained research teams to conduct the entire data collection process in a standardized manner.

3.4 Data Analysis

We conducted data analysis through several interrelated phases. Descriptive statistical analysis was applied to process quantitative data collected through the questionnaire. Through this analysis, percentages of document/procedure ownership and actual implementation percentages were generated for each dimension and indicator, which then became the basis for calculating implementation gaps. Based on gap magnitude, categorization was performed into high (30-44%), moderate (20-29%), and low (10-19%) gaps.

To facilitate interpretation, descriptive analysis results were presented in tables, graphs, and diagrams. Subsequently, gap analysis was conducted comparing the implementation status quo with expected standards by calculating percentage differences between ownership and implementation for each indicator. We then integrated all analysis results to produce comprehensive findings regarding QMS implementation status, critical gaps requiring attention, factors hindering implementation, and evidence-based recommendations for optimizing ISO 9001:2015 Quality Management System implementation in Vocational High Schools.

4 RESULTS

4.1 Implementation Status and Gap Categories

Quality Management System (QMS) implementation in Vocational High Schools (VHS) demonstrated an overall achievement of 90% (SD = 8.5%), indicating relatively good adoption levels across all participating institutions. The standard deviation of 8.5% indicates implementation differences among VHSs, though generally within an acceptable range for vocational education settings. This achievement places VHSs in a relatively favorable position compared to average quality standard implementation in developing countries.

Figure 1 presents the implementation status across eight QMS dimensions, revealing significant variations in achievement levels. The horizontal axis represents the QMS dimensions, while the vertical axis shows the implementation percentage achieved in each dimension. The Awareness dimension achieved perfect implementation (100%), followed by Improvement (96%) and Evaluation (94%), demonstrating a strong foundation in quality awareness and commitment to continuous improvement.

Conversely, the Resources dimension showed the lowest implementation (75%), indicating substantial challenges in resource mobilization and optimization. This pattern reveals a paradox where the most fundamental aspects have been well-mastered, yet resource operationalization still faces significant obstacles.

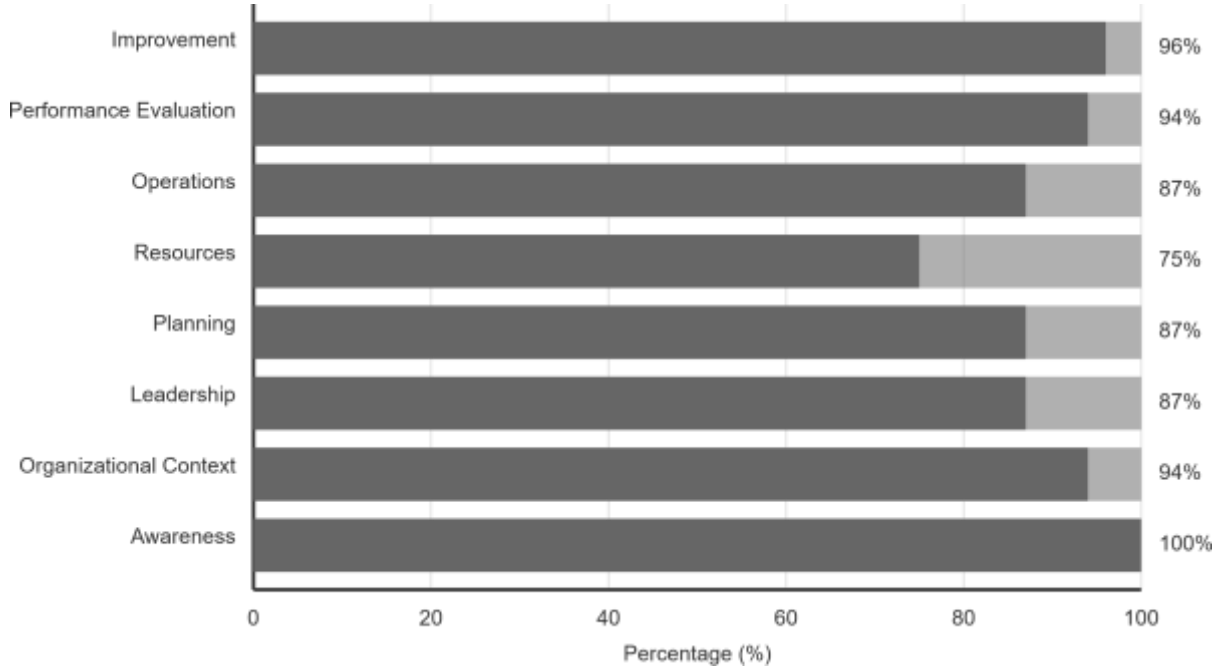

Figure 1. QMS Implementation Profile in VHSs

Based on the implementation profile above, a detailed analysis of 92 indicators reveals clear gaps at various levels of complexity and technical requirements. Table 1 presents the categorization of implementation gaps based on their magnitude, providing insights into the nature of implementation challenges faced by VHSs. This categorization helps identify improvement priorities and allocate resources more effectively.

Table 1. Gap Categorization Analysis

Gap Category	Range	Indicators (n)	% of Total	Primary Examples
Critical	>30%	3	3.30%	Problem-solving tools (44%), Knowledge management (34%), Urgency communication (33%)
High	20-29%	15	16.30%	Vision-mission implementation (22%), Supplier management (22%), HR evaluation (22%)
Moderate	10-19%	10	10.90%	Top management involvement (11%), Job description (11%), Quality objectives (11%)
Low	<10%	64	69.60%	Awareness indicators, Internal audit, Policy documentation

The categorization results show an interesting gap distribution, where 69.6% of indicators achieve full or nearly full implementation, while only 3.3% face critical implementation challenges. The distribution pattern indicates that basic QMS components are well-established, yet technical and methodological aspects requiring specialized expertise still need significant attention. Critical gaps are concentrated in areas requiring specific technical competencies, such as problem-solving tools and knowledge management, indicating the need for more focused capacity-building interventions.

4.2 Documentation-Practice Gap and Technical Competence

The data reveals a consistent pattern showing an average 22% gap between document ownership and actual implementation across various indicators. Table 2 illustrates examples of the documentation-practice gap across key indicators. This phenomenon indicates that VHSs have succeeded in developing documentation and formal standards but face systematic challenges in operationalizing these processes into daily practices. The largest gaps occur in risk and opportunity identification and resource provider evaluation, where despite high documentation availability (89%), implementation only reaches 67%.

Table 2. Documentation-Practice Gap

Indicator	Documentation (Possessed)	Implementation (Applied)	Gap
Vision-mission implementation	100%	78%	22%
External issue analysis	100%	78%	22%
Stakeholder needs identification	100%	78%	22%
Risk and opportunity identification	89%	67%	22%
Resource provider evaluation	89%	67%	22%

Complementing the documentation-practice phenomenon, technical competence gaps show a more complex pattern. Problem-solving tools experience a 44% implementation gap (56% implementation), while measurement and monitoring show a larger gap of 56% (44% implementation). Knowledge management has a 34% gap (44% implementation), and urgency communication shows a 33% gap (67% implementation). These gap patterns confirm that although VHSs have a high commitment to quality improvement, the implementation of systematic methodologies to address quality issues remains suboptimal.

The waterfall analysis (Figure 2) provides a more holistic perspective on each dimension's contribution to the overall implementation gap of 10%. The Resources dimension contributes the largest share (-25%), followed by Leadership, Planning, and Operations (each -13%), while Organizational Context and Evaluation each contribute -6%. The emerging paradox shows that the dimension with the highest potential impact (Resources) demonstrates the lowest implementation, while fundamental QMS components such as awareness and commitment are well-established.

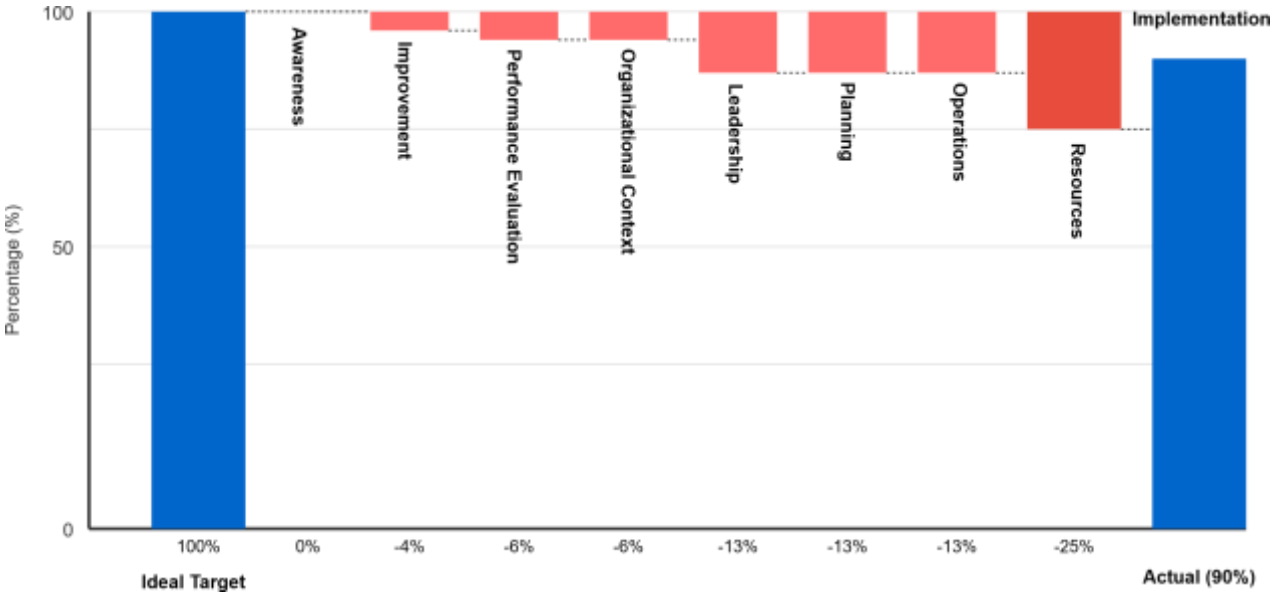

Figure 2. Waterfall Analysis of Gap Contributions

A deeper analysis of the Resources dimension reveals specific challenges in translating documentation into operational practices. Document management SOP implementation shows significant variation from 67% to 89%,

reflecting inconsistencies in standard procedure application. Human resource management implementation shows better performance with a range of 78% to 89%, yet still demonstrates gaps requiring attention.

The largest gap in this dimension occurs in technical aspects such as measurement and monitoring, where implementation reaches only 44%, indicating an urgent need for technical capacity development and more effective monitoring systems.

4.3 Implementation Patterns Across Dimensions and Key Finding Synthesis

Our dimensional analysis revealed significantly different implementation patterns across QMS components. The Evaluation dimension showed relatively consistent implementation (94%), with management review meeting agendas achieving 78-100% implementation, realized review meeting outputs ranging from 89-100%, and data utilization for various evaluation purposes reaching 89-100%. The Improvement dimension demonstrated the second-highest performance (96%), where all basic improvement indicators (complaint response, preventive action, documentation) reached 100% implementation. However, the use of problem-solving tools/methods reached only 56%, becoming a primary area for improvement.

Beyond these dimensional patterns, our synthesis of findings identified three main patterns from the data analysis. Technical competency gaps represented the largest pattern, occurring in aspects requiring specific technical competencies such as problem-solving tools and knowledge management. This indicates the need for capacity development programs focused on methodologies and technical tools.

The documentation-practice gap emerged as a consistent phenomenon across multiple indicators, suggesting systematic challenges in translating formal procedures into operational reality. Finally, resource utilization showed paradoxical patterns, where areas with potentially the highest impact demonstrated the lowest implementation levels.

5 DISCUSSION

The 90% achievement (SD = 8.5%) in ISO 9001:2015 implementation in Indonesian VHSs demonstrates significant progress. This positions these institutions above the developing country average and approaches OECD country standards (Rodriguez-Arnaldo & Martínez-Lorente, 2021). This achievement indicates the capacity of Indonesian vocational education institutions to adopt international standards despite resource limitations. The moderate standard deviation (8.5%) shows variation within acceptable limits, suggesting implementation challenges that are operational rather than structural (Ngwekazi et al., 2023).

5.1 Analysis of Implementation Gap Patterns

The implementation differential across dimensions reveals complex organizational transformation dynamics. High implementation rates in the Awareness (100%) and Improvement (96%) dimensions demonstrate that VHSs have successfully moved beyond formal compliance. These schools are now internalizing quality principles—a positive indicator for system sustainability (Mtitu, 2025). Conversely, the lowest implementation in the Resources dimension (75%) is consistent with research in other developing countries that identifies resource constraints as a primary barrier to QMS implementation (Rezaee & Pooya, 2019).

We identified a consistent 22% documentation-practice gap in QMS implementation within educational institutions. Previous studies have identified similar patterns, with gaps ranging from 20-25% (Cook et al., 2019). This pattern indicates that while VHSs have established formal QMS infrastructure, they face significant challenges in translating documentation into sustainable operational practices.

The Theory of Planned Behavior explains this phenomenon: formal infrastructure does not automatically generate behavioral change if staff feel they lack adequate competence or authority (perceived behavioral control) (Medisauskaite et al., 2021).

These findings reinforce the perspective that in developing countries, quality improvement efforts are often oriented toward formal compliance rather than substantive improvement (Eryilmaz, 2024). In the Indonesian VHS context, this phenomenon indicates the need for a holistic implementation approach involving documentation, change management, and capacity development (Kalbarczyk et al., 2023).

5.2 Technical Competence Gaps and Resource Optimization

Building on the analysis of implementation gaps, we now examine the specific technical competencies that require attention. The identified technical gaps—problem solving tools (44%) and knowledge management (34%)—reveal priority areas for targeted interventions. These findings align with research identifying technical competence as a primary differentiator between successful and problematic QMS implementation in vocational education (Limón-Romero et al., 2024). The gaps are particularly critical because problem-solving tools form the foundation for continuous improvement (Singh et al., 2024), consistent with the cyclical improvement approach emphasized in quality management systems, essential for effective organizational transformation (Negrete et al., 2020).

The Resources dimension's contribution to the implementation gap (-25%) indicates systemic challenges requiring fundamental reorientation in resource management. This paradox, where the dimension with the highest potential impact shows the lowest implementation, can be explained through perspectives that acknowledge the non-linear character of educational systems. These gaps closely relate to technical aspects such as measurement (44%) and knowledge management (44%), indicating that the primary challenge lies not in resource availability but in optimization of their use (Golubovsky, 2023).

This perspective aligns with the Resource-Based View, emphasizing that effective human resource management and continuous development are crucial for quality improvement in educational institutions (Wu & Gu, 2022). Research suggests that strategic resource allocation using analytical methodologies can significantly reduce implementation gaps in quality management systems (Rezaee & Pooya, 2019). Further, developing dynamic capabilities in educational institutions enables better adaptation to changing requirements and sustainable quality improvement processes (Liu & Xie, 2024).

5.3 Implications for Practice and Theory

Integrated analysis reveals significant patterns in implementation across dimensions. Fundamental dimensions (Awareness, Improvement) demonstrate high implementation levels, while operational dimensions (Resources, Operations) face greater challenges, aligning with Change Management Theory which identifies behavioral and procedural changes as more difficult to achieve compared to attitudinal changes (Mngadi & Proches, 2024).

Furthermore, the Leadership dimension shows moderate implementation (87%), revealing gaps between top management commitment and operational translation, findings confirmed by recent research and consistent with frameworks emphasizing the critical role of middle management in mediating policy implementation and coordinating processes across organizational levels (Héreginé Nagy et al., 2024).

In the vocational education context, technical competence gaps have direct implications for graduate quality, as confirmed by empirical studies showing a positive correlation between quality management capabilities and graduate outcomes in industry (Meirani & Intania, 2023). The documentation-practice gap phenomenon becomes highly relevant in the VHS context, which traditionally already faces similar gaps between classroom learning and industry practices, indicating the need for an integrated approach addressing both technical and cultural barriers (Callan & Johnston, 2022).

This research contributes to the theoretical understanding of implementation dynamics in educational settings by identifying the documentation-practice gap as a systematic pattern requiring adaptation of traditional change management models. For practical application, the research results provide an evidence-based framework for optimizing QMS implementation with a focus on technical competence development and strategies to bridge the documentation-practice gap, relevant for policymakers designing capacity-building programs (Castillo et al., 2024).

This research also provides insights into adapting international standards to local contexts without sacrificing standard integrity, balancing standardization and localization (Sarker & Dunston, 2025). The ultimate goal of QMS implementation is to create a sustainable quality culture, not merely formal compliance (Thawinkarn, 2019). Our findings demonstrate that VHSs have achieved significant progress in awareness and commitment; the challenge ahead is transforming this foundation into systematic capabilities for continuous improvement and adaptation to Industry 4.0 demands (Spychalski, 2025).

5.4 Strategic Recommendations

Based on our comprehensive analysis of implementation gaps and contributing factors, we propose a three-phase

strategic approach to optimize ISO 9001:2015 implementation in VHSs. Figure 3 presents a visualization of the strategic roadmap with a specific focus for each phase.

Phase I: Technical Capability Development (0-6 months). This phase focuses on technical capacity development through an intensive training program implementation for PDCA tools, Fishbone Diagrams, and Pareto Analysis with a practice-based approach using contextual case studies. This strategy is complemented by creating "Quality Champions" in each department to address the 44% gap in problem-solving competencies identified in the research. To support knowledge management, a simple digital platform is developed with format standardization and formalization of knowledge capture processes from audits and projects. This phase also includes diversification of communication channels to address "message fatigue" with data-based storytelling approaches that more effectively reach all stakeholders.

Phase II: System Integration (6-12 months). This phase focuses on system integration through resource management optimization with impact-based allocation matrices and priority systems to address the 25% gap in the Resources dimension. Supplier evaluation is simplified by implementing practical criteria and integrating supplier performance in strategic decision-making. To monitor implementation progress, an implementation gap monitoring dashboard is developed with early warning systems and metric standardization for objective and transparent comparison between units.

Phase III: Sustainable Quality Culture (12-24 months). This phase aims to build a sustainable quality culture through a gradual digital transformation of QMS processes to reduce administrative burdens that often hinder implementation. Industry partnerships are strengthened through mentoring programs for technical implementation aspects, leveraging external expertise to support internal development. Continuous improvement is integrated into routine operations by building effective reward systems and developing quality circles as mechanisms for institutionalizing self-sustaining quality culture.

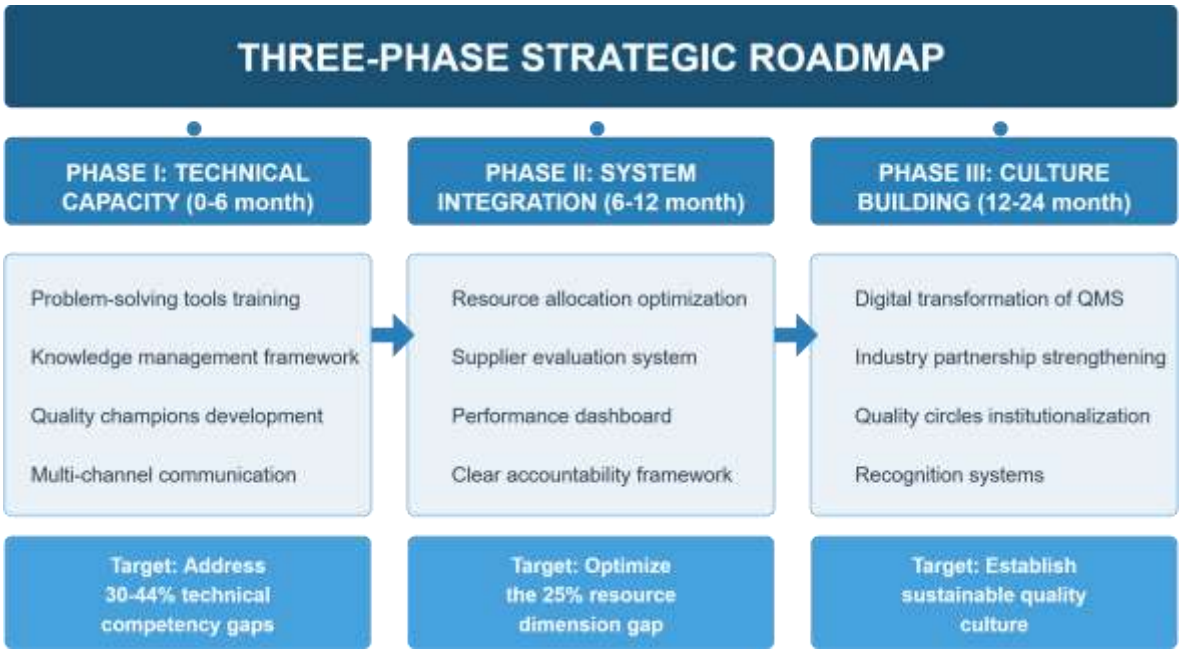

Figure 3: Three-Phase Strategic Roadmap for QMS Optimization

Implementation of this roadmap follows a gradual approach principle focusing on quick wins to build momentum, transitioning from compliance-oriented to performance-oriented, and continuous monitoring. This strategy leverages existing strengths (100% awareness, 96% improvement commitment) as a foundation, emphasizing resource optimization rather than expansion, utilization of internal expertise, and peer learning mechanisms.

Successful implementation of this roadmap requires continuous commitment from all organizational levels and the perspective that quality is a continuous journey, not an end goal. With this approach, VHSs can transition from achieving standard compliance toward developing sustainable competitive advantage through internalized quality culture.

6 CONCLUSION

This research revealed that ISO 9001:2015 adoption in Indonesian VHSs reached 90%, demonstrating a strong commitment to international quality standards. However, execution varied across dimensions, with Resources showing the lowest application rate (75%). We uncovered a systematic average gap of 22% across multiple indicators, revealing what we term the "documentation-practice gap" phenomenon. In this pattern, formal documentation exists, but translation into operational practices remains constrained. Three critical gaps—problem solving tools (44%), knowledge management (34%), and urgency communication (33%)—indicate the need for systematic intervention despite strong awareness and commitment.

This research contributes significantly to understanding quality standard implementation in resource-constrained contexts. Our study provides the first comprehensive empirical evidence about implementation depth in vocational education settings in developing countries.

The "documentation-practice gap" phenomenon extends organizational change theory by demonstrating that formal infrastructure does not automatically generate behavioral change.

The practical implications are highly relevant for VHS administrators and education policymakers, providing clear direction to focus on technical competence development. The three-phase strategic roadmap—technical capability development, system integration, and sustainable quality culture creation—provides an implementation framework for continuous improvement.

The identified patterns offer valuable insights not only for Indonesia but also for other developing countries facing similar challenges, making this research an important contribution to international discourse on vocational education quality assurance in resource-constrained contexts.

Acknowledgment

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Declaration of Generative AI Use

Claude 3 AI was used solely for proofreading and language editing. All content, analysis, and interpretations are the authors' original work.

Ethical Statement

This research was conducted with formal consent from all participants. Confidentiality was maintained, and data was used exclusively for academic purposes.

Conflict of Interest

The authors declare no financial, professional, or personal relationships that could influence this research.

REFERENCES

Aamer, A. M., Al-Awlaqi, M. A., & Mandahawi, N. (2021). Insights into the reasons behind the limited implementation of ISO 9001 certification: Empirical evidence from Yemen. *TQM Journal*, *33*(2), 358–378.

Scopus. https://doi.org/10.1108/TQM-04-2020-0068

Agmon, N., Kordova, S., & Shoval, S. (2022). Global Quality Management System (G-QMS) in Systems of Systems (SoS)—Aspects of Definition, Structure and Model. *Systems*, *10*(4). Scopus. https://doi.org/10.3390/systems10040099

Cabreros, B. S., & Barbacena, C. B. (2024). Management Framework for Quality Assurance to Strengthen Technology and TVET Pre-service Teacher Education. *Journal of Technical Education and Training*, *16*(2), 37–54. Scopus. https://doi.org/10.30880/JTET.2024.16.02.004

Callan, V. J., & Johnston, M. A. (2022). Influences upon social media adoption and changes to training delivery in vocational education institutions. *Journal of Vocational Education & Training*, *74*(4), 619–644. https://doi.org/10.1080/13636820.2020.1821754

Cann, R., Sinnema, C., Daly, A. J., & Rodway, J. (2024). A Contextual Approach to Designing, Implementing, and Adapting a Wellbeing Program: A case Study of the MARKERS Wellbeing Program for Educators. *International Journal of Applied Positive Psychology*, *9*(1), 301–325. Scopus. https://doi.org/10.1007/s41042-023-00123-4

Castillo, M. J. A. C., Córdova, M. M. E. R., Orozco, M. E. P., & Gurumendi, J. M. B. (2024). Strategic Planning for the Management of Educational Institutions: Sistematic Review. *Journal of Ecohumanism*, *3*(8), 314–323.

Chaiwichit, C., & Na, W. S. (2020). Developing an Operational Approach to Educational Quality Assurance in Colleges under the Office of the Vocational Education Commission in Thailand. *Образование и Наука*, *22*(9), 67–85.

Cook, C. R., Lyon, A. R., Locke, J., Waltz, T., & Powell, B. J. (2019). Adapting a Compilation of Implementation Strategies to Advance School-Based Implementation Research and Practice. *Prevention Science*, *20*(6), 914–935. Scopus. https://doi.org/10.1007/s11121-019-01017-1

da Fonseca, L. M. C. M., Domingues, J. P., Machado, P. B., & Harder, D. (2019). ISO 9001:2015 adoption: A multi-country empirical research. *Journal of Industrial Engineering and Management*, *12*(1), 27–50. Scopus. https://doi.org/10.3926/jiem.2745

Eryilmaz, N. (2024). Measuring the effective implementation of the GEQIP reform at school level in Ethiopia. *Frontiers in Education*, *9*. Scopus. https://doi.org/10.3389/feduc.2024.1353554

Fairman, B., Voak, A., Abdullah, H., & Indarjo, A. (2019). *Re-skilling vocational education and training practitioners in Indonesia*.https://dro.deakin.edu.au/articles/conference_contribution/Re-skilling_vocational_education_and_training_practitioners_in_Indonesia/20699203/1/files/36912376.pdf

Fernández-Cruz, F. J., Rodríguez-Mantilla, J. M., & Fernández-Díaz, M. J. (2019). Assessing the impact of ISO: 9001 implementation on school teaching and learning processes. *Quality Assurance in Education*, *27*(3), 285–303. Scopus. https://doi.org/10.1108/QAE-09-2018-0103

Gamit, A. M., Santos, A. R., Armas, K. L., & Villegas, M. N. (2024). Implementation of ISO 9001: 2015 in State Universities and Colleges: A Quality Management, Organizational Performance, and Legal Framework. *Corporate Law & Governance Review*, *6*(4).

Golubovsky, V. N. (2023). Quality Management System of Vocational Education in The Republic of Belarus: Improvement Strategy. *Obrazovanie i Nauka*, *25*(10), 76–108. Scopus. https://doi.org/10.17853/1994-5639-2023-10-76-108

Héreginé Nagy, M., Lénárd, S., Horváth, L., & Rapos, N. (2024). The organisational context of middle management role behaviour in Hungarian schools. *School Leadership and Management*, *44*(4), 389–412. Scopus. https://doi.org/10.1080/13632434.2024.2318435

Hofmann, R., & Ilie, S. (2022). A Theory-Led Evaluation of a Scalable Intervention to Promote Evidence-Based, Research-Informed Practice in Schools to Address Attainment Gaps. *Education Sciences*, *12*(5). Scopus.

https://doi.org/10.3390/educsci12050353

Iqbal, S. (2024). ISO 9001 as a catalyst: Linking staff training to university performance. *The TQM Journal*.

Irsyada, R., Isbiyantoro, S., Wibawa, A. P., Teng, M. F., Gaffar, A. F. O., Herdianto, R., & Witarsa, A. R. (2018). *Achievement of quality management system ISO 9001:2015 strategy in Vocational High School*. *403*(1). Scopus. https://doi.org/10.1088/1757-899X/403/1/012077

Jasmine, K. S. (2020). Risk based thinking and contingency modeling in leadership and administration for quality management in higher education. In *Research Anthology on Preparing School Administrators to Lead Quality Education Programs* (pp. 415–436). Scopus. https://doi.org/10.4018/978-1-7998-3438-0.ch020

Jingura, R. M., Kamusoko, R., & Tapera, J. (2019). *Critical analysis of the applicability of the ISO 9001 standard in higher education institutions*.

Kalbarczyk, A., Rao, A., & Alonge, O. O. (2023). Determinants of factors affecting readiness of academic institutions to conduct knowledge translation in low- and middle-income countries. *Frontiers in Public Health*, *11*. Scopus. https://doi.org/10.3389/fpubh.2023.1302756

Krooi, M., Whittingham, J., & Beausaert, S. (2024). Introducing the 3P conceptual model of internal quality assurance in higher education: A systematic literature review. *Studies in Educational Evaluation*, *82*. Scopus. https://doi.org/10.1016/j.stueduc.2024.101360

Legowo, M., Broto, Indiarto, B., & Prayitno, D. (2020). A unified model of quality assurance system for ISO-certified higher education institutions. *International Journal for Quality Research*, *14*(3), 829–846. https://doi.org/10.24874/IJQR14.03-12

Limón-Romero, J., García-Alcaraz, J. L., Alberto Sanchez-Lizarraga, M., Gastelum-Acosta, C., Báez-López, Y., & Tlapa, D. (2024). Implementing a Quality Management System Based on ISO 9001:2015 Standard: Modeling the Enablers' Relationships. *IEEE Access*, *12*, 195174–195187. Scopus. https://doi.org/10.1109/ACCESS.2024.3520892

Liu, W., & Xie, F. (2024). *Research on the Cultivation of Digital Competence of Vocational and Technical Education students*. 589–593. Scopus. https://doi.org/10.1109/ITME63426.2024.00121

Martins, Y. S., Sanches da Silva, C. E., Sampaio, P. A. D. C. A., & Catalani Gabriel, L. (2022). ISO 9001:2015 and risk-based thinking: Scientific research insights. *Total Quality Management and Business Excellence*, *33*(11–12), 1326–1343. Scopus. https://doi.org/10.1080/14783363.2021.1954898

Medisauskaite, A., Griffin, A., Viney, R., Rashid, A., & Rich, A. (2021). Changing professional behaviours: Mixed methods study utilising psychological theories to evaluate an educational programme for UK medical doctors. *BMC Medical Education*, *21*(1). Scopus. https://doi.org/10.1186/s12909-021-02510-4

Meirani, R. K., & Intania, N. (2023). Key Elements of Total Quality Management Implementation in Vocational High School. *International Society for Technology, Education, and Science*.

Mielke, J., Brunkert, T., Zúñiga, F., Simon, M., Zullig, L. L., & De Geest, S. (2022). Methodological approaches to study context in intervention implementation studies: An evidence gap map. *BMC Medical Research Methodology*, *22*(1). Scopus. https://doi.org/10.1186/s12874-022-01772-w

Mngadi, N., & Proches, C. N. G. (2024). Middle management and strategy execution in a VUCA world: A case of a higher educational institution. In *Promoting Crisis Management and Creative Problem-Solving Skills in Educational Leadership* (pp. 212–231). Scopus. https://doi.org/10.4018/978-1-6684-8332-9.ch010

Moses, K. M. (2016). *Improving the quality and competence of technical vocational education and training output through vocational school cooperation with industry: A case study of Uganda*. 030060. https://doi.org/10.1063/1.4965794

Mtitu, E. A. (2025). Exploring factors for the introduction and implementation of quality assurance systems in

selected higher education institutions in Tanzania. *Cogent Education*, *12*(1). Scopus. https://doi.org/10.1080/2331186X.2025.2455767

Negrete, K. P., Yépez, J., Maya-Olalla, E., Naranjo-Toro, M., & Caraguay-Procel, J. (2020). *Quality at the University Based on Process Management: Design and Implementation of the Quality Management System Under ISO 9001:2015 Standard Applied to the Industrial Engineering Degree of the Northern Technical University*. *1110 AISC*, 183–192. Scopus. https://doi.org/10.1007/978-3-030-37221-7_16

Ngatiman, S., Sulaiman, T., & Wong, K. Y. (2023). The Challenges of Implementing Industrial Revolution 4.0 Elements in TVET. *Journal of Technical Education and Training*, *15*(3). https://doi.org/10.30880/jtet.2023.15.03.015

Ngwekazi, T. G. Z., Makhanya, B. B. S., & Nel, H. (2023). Factors influencing the implementation of ISO 9001:2015 in the cement industry in South Africa. *International Journal of Productivity and Quality Management*, *38*(3), 413–434. Scopus. https://doi.org/10.1504/IJPQM.2023.129613

Nurcahyo, R., Meiliana, A., & Habiburrahman, M. (2019). The comparison of student satisfaction between certified and non-certified ISO 9001 schools. *Proceedings of the International Conference on Industrial Engineering and Operations Management*, *November*, 130–138.

Oroh, R. R., Runtuwene, J. P. A., Tumanduk, M. S. S., & Palilingan, V. R. (2020). Relevance of student productive skills competencies based on construction services needs. *International Journal of Innovation and Learning*, *28*(1), 4. https://doi.org/10.1504/IJIL.2020.108461

Palmieri, J. M. (2023). *Competency-Based Approach and Learning Plans in Moodle. A Case of International Engineering Educator Certification Program (IEECP) in Latin America*. *633 LNNS*, 553–564. Scopus. https://doi.org/10.1007/978-3-031-26876-2_53

Parast, M. M., & Safari, A. (2023). Do quality and business excellence models improve quality and operational results in educational organizations? A repeated cross-sectional analysis. *Operations Management Research*, *16*(2), 868–886. Scopus. https://doi.org/10.1007/s12063-022-00332-1

Purwanto, A., Lumbantobing, J. P., Hadisaputra, N. S., Setiawan, D., Suryono, Y. B., & Karini, N. D. (2020). Does ISO 9001 reinforce company performance? Evidence from Indonesian Industries. *Management Science Letters*, 3553–3560. https://doi.org/10.5267/j.msl.2020.6.039

Rezaee, E., & Pooya, A. (2019). Resource allocation to strategies of quality management with FANP and Goal Programming approach. *TQM Journal*, *31*(5), 850–870. Scopus. https://doi.org/10.1108/TQM-10-2018-0145

Rincón-Moreno, M., & Gordillo-Ramírez, N. Y. (2025). Quality assurance processes in higher education: A systematic review. *European Public and Social Innovation Review*, *10*. Scopus. https://doi.org/10.31637/epsir-2025-1429

Rodriguez-Arnaldo, O., & Martínez-Lorente, A. R. (2021). What determinants influence the diffusion of ISO 9001 by countries? *TQM Journal*, *33*(1), 223–246. Scopus. https://doi.org/10.1108/TQM-03-2020-0055

Sarker, T. R., & Dunston, J. K. (2025). Implementation of Quality 4.0, a systematic review of approaches, root causes, and challenges. *Quality Engineering*, *37*(2), 204–218. https://doi.org/10.1080/08982112.2024.2373360

Scott, V. C., Jillani, Z., Malpert, A., Kolodny-Goetz, J., & Wandersman, A. (2022). A scoping review of the evaluation and effectiveness of technical assistance. *Implementation Science Communications*, *3*(1). Scopus. https://doi.org/10.1186/s43058-022-00314-1

Shen, Q. (2023). *Research on Intelligent Allocation and Optimization Algorithm of Higher Education Resources Based on PSO*. 396–399. Scopus. https://doi.org/10.1109/ICEIB57887.2023.10170632

Sherstobitova, A. A., & Iskoskov, M. O. (2020). *The role of quality management systems for educational institutions in the digital economy*. *986*(1). Scopus. https://doi.org/10.1088/1757-899X/986/1/012023

Sherwani, K. H., Demir, A., & Maroof, L. (2025). Way to achieve sustainable benefits of ISO 9001 practices. *International Journal of Quality and Reliability Management*, *42*(4), 1167–1195. Scopus. https://doi.org/10.1108/IJQRM-01-2023-0023

Silaeva, V. V., & Semenov, V. P. (2018). *Internal Education Quality Assurance through Standardization of Educational Organization Management System*. 70–73. Scopus. https://doi.org/10.1109/ITMQIS.2018.8525083

Singh, A. K., Meshram, S. A., Khandelwal, V., Tiwari, P., & Singh, P. (2024). Implementation of Industry-Based Perspective in Technical Education: A Qualitative and Quantitative Analysis. In *Industrial and Manufacturing Designs: Quantitative and Qualitative Analysis* (pp. 321–346). Scopus. https://doi.org/10.1002/9781394212668.ch11

Sørlie, M.-A. (2021). Structural, cultural and instructional predictors essential to sustained implementation fidelity in schools: The School-Wide Positive Behavior Support Model (SWPBS). *International Journal of Educational Research Open*, *2*. Scopus. https://doi.org/10.1016/j.ijedro.2021.100082

Spychalski, B. (2025). Quality Management System in Shaping Students' Pro-Quality Attitude in the Era of Industry 4.0. *Applied Sciences (Switzerland)*, *15*(8). Scopus. https://doi.org/10.3390/app15084227

Stewart, S., Kendrick, D., Watson, M. C., Hayes, M., & Orton, E. (2023). Implementation fidelity of the "Stay One Step Ahead" home safety intervention: A mixed-methods analysis. *Injury Prevention*, *29*(4), 340–346. Scopus. https://doi.org/10.1136/ip-2023-044855

Thawinkarn, D. (2019). The effects of quality culture on the image of vocational institutions in Thailand. *Journal of Critical Reviews*, *6*(4), 18–22. Scopus. https://doi.org/10.22159/jcr.06.04.04

Tian, S. (2023). Research on the Quality Management System of Classroom Teaching in Higher Vocational Education. *International Journal of Information and Education Technology*, *13*(6), 969–974. Scopus. https://doi.org/10.18178/ijiet.2023.13.6.1893

Vasiliou, V. S., Dockray, S., Dick, S., Davoren, M. P., Heavin, C., Linehan, C., & Byrne, M. (2021). Reducing drug-use harms among higher education students: MyUSE contextual-behaviour change digital intervention development using the Behaviour Change Wheel. *Harm Reduction Journal*, *18*(1). Scopus. https://doi.org/10.1186/s12954-021-00491-7

Villegas, M. N. (2022). Analysis of the Implementation of ISO 9001:2015 in Extension Services of the State Universities and Colleges in Region III Using Multivariate Linear Regression. *International Journal of Applied Engineering and Technology (London)*, *4*(1), 77–85. Scopus.

Vyas, P. S., Bhattacharya, S., & Mahmud, M. (2023). Co-designing Education 4.0 in the Indian context. *Proceedings of the 16th Annual ACM India Compute Conference*, 94–99. https://doi.org/10.1145/3627217.3627231

Wafudu, S. J., Kamin, Y. B., & Marcel, D. (2022). Validity and reliability of a questionnaire developed to explore quality assurance components for teaching and learning in vocational and technical education. *Humanities and Social Sciences Communications*, *9*(1), 303. https://doi.org/10.1057/s41599-022-01306-1

Ward, C. S., Farmer, S., & Livet, M. (2024). Technical Assistance for Systemic Change: Lessons Learned From a National Technical Assistance Center. *Evaluation and the Health Professions*, *47*(2), 219–229. Scopus. https://doi.org/10.1177/01632787241247853

Widodo, W., Baswedan, A. R., Suyata, P., & Eka Saputra, W. N. (2025). Entrepreneurship education in vocational schools: An Indonesian model. *International Journal of Evaluation and Research in Education (IJERE)*, *14*(1), 373. https://doi.org/10.11591/ijere.v14i1.32317

Wu, J., & Gu, Y. (2022). Innovation capabilities in the convergence trend of higher education from the perspective of quality management. *Frontiers in Psychology*, *13*. Scopus. https://doi.org/10.3389/fpsyg.2022.979059

Zhang, Y., Cook, C. R., Azad, G. F., Larson, M., Merle, J. L., Thayer, J., Pauls, A., & Lyon, A. R. (2023). A Pre-Implementation Enhancement Strategy to Increase the Yield of Training and Consultation for School-Based Behavioral Preventive Practices: A Triple-Blind Randomized Controlled Trial. *Prevention Science*, *24*(3), 552–566. Scopus. https://doi.org/10.1007/s11121-022-01464-3