

Integrating Smart Digital Quality Assurance into Internal Quality Management: A Comprehensive Review of Decision Support Systems and Organizational Resilience

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Abstract

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Digital transformation in quality assurance has reshaped internal quality management practices, moving organizations from manual reporting structures toward integrated, data-driven ecosystems. However, many institutions still face challenges such as fragmented system integration, low interoperability between platforms, and an overemphasis on administrative audits, which collectively reduce the effectiveness of evidence-based decision-making. This study examines the integration of Smart Quality Assurance within internal quality management using a Decision Support System (DSS) approach and explores its linkage with organizational resilience. A systematic literature review was conducted on 20 scientific articles published between 2022 and 2026, following a structured process of identification, screening, evaluation, and thematic synthesis. Findings indicate that the digitalization of quality systems through Internal Quality Assurance Systems, Total Quality Management, ISO 9001:2015 frameworks, and artificial intelligence-based applications enhances audit efficiency, accelerates evaluation cycles, and improves the accuracy of managerial decision-making. DSS integration further demonstrates strong potential in enabling predictive analytics and supporting adaptive, proactive quality governance. In addition, successful implementation is strongly influenced by digital literacy levels, infrastructure readiness, and the degree of integration across institutional information systems. This study contributes by synthesizing an integrated conceptual framework that connects Smart Quality Assurance, DSS-based decision-making, and organizational resilience, offering a consolidated perspective that can guide future research and practical implementation in higher education and organizational quality systems.

Kata Kunci:

Smart Quality Assurance,
Decision Support System,
Manajemen Mutu Internal,
Resiliensi Organisasi,
Transformasi Digital

Abstrak

Transformasi digital dalam sistem penjaminan mutu telah mengubah praktik manajemen mutu internal dari pendekatan berbasis manual menjadi sistem terintegrasi berbasis data. Namun, berbagai institusi masih menghadapi tantangan seperti integrasi sistem yang terbatas, rendahnya interoperabilitas antarpelatform, serta dominasi audit administratif yang mengurangi efektivitas pengambilan keputusan berbasis bukti. Penelitian ini bertujuan untuk menganalisis integrasi Smart Quality Assurance dalam manajemen mutu internal melalui pendekatan Decision Support System (DSS) serta mengkaji hubungannya dengan ketahanan organisasi. Metode yang digunakan adalah studi literatur terhadap 20 artikel ilmiah yang diterbitkan pada tahun 2022–2026 dengan pendekatan systematic literature review yang meliputi tahapan identifikasi, seleksi, evaluasi, dan sintesis tematik. Hasil penelitian menunjukkan bahwa digitalisasi sistem mutu melalui Internal

Quality Assurance System, Total Quality Management, ISO 9001:2015, serta sistem berbasis kecerdasan buatan dapat meningkatkan efektivitas audit, mempercepat proses evaluasi, dan memperkuat kualitas pengambilan keputusan manajerial. Integrasi DSS juga menunjukkan potensi untuk mendukung analitik prediktif dalam pengambilan keputusan mutu yang lebih adaptif dan responsif. Selain itu, keberhasilan implementasi dipengaruhi oleh literasi digital, kesiapan infrastruktur teknologi, serta tingkat integrasi antarsistem informasi di unit kerja. Kontribusi penelitian ini terletak pada penyusunan kerangka konseptual terpadu yang menghubungkan Smart Quality Assurance, DSS, dan ketahanan organisasi, sehingga memberikan perspektif komprehensif bagi pengembangan penelitian dan implementasi sistem mutu di institusi pendidikan maupun organisasi.

INTRODUCTION

The rapid advancement of digital technology has significantly transformed organizational management across various sectors, particularly through the transition from manual-based processes to data-driven systems that enhance efficiency and accuracy. Digital tools now enable faster data collection, processing, and dissemination, allowing organizations to respond more effectively to dynamic environmental changes. This shift requires institutions to adopt more precise and adaptive decision-making systems to remain competitive in an increasingly complex digital era (Sihotang, 2026). In addition, digital transformation also strengthens organizational agility by enabling more integrated and responsive operational structures (Aulia & Marini, 2025).

Effective quality assurance systems depend on structured, accurate, and integrated information to support continuous monitoring and evaluation processes. (Raprap et al., 2026). Moreover, digital integration within quality systems has been shown to improve transparency and accountability in institutional reporting mechanisms (Dayanti et al., 2025). Decision-making in modern organizations increasingly relies on structured data analysis rather than intuitive judgment alone. Decision Support Systems (DSS) provide a systematic framework for transforming large-scale data into actionable insights that support managerial decisions. (Madiah & Cahyanto, 2024). Furthermore, the integration of analytics-based systems strengthens evidence-based decision-making in educational and organizational contexts (Simbolon & Parulian, 2026).

Organizational resilience has become a critical factor in maintaining stability amid rapidly changing and uncertain environments. Resilience is strengthened through the ability of organizations to adapt their structures and processes using technology-based systems. These systems enhance analytical capabilities and improve decision quality through data-driven modeling and evaluation processes. Integrated digital systems support flexibility in resource management and operational continuity under various challenges (Hasmy et al., 2026). In addition, digital transformation in quality-related systems contributes to improved competitiveness and sustainability in institutional governance (Hidayati et al., 2025).

Previous studies have demonstrated that digital transformation in quality assurance systems enhances audit effectiveness and operational efficiency. Research indicates that Internal Quality Assurance Systems supported by digital platforms improve workflow automation and data consolidation processes (Fitriadi et al., 2025). Other studies show that web-based quality assurance integration improves transparency and reporting speed, although interoperability challenges remain significant (Dayanti et al., 2025). However, most existing research still focuses on isolated system improvements rather than integrated frameworks combining Smart Quality Assurance, DSS, and organizational resilience.

Despite these advances, a significant research gap remains: a unified conceptual model that integrates Smart Quality Assurance, Decision Support Systems, and organizational resilience into

a single framework. Existing studies tend to emphasize technical or operational aspects separately without exploring their strategic interconnections in supporting adaptive decision-making. Furthermore, limited research addresses how predictive analytics within DSS can enhance proactive quality governance in complex organizational environments. This gap highlights the need for a more holistic and integrated approach to digital quality management systems.

This study aims to analyze the integration of Smart Quality Assurance within internal quality management through a Decision Support System approach and its relationship with organizational resilience. The proposed framework positions Smart Quality Assurance as an intelligent system supported by automation and predictive analytics for real-time decision-making. The main contribution of this research lies in developing an integrated conceptual model that connects digital quality transformation, DSS-based analytics, and organizational resilience. However, this study is limited to a conceptual literature-based approach. It has not yet been empirically validated across different organizational contexts, requiring further empirical testing to strengthen its practical applicability.

METHOD

This study adopts a qualitative literature review approach with a systematic orientation to ensure scientific rigor in selecting and synthesizing relevant scholarly works. The research object focuses on the conceptual integration of digital transformation in quality systems, specifically examining Smart Quality Assurance, digital information systems, Decision Support Systems (DSS), and organizational resilience across higher education and manufacturing contexts. The informational data sample consists of 20 peer-reviewed articles published between 2022 and 2026, encompassing empirical, theoretical, and case-based studies. While positioning itself as a structured literature review rather than a fully protocol-driven systematic review, this methodological framework prioritizes qualitative theoretical consolidation and conceptual integration over statistical aggregation, making it highly suitable for emerging interdisciplinary topics.

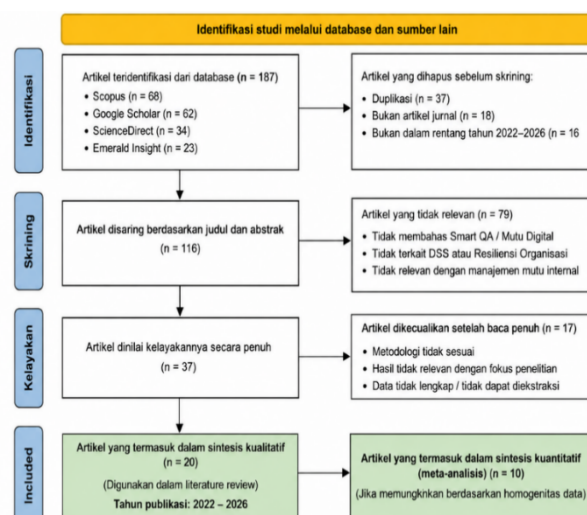


Figure 1. PRISMA Flow Diagram

Data collection was executed through structured database exploration, followed by a rigorous screening and eligibility assessment based on direct relevance to the research focus. The technical analytical process was carried out through iterative thematic synthesis, data coding, and matrix categorization to group literature-based evidence into distinct themes, ensuring consistency while minimizing interpretation bias (Maganga & Taifa, 2023). Theoretical interpretation of these

synthesized findings is deeply grounded in Total Quality Management theory to explain data-driven continuous improvement, Decision Support System theory to analyze computerized managerial decision-making under uncertainty, and organizational resilience theory to evaluate adaptive capacity development in response to disruption.

RESULTS AND DISCUSSION

Results

The systematic extraction and analysis of the 20 selected peer-reviewed articles (2022–2026) reveal a dynamic, multi-sectoral trajectory of digital quality management evolution. The literature sample encompasses a rich interdisciplinary spectrum, bridging higher education institutions, secondary and Islamic schooling, sharia-compliant industries, healthcare services, and public sector governance. Methodologically, the reviewed studies employ a diverse array of research designs ranging from qualitative case studies and strategic planning assessments to quantitative empirical trials and advanced bibliometric mapping. This cross-sectoral and methodologically diverse landscape ensures that the synthesized evidence captures not only localized institutional adjustments but also macro-level structural shifts from rigid, compliance-based audit frameworks toward intelligent, automated quality assurance systems.

To interpret these fragmented empirical and theoretical insights with high scientific rigor, the extracted literature is systematically organized through an integrated conceptual lens. The data parsing protocol focuses on mapping how individual institutional frameworks address three core analytical dimensions: the digitization of internal quality assurance, the deployment of Decision Support Systems (DSS) for evidence-based governance, and the cultivation of long-term organizational resilience amid technological disruptions. This structured cataloging serves to minimize interpretation bias while maximizing the transparency of the literature-based evidence. Consequently, Table 1 delineates the high-density informational matrix of the reviewed studies, establishing the foundational baseline for the subsequent thematic clustering and theoretical synthesis.

Table 1. Reconstructed Extraction Matrix of Reviewed Literature

Author (Year)	Context	Method	Key Findings Related to Smart QA / DSS / Resilience
(Kurniyawan & Ghozali, 2025)	Higher Education	Qualitative Strategic	Data-driven QA shifts policy toward digital system integration, enhancing institutional competitiveness.
(Irawati et al., 2026)	Primary Education	Qualitative Empirical	Data-driven programs strengthen school decision-making; digital literacy dictates system success.
(Nasar & Walela, 2025)	Higher Education	Qualitative Concept	Internal Quality Assurance Systems (SPMI) run strictly on compliance; cross-unit integration remains limited.
(Kutbaniyah & Faslah, 2025)	Islamic Education	Qualitative Case Study	Quality systems are still overly oriented toward cognitive-verbal data rather than digital metrics.
(Paizaluddin et al., 2025)	Secondary Education	Qualitative Empirical	Integrating Total Quality Management (TQM) with digital data infrastructure improves managerial decisions.
(Chamidi, 2025)	Higher Education	Qualitative Evaluative	Internal Quality Audits (AMI) effectively optimize the PDCA cycle only when supported by integrated platforms.
(Al Rosid et al., 2025)	Islamic Education	Qualitative Strategic	Analytical data leadership improves quality planning; requires upskilling human resource competence.

(Prihatmadji et al., 2024)	Sharia Industry	Qualitative Case Study	Digitalization of ISO 9001:2015 audits optimizes efficiency in document verification and data tracking.
(Rohmah, 2025)	Educational Institution	Qualitative Concept	Merging competency-based TQM with internal quality assurance systems stabilizes organizational performance.
(Sanbein & Sarimanah, 2025)	Higher Education	Qualitative Concept	Artificial Intelligence (AI) enables predictive quality assurance but demands high organizational readiness.
(Warits et al., 2026)	Islamic Higher Education	Bibliometric Analysis	Research trends show a critical transition away from manual structures toward data-technology integration.
(Hidayati et al., 2025)	Food Industry	Qualitative Strategic	Integrating halal assurance with quality management systems safeguards long-term quality sustainability.
(Mubarok et al., 2026)	Secondary Education	Qualitative Evaluative	Digitalizing internal quality audits serves as a strategic trigger for automated quality control.
(Hudaya, 2025)	Higher Education	Qualitative Concept	SPMI applications act as the core backbone for fostering a continuous institutional quality culture.
(Pahrudin, 2025)	Higher Education	Qualitative Governance	Smart campus governance systems accelerate the transition from conventional to transformative management.
(Manullang et al., 2026)	Healthcare Service	Quantitative Empirical	Smart Claim implementations optimize administrative operations and accelerate healthcare service delivery.
(Jayanti et al., 2024)	Public Sector	Qualitative Evaluative	Integrated regional smart systems directly elevate the overall delivery and accessibility of public services.
(Afifa, 2025)	Education	Qualitative Action Research	Web-based digital media optimizes learning analytics and strengthens continuous evaluation interactivity.
(Alwiyah et al., 2025)	Educational Management	Qualitative Concept	Digital-based quality control mechanisms minimize administrative defects and maximize structural efficiency.
(Furqon & Yusman, 2025)	Higher Education	Strategic Planning (Ward & Peppard)	Existing quality systems suffer from isolated data; system integration is non-negotiable for DSS execution.

Source: Data Collection, 2026

The thematic synthesis across these 20 scholarly works explicitly establishes a defining macro pattern: the structural transformation toward digital-based Smart Quality Assurance is fundamentally altering the functional architecture of internal quality management systems. This paradigm shift manifests prominently through the institutionalization of centralized data repositories, the automated streamlining of internal quality audits, and the transition toward robust, evidence-based managerial decision-making. However, a critical paradox emerges from the current literature; the majority of reviewed organizations remain captured within a rudimentary *"administrative-to-digital"* transition phase. This institutional stagnation is heavily characterized by localized, siloed databases, low cross-platform interoperability, and a persistent overreliance on compliance-driven audit workflows that prioritize superficial bureaucratic reporting over strategic quality improvements.

Conversely, pioneering contemporary research focusing on advanced Decision Support Systems (DSS) and Artificial Intelligence (AI) algorithms reveals an evolutionary trajectory toward predictive analytics. This advanced digital ecosystem successfully liberates organizations from the

constraints of late, retrospective descriptive reporting, which merely documents past operational failures, and propels them toward a proactive quality governance model capable of anticipating real-time institutional risks. By bridging the gap between isolated administrative tasks and predictive resilience, this integrated approach redefines quality assurance as a dynamic, socio-technical capability. To provide a highly structured and rigorous conceptual landscape of these cross-sectoral dynamics, these core findings are systematically distilled into critical thematic clusters and strategic dimensions in Table 2.

Table 2. Synthesis of Literature Review Results

Main Theme		Focus of Study	Key Findings	Core Strategic
Digitalization of Quality Management		Digital-based quality system transformation	Increased audit efficiency, process automation, and data consolidation	Quality systems become faster and data-driven
Internal Assurance (IQAS/SPMI)	Quality System	Strengthening the internal quality assurance system	The audit system is still administrative and partial	Need for system integration between organizational units
Decision Support System (DSS)	Support	Data-driven decision making	DSS improves the quality of analytical-based decisions	Real-time data-driven decision-making
Artificial Intelligence & Data Analytics		Automatic quality prediction and evaluation	AI supports predictive quality assurance	Improving the accuracy of quality evaluation
Information Integration	System	Data interoperability between quality systems	Data is scattered and not yet connected	The need for integrated quality platforms
Total Quality Management (TQM)	Quality	Quality management based on continuous improvement	TQM improves competency-based performance	Strengthening a data-driven quality culture
Smart Campus & Smart System		Digital governance transformation	Service improvement through integrated systems	Efficiency of digital-based services
Organizational Resilience		Adaptation-based organizational resilience	Organizations are more adaptive to digital systems	Strengthening the ability to adapt to change

Source: Data Collection, 2026

The structural insights derived from the empirical matrix indicate that the paradigm of quality management is rapidly transitioning toward a highly integrated, digitalized ecosystem. This evolution places critical emphasis on cross-functional data synthesis, process automation, and analytics-driven executive decision-making. Specifically, the digitalization of internal quality assurance systems (IQAS) and automated audit mechanisms demonstrates a substantial escalation in institutional efficiency. However, a significant operational bottleneck persists in the form of localized data fragmentation and sub-optimal cross-unit interoperability. To bridge these technological divides, the strategic integration of Decision Support Systems (DSS) and Artificial Intelligence (AI) algorithms becomes paramount, effectively augmenting predictive analytical capacities and enabling highly adaptive, forward-looking organizational governance.

Furthermore, aligning Total Quality Management (TQM) principles with digital data infrastructures systematically cultivates an information-driven quality culture, which simultaneously elevates human resource competence and performance metrics. This digital convergence, alongside the continuous development of smart campus architectures, directly bolsters macro-level operational efficiency through the systemic institutionalization of advanced informational workflows. Ultimately, the synthesis underscores an urgent mandate: institutions must actively reconstruct a unified digital quality framework. This integrated ecosystem must

seamlessly bind real-time evaluation matrices, computerized decision support, and adaptive organizational resilience into a singular, cohesive capability.

Table 3. Integrated Meta-Synthesis: Conceptual Convergence and Theoretical Grounding

Strategic Dimension	Empirical Evidence from Literature	Theoretical Interpretation & Grounding	Strategic & Policy Implications
Smart Quality Assurance Evolution	Transition from manual to automated reporting frameworks; digitalization improves audit document tracking and efficiency	Total Quality Management (TQM) Theory: Digitization operationalizes continuous, real-time feedback loops, moving quality culture from compliance-driven into an embedded institutional habit.	Organizations must build unified digital quality platforms instead of isolated databases to sustain continuous quality enhancement.
Decision Support System & AI Analytics	Deployment of dashboards and analytical modeling enhances strategic decision speed; AI enables predictive risk scoring and outcome forecasting	Decision Support System (DSS) Theory: Advanced analytics shift institutional governance from reactive descriptive reporting to proactive risk mitigation under structural uncertainty.	Institutions should progressively invest in cloud-based predictive AI tools to integrate data-driven insights directly into executive policymaking.
Organizational Resilience Integration	Fragmented system integration and low interoperability cause data defects, but competent human resources and system agility safeguard continuous operations	Organizational Resilience Theory: Smart Quality Assurance acts as an adaptive socio-technical capability, maximizing information accessibility and learning speed during tech disruptions.	Quality governance must be repositioned as a strategic defense mechanism that actively fosters long-term institutional agility and survival.

Source: Data Collection, 2026

The analytical insights compiled in Table 3 rigorously demonstrate that internal quality management has progressively evolved from a rudimentary administrative digitalization phase into a highly sophisticated, integrated governance system. This modern paradigm is explicitly anchored in centralized data repositories, intelligent predictive analytics, and socio-technical organizational adaptability. Evidence indicates that digital transformation across various sectors significantly improves corporate transparency, operational efficiency, and evidence-based quality metrics through the deployment of automated internal quality audits and real-time operational monitoring. Within this framework, Decision Support Systems (DSS) serve as a critical strategic catalyst, systematically converting raw operational data into high-value, actionable insights.

Concurrently, the integration of Artificial Intelligence (AI) algorithms enables predictive risk modeling, successfully liberating executive leadership from the constraints of descriptive, retrospective reporting and shifting the organizational focus toward proactive, continuous quality enhancement. However, the synthesized literature strongly emphasizes a critical socio-technical paradox: the acquisition of cutting-edge technology alone is structurally insufficient to guarantee systemic quality. The operational success of Smart Quality Assurance is inherently contingent upon a complex interplay of human resource digital literacy, advanced analytical capabilities, robust leadership commitment, and cross-platform system interoperability.

Consequently, Smart Quality Assurance must not be viewed merely as an isolated software implementation, but rather as a dynamic organizational capability. This integrative framework seamlessly binds digital infrastructure, automated decision support, continuous quality

improvement loops, and information-driven adaptive learning. By repositioning quality governance through this holistic lens, institutions can transform their quality systems into a resilient, strategic asset that actively drives long-term competitive performance and organizational survival amid ongoing digital disruptions.

DISCUSSION

Integration of Digital Smart Quality Assurance in Internal Quality Management Transformation

The rapid advancement of digital technologies has transformed internal quality management from a manual, compliance-oriented process into Smart Quality Assurance. The literature consistently identifies digital transformation as the primary driver of this shift (Alawag et al., 2023). Demonstrating that digital-based Internal Quality Assurance Systems improve audit efficiency, reduce administrative burdens, enhance data reliability, and strengthen organizational performance through automated workflows, centralized databases, and integrated digital reporting. The significance of this transformation extends beyond operational efficiency. Automated audit systems allow organizations to establish continuous monitoring processes where quality indicators can be observed throughout the operational cycle rather than only during scheduled accreditation periods (Isaja et al., 2023).

Similarly, (Kurniyawan & Ghozali, 2025) argue that digital transformation shifts quality assurance from a reactive administrative function to a strategic, data-driven capability that supports institutional planning, performance evaluation, and evidence-based decision-making through integrated real-time dashboards. This transformation aligns with Total Quality Management principles by promoting continuous improvement, organizational learning, and customer-focused quality enhancement (Irawati et al., 2026). Similarly, they emphasize that the effectiveness of digital quality systems depends as much on human competencies as on technological infrastructure, requiring quality assurance professionals to integrate data analytics, information technology, and strategic management (Irawati et al., 2026). Therefore, successful digital transformation should be viewed as a socio-technical process that combines advanced digital systems with continuous professional development, organizational commitment, and a strong data-driven culture (Waqar et al., 2023).

Another recurring issue identified throughout the literature concerns the persistence of fragmented organizational structures that inhibit effective digital integration. (Vosough et al., 2024) observe that Internal Quality Assurance Systems in many higher education institutions continue operating primarily within administrative frameworks designed to satisfy accreditation requirements rather than facilitate continuous organizational improvement. Nasar and Walela argue that fragmented, compliance-oriented quality assurance limits strategic decision-making by creating disconnected data, inconsistent reporting, and inefficient processes. Similarly, (Patil et al., 2023) shows that conventional Internal Quality Audits constrain the effectiveness of the PDCA cycle. In contrast, Smart Quality Assurance enhances every PDCA stage through integrated digital systems, automation, and data analytics, enabling continuous monitoring, evidence-based evaluation, faster corrective actions, and sustained organizational improvement.

Illustrates that the integration of Smart Quality Assurance represents a multidimensional transformation involving technological innovation, human capability development, organizational restructuring, and strategic governance reform (Salahat et al., 2023). The transformation of internal

quality management through Smart Quality Assurance becomes more comprehensive when digital technologies are integrated not only into quality assurance activities but also into broader institutional governance systems. One important contribution to this perspective is provided by (Lerman et al., 2022). Who examines the role of the Internal Quality Assurance System (SPMI) in supporting continuous quality development within higher education institutions? Hudaya argues that SPMI remains the core mechanism for maintaining institutional quality because it provides systematic procedures for planning, implementing, evaluating, controlling, and improving academic and administrative performance. Nevertheless, the study also reveals that technological integration within many SPMI implementations remains relatively limited.

Suggest that although institutions recognize the strategic importance of continuous quality improvement, many have not yet transformed SPMI into an integrated digital ecosystem capable of supporting real-time organizational learning (Skalli et al., 2023). The absence of comprehensive digital integration limits the ability of quality assurance units to monitor institutional performance continuously and identify emerging quality issues before they become significant organizational problems (Rohmah, 2025). From the perspective of Smart Quality Assurance, the findings imply that SPMI should evolve beyond procedural compliance toward an intelligent quality management platform where data collection, performance monitoring, quality evaluation, and corrective actions operate simultaneously through interconnected digital systems. Such integration would enable continuous quality assurance rather than periodic quality assessment, thereby strengthening institutional responsiveness and improving the effectiveness of quality governance (Alawag et al., 2023).

Previous Studies (Saha et al., 2022) highlights the smart campus as a model of integrated digital governance that connects academic, administrative, financial, research, and quality assurance systems. However, many institutions still face fragmented information systems with limited interoperability, leading to data duplication, reporting inconsistencies, and inefficient decision-making. Similarly, (Papp, 2023) argue that integrated enterprise-wide information systems are essential for Smart Quality Assurance because they provide comprehensive, reliable data that support Decision Support Systems (DSS), Artificial Intelligence (AI), predictive analytics, and holistic institutional evaluation. The importance of digital integration is further supported by (Park & Kang, 2024) who found that digitalizing ISO 9001:2015 quality management improves audit efficiency, document traceability, transparency, and evidence-based decision-making through continuous monitoring and automated data management. Nevertheless, technology alone is insufficient (Christou et al., 2022).

The Role of Decision Support Systems and Organizational Resilience in Strengthening Digital Quality Management

The successful implementation of Smart Quality Assurance is fundamentally dependent on the capacity of organizations to transform large volumes of operational data into meaningful knowledge that supports timely and strategic decision-making (Dias et al., 2021). While digital technologies have significantly improved the efficiency of quality assurance processes through automation and integrated information systems, the true value of digital transformation lies in the ability to convert data into actionable intelligence (Singh et al., 2024). In contemporary quality management, Decision Support Systems represent a transition from conventional administrative reporting toward intelligent governance systems capable of supporting continuous evaluation, predictive analysis, and adaptive organizational management (Yang et al., 2025).

The effectiveness of Decision Support Systems depends heavily upon the existence of integrated organizational information systems capable of providing accurate, comprehensive, and consistent datasets. This relationship is clearly demonstrated by Lee through the implementation of the smart campus concept (Singh et al., 2024). Their study shows that integrating information systems across academic, administrative, financial, and quality assurance functions substantially strengthens institutional governance by consolidating organizational data into a single digital ecosystem (Lee et al., 2024). Rather than operating through isolated departmental databases, the smart campus enables all organizational units to contribute information to a shared digital platform where institutional performance can be monitored comprehensively.

The significance of integrated information systems is further reinforced by (Furqon & Yusman, 2025) who examine the implementation of web-based internal and external quality assurance systems. Their findings indicate that digital integration substantially improves the transparency, accessibility, and efficiency of institutional quality reporting. Beyond improving decision-making, Decision Support Systems contribute significantly to strengthening organizational resilience, particularly within environments characterized by uncertainty, technological disruption, and rapidly changing stakeholder expectations. According to (Raprap et al., 2026). Organizational resilience refers to the capability of organizations to anticipate, respond to, and recover from disruptions through adaptive learning and effective utilization of information. The relationship between digital transformation and organizational resilience is further demonstrated by (Warits et al., 2026) through their bibliometric analysis of quality assurance research in Islamic higher education.

Similarly, (Rohmah, 2025) reports that the digitalization of educational quality control significantly improves evaluation effectiveness by enabling continuous monitoring of organizational performance through responsive information systems. Unlike conventional evaluation methods that provide static descriptions of institutional performance, digital quality control continuously updates organizational indicators as operational conditions change (Jayanti et al., 2024). This dynamic monitoring capability allows organizations to respond rapidly to emerging issues while maintaining consistent quality standards despite environmental uncertainty. Evidence supporting the strategic value of digital integration also emerges from sectors beyond education. (Mubarok et al., 2026) Demonstrate that implementing the Smart Claim system within healthcare substantially improves administrative efficiency through integrated digital processes that accelerate service delivery, reduce documentation errors, and enhance coordination among healthcare providers.

This proactive approach is reinforced by research that examines Artificial Intelligence-based predictive quality assurance. Their research demonstrates that AI expands the capabilities of Decision Support Systems by identifying complex patterns within organizational datasets that cannot easily be detected through conventional statistical analysis (Afifa, 2025). Predictive models generated by AI enable institutions to forecast accreditation outcomes, identify operational risks, estimate future resource requirements, and recommend strategic improvement priorities based upon empirical evidence (Sanbein & Sarimanah, 2025). Nevertheless, predictive decision-making remains impossible without comprehensive system integration. (Furqon & Yusman, 2025) emphasize that fragmented organizational information systems significantly reduce the effectiveness of quality-related decisions because incomplete datasets fail to represent overall organizational conditions accurately.

Overall, the reviewed literature demonstrates that Decision Support Systems occupy a central position within Smart Quality Assurance by transforming organizational data into strategic knowledge that supports evidence-based governance, predictive quality management, and organizational resilience. Integrating DSS with intelligent digital technologies enables organizations to replace intuition-driven decision-making with systematic analytical evaluation while strengthening their capacity to anticipate risks, respond rapidly to environmental changes, and sustain continuous quality improvement. Consequently, Smart Quality Assurance should be understood as an integrated digital ecosystem in which Decision Support Systems, Artificial Intelligence, interoperable information systems, and organizational learning collectively strengthen institutional adaptability, improve strategic decision-making, and ensure the long-term sustainability of organizational performance in increasingly complex and uncertain environments.

Table 4. Research Contribution and Novelty Matrix

Core Dimensional	Conventional	Framework Offered by This Study	Practical & Strategic Contributions
Digital Quality Assurance (Smart QA)	Focused primarily on manual-to-digital document migration (<i>paper-replicating workflows</i>) and passive, compliance-based auditing.	Establishes a dynamic, continuous quality culture driven by automated validation loops and real-time operational monitoring.	Shifts institutional quality management from a rigid administrative burden into an embedded, everyday operational habit.
Decision Support Systems (DSS) & AI	Treated DSS as an isolated IT reporting tool that merely generates descriptive, retrospective data after failures occur.	Integrates predictive AI algorithms into the DSS framework to forecast institutional quality risks and simulate outcomes under uncertainty.	Empowers executive leadership with proactive, forward-looking insights to mitigate risks before they impact organizational compliance.
Organizational Resilience	Examined resilience as a purely reactive crisis management strategy, separate from digital and quality infrastructures.	Defines resilience as an active, socio-technical capability cultivated through the convergence of Smart QA and predictive analytical systems.	Repositioning quality assurance infrastructure as a strategic defense mechanism that secures long-term institutional survival and agility.

Source: Data Collection, 2026

CONCLUSION

The findings of this study demonstrate that digital transformation in Smart Quality Assurance has fundamentally reshaped internal quality management toward a more integrated and data-driven system. The literature consistently shows that quality assurance processes are evolving from manual, compliance-oriented activities into automated and real-time digital ecosystems supported by Decision Support Systems (DSS) and artificial intelligence. In relation to system evolution, studies confirm that digital workflows and integrated audit platforms improve efficiency and reduce fragmentation in quality management practices. Regarding decision-making, evidence indicates that DSS and analytics-based systems enhance the accuracy, speed, and consistency of managerial decisions by converting dispersed data into actionable insights. In terms of organizational resilience, the reviewed studies highlight that digital integration strengthens

institutional adaptability by enabling faster responses to disruptions through information-based coordination and predictive capabilities.

This study contributes by developing a synthesized conceptual understanding of how Smart Quality Assurance, DSS, and organizational resilience are interconnected within a unified digital governance perspective. It offers a structured interpretation of fragmented literature by positioning digital quality systems not only as operational tools but also as strategic mechanisms for institutional adaptation and performance improvement. However, the study is limited by its reliance on secondary literature sources, which may limit contextual depth and empirical validation across different organizational settings. Future research is recommended to conduct empirical studies that test the proposed conceptual relationships, particularly through quantitative models or case-based implementations, in order to validate the effectiveness of Smart Quality Assurance and DSS integration in real-world institutional environments.

REFERENCES

- Afifa, I. (2025). Optimalisasi Media Digital Berbasis Web Dalam Persiapan Perangkat Pengajaran. *Jurnal Educo*, 8(2), 667–673.
- Al Rosid, M. H., Nikmah, I. K., & Karim, A. (2025). Strategy Towards Quality Madrasah: Transforming Teachers Into Madrasah Quality Assurance Unit Architects: Strategi Menuju Madrasah Berkualitas: Mentransformasikan Guru Menjadi Arsitek Unit Penjaminan Mutu Madrasah. *Mapendis: Jurnal Manajemen Pendidikan Islam*, 3(2), 78–89.
- Alawag, A. M., Alaloul, W. S., Liew, M. S., Baarimah, A. O., Musarat, M. A., & Al-Mekhlafi, A.-B. A. (2023). The role of the total-quality-management (TQM) drivers in overcoming the challenges of implementing TQM in industrialized-building-system (IBS) projects in Malaysia: Experts' perspectives. *Sustainability*, 15(8), 6607.
- Alwiyah, L., Darajat, Z. A., & Duryat, M. (2025). Implementasi Dan Pengendalian Mutu Lembaga Pendidikan: Implementasi Strategi dan Pengendalian Mutu dalam Peningkatan Kualitas Pendidikan. *Journal of Society and Development*, 5(2), 17–22.
- Aulia, R. N., & Marini, A. (2025). *Manajemen sistem informasi pendidikan tinggi: Teori, strategi dan implementasi*. Publica Indonesia Utama.
- Chamidi, A. S. (2025). Audit Mutu Internal (Ami) Di Iainu Kebumen Dalam Perspektif Plan Do Check ACT PDCA. *Ar-Riblah: Jurnal Inovasi Pengembangan Pendidikan Islam*, 10(2), 118–141.
- Christou, I. T., Kefalakis, N., Soldatos, J. K., & Despotopoulou, A.-M. (2022). End-to-end industrial IoT platform for Quality 4.0 applications. *Computers in Industry*, 137, 103591.
- Dayanti, W. I., Wulandari, S. A., & Maryamah, S. (2025). Integrasi sistem penjaminan mutu eksternal dan internal berbasis internet dalam meningkatkan akuntabilitas pendidikan di era digital. *Dinamika Pembelajaran: Jurnal Pendidikan Dan Bahasa*, 2(4), 79–89.
- Dias, A. M., Carvalho, A. M., & Sampaio, P. (2021). Quality 4.0: Literature review analysis, definition and impacts of the digital transformation process on quality. *International Journal of Quality & Reliability Management*, 39(6), 1312–1335. <https://doi.org/10.1108/IJQRM-07-2021-0247>
- Fitriadi, A., Wan, M., Batang, S., Abeh, Y. A., Wibawa, R., & Mebang, D. N. (2025). Analisis penerapan sistem informasi SPMI berbasis digital dalam meningkatkan efektivitas audit mutu internal di Universitas Mulawarman. *SIBATIK Journal: Jurnal Ilmiah Bidang Sosial, Ekonomi, Budaya, Teknologi, Dan Pendidikan*, 4(9), 2809–2820.

- Furqon, M., & Yusman, N. I. (2025). Perencanaan Strategis Sistem Informasi Menggunakan Metode Ward and Peppard di Lembaga Penjaminan Mutu Universitas Ma'soem. *INTERNAL (Information System Journal)*, 8(1), 55–69.
- Hasmy, A., Rosidah, R., Segu, S., & Budiyo, B. (2026). Smart campus strategy in Islamic higher education: Enhancing service quality through IT governance at IAIN Pontianak. *Nidhomul Haq: Jurnal Manajemen Pendidikan Islam*, 11(1), 237–253.
- Hidayati, L., Cheumar, M., Sucipto, S., & Juliana, J. (2025). *Integrating Halal Assurance and Quality Management: A Strategic Framework for Sustainable Growth in the Food Industry Integrasi Jaminan Halal dan Manajemen Mutu: Kerangka Strategis untuk Pertumbuhan Berkelanjutan dalam Industri Pangan*.
- Hudaya, A. (2025). SPMI Sebagai Pilar Pengembangan Mutu Berkelanjutan di Perguruan Tinggi. *Jurnal Ilmu Pendidikan Dan Sosial*, 4(2), 178–189.
- Irawati, D., Priatna, T., Zakiah, Q. Y., & Rosyad, R. (2026). Implementation of an Internal Quality Assurance System Based on Rapor Pendidikan in Sekolah Penggerak. *International Journal Of Science Education and Technology Management (IJSETM)*, 5(1), 14–31.
- Isaja, M., Nguyen, P., Goknil, A., Sen, S., Husom, E. J., Tverdal, S., Anand, A., Jiang, Y., Pedersen, K. J., & Myrseth, P. (2023). A blockchain-based framework for trusted quality data sharing towards zero-defect manufacturing. *Computers in Industry*, 146, 103853.
- Jayanti, N. W. D. B., Sjamsuddin, S., & Saleh, C. (2024). Transformasi digital: Program inovasi Bali Smart Island dalam peningkatan kualitas pelayanan publik di Bali. *Jurnal Ilmiah Administrasi Publik*, 10(1), 93–108.
- Kurniawan, H., & Ghazali, A. F. (2025). Strategi Inovasi Manajemen Mutu untuk Meningkatkan Daya Saing Perguruan Tinggi di Era Digital. *Paradigma: Jurnal Pemikiran Dan Penelitian Pendidikan*, 11(2), 108–115.
- Kutbaniyah, A., & Faslah, R. (2025). Merajut Kualitas Islami: Strategi Transformasi Sistem Penjaminan Mutu PAI Menuju Madrasah Ibtidaiyah Unggul. *An-Nuha*, 5(4), 650–672.
- Lee, K. L., Teong, C. X., Alzoubi, H. M., Alshurideh, M. T., Khatib, M. El, & Al-Gharaibeh, S. M. (2024). Digital supply chain transformation: The role of smart technologies on operational performance in manufacturing industry. *International Journal of Engineering Business Management*, 16, 18479790241234986.
- Lerman, L. V., Benitez, G. B., Müller, J. M., de Sousa, P. R., & Frank, A. G. (2022). Smart green supply chain management: A configurational approach to enhance green performance through digital transformation. *Supply Chain Management: An International Journal*, 27(7), 147–176.
- Madiah, H., & Cahyanto, I. (2024). *Manajemen mutu pendidikan: Strategi praktis menuju pendidikan berkualitas dan berkelanjutan*. K-Media.
- Maganga, D. P., & Taifa, I. W. R. (2023). The readiness of manufacturing industries to transit to Quality 4.0. *International Journal of Quality & Reliability Management*, 40(7), 1729–1752.
- Manullang, B. R., Kasim, F., & Bangun, S. M. (2026). The Effect of BPJS Kesehatan Smart Claim Implementation on Service Efficiency and Effectiveness at Santa Elisabeth Hospital Medan. *JURNAL KESMAS DAN GIZI (JKG)*, 8(2), 1209–1213.
- Mubarok, A., Perawironegoro, D., & Holid, A. (2026). Peran Audit Mutu Internal Dalam Sistem Penjaminan Mutu Pendidikan Di Sekolah Menengah. *Jurnal Manajemen Pendidikan*, 11(2), 2489–2503.

- Nasar, I., & Walela, A. (2025). Strengthening The Internal Quality Assurance System As The Foundation Of Higher Education Management. *LIMEEMAS: Jurnal Ilmiah Pendidikan*, 3(2), 12–24.
- Pahrudin, A. (2025). Penguatan Sistem Tata Kelola Pendidikan Tinggi Dari Paradigma Konvensional Ke Transformatif. *Crossroad Research Journal*, 2(1), 1–21.
- Paizaluddin, P., Herawati, E., Irama, D., Abidin, Z., & Pebrikarlepi, E. (2025). Penerapan Manajemen Mutu Terpadu Dalam Penguatan Kinerja, Kepemimpinan, Dan Budaya Mutu Madrasah Aliyah Swasta. *Jurnal Kepemimpinan Dan Pengurusan Sekolah*, 10(3), 1377–1389.
- Papp, J. (2023). *Quality management in the imaging Sciences-E-Book: Quality management in the imaging Sciences-E-Book*. Elsevier Health Sciences.
- Park, J., & Kang, D. (2024). Artificial intelligence and smart technologies in safety management: A comprehensive analysis across multiple industries. *Applied Sciences*, 14(24), 11934.
- Patil, R. S., Kulkarni, S. B., & Gaikwad, V. L. (2023). Artificial intelligence in pharmaceutical regulatory affairs. *Drug Discovery Today*, 28(9), 103700.
- Prihatmadji, W., Faisal, K. M., Setiady, T., & Widowati, R. (2024). ISO 9001: 2015 Certification Audit at PT. Halal Syariah Integrasi and Its Implications for Quality Management Systems. *Best Journal of Administration and Management*, 2(3), 133–145.
- Raprap, W. P., Rustiyana, R., Suharno, W. A., & Haryono, H. (2026). *Manajemen pendidikan sekolah: Pengantar, prinsip, manajemen, sistem penjaminan mutu dan evaluasi berbasis digital*. Star Digital Publishing.
- Rohmah, I. I. (2025). Penjaminan Mutu Internal Pendidikan Melalui Total Quality Management (Tqm) Berbasis Kompetensi Kerja. *Hijri*, 14(1), 23–33.
- Saha, P., Talapatra, S., Belal, H. M., & Jackson, V. (2022). Unleashing the potential of the TQM and industry 4.0 to achieve sustainability performance in the context of a developing country. *Global Journal of Flexible Systems Management*, 23(4), 495–513.
- Salahat, M., Ajouz, M., Hammash, A., Shehadeh, M., Tunsy, W., Jamjoom, Y., Kanan, M., & Al-Sartawi, A. (2023). The nexus of leadership styles and total quality management: Enhancing healthcare sector implications through individual readiness to change within decisions sciences framework. *Operational Research in Engineering Sciences: Theory and Applications*, 6(4).
- Sanbein, P., & Sarimanah, E. (2025). Kecerdasan Buatan Dalam Jaminan Mutu Akademik: Peluang Dan Tantangan. *Jurnal Teknodik*, 89–98.
- Sihotang, H. (2026). *Manajemen mutu pendidikan*. PT Bukuloka Literasi Bangsa.
- Simbolon, M. P., & Parulian, H. G. (2026). Pengembangan kerangka penjaminan mutu berbasis bukti di SMKN 2 Balige: Integrasi total quality management, analitik data, dan sistem keputusan digital. *Jurnal Pendidikan Modern Dan Multikultural*, 10(1).
- Singh, A. R., Dashtdar, M., Bajaj, M., Garmsiri, R., Blazek, V., Prokop, L., & Misak, S. (2024). AI-enhanced power quality management in distribution systems: Implementing a dual-phase UPQC control with adaptive neural networks and optimized PI controllers. *Artif Intell Rev*, 57(11), 311.
- Skalli, D., Charkaoui, A., Cherrafi, A., Garza-Reyes, J. A., Antony, J., & Shokri, A. (2023). Industry 4.0 and Lean Six Sigma integration in manufacturing: A literature review, an integrated framework and proposed research perspectives. *Quality Management Journal*, 30(1), 16–40.

- Vosough, M., Schmidt, T. C., & Renner, G. (2024). Non-target screening in water analysis: Recent trends of data evaluation, quality assurance, and their future perspectives. *Analytical and Bioanalytical Chemistry*, 416(9), 2125.
- Waqar, A., Skrzypkowski, K., Almujiab, H., Zagorski, K., Khan, M. B., Zagorska, A., & Benjeddou, O. (2023). Success of implementing cloud computing for smart development in small construction projects. *Applied Sciences*, 13(9), 5713.
- Warits, A., Husnayain, M. F., Imaduddin, I., Paisun, P., & Azis, A. (2026). Bibliometric Analysis of Quality Assurance In Indonesian Islamic Higher Education: Mapping the Knowledge Landscape and Policy Implications. *Nidhomul Haq: Jurnal Manajemen Pendidikan Islam*, 11(1), 94–109.
- Yang, C., Guo, Z., Fernandes Barbin, D., Dai, Z., Watson, N., Povey, M., & Zou, X. (2025). Hyperspectral imaging and deep learning for quality and safety inspection of fruits and vegetables: A review. *Journal of Agricultural and Food Chemistry*, 73(17), 10019–10035.