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Strategy for Developing the Quality of Arts Learning Through TQM-Based Optimization of Facilities and Infrastructure

Chaenurnissa Dita Triyani[*1], Dedy Achmad Kurniady[2], Taufani Chusnul Kurniatun[3]

Universitas Pendidikan Indonesia, Bandung, Indonesia
Corresponding email: chaenurnissadita0@upi.edu

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Abstract

Facilities and infrastructure are among the key determinants of arts learning quality because arts education relies on practice, media exploration, and aesthetic experience that require adequate spaces and equipment. In many arts education institutions, the management of facilities remains reactive and procurement-oriented and is not systematically linked to learning needs. This article aims to formulate a strategy for developing the quality of arts learning through the optimization of facilities and infrastructure based on Total Quality Management (TQM). The study employs a structured integrative literature review of 38 sources published between 1986 and 2026 (27 journal articles, one conference paper, five books, one research report, and four regulations), synthesized thematically across five themes: TQM and strategic quality management, educational facilities and learning quality, arts learning and infrastructure, facilities maintenance, and review methodology. The findings yield six strategies: (1) establishing user-focused facility standards, (2) strengthening leadership commitment and quality teams, (3) preventive asset life-cycle management, (4) involving and developing human resources, (5) integrating facility use into learning planning and occupational safety, and (6) continuous measurement and improvement through the Plan-Do-Check-Act (PDCA) cycle. These strategies form a conceptual framework that can be further tested through empirical research in arts education institutions.

Keywords: Arts Learning Quality; Facilities And Infrastructure; Total Quality Management; Educational Quality Management; Continuous Improvement

JEL Classification: I21, M11, Z11

1. Introduction

Educational quality is a goal that is continuously pursued within the national education system. Law Number 20 of 2003 on the National Education System positions facilities and infrastructure as part of national education standards, and Government Regulation Number 57

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of 2021 reaffirms facilities and infrastructure standards as components that educational units must meet. At the higher education level, Regulation of the Minister of Education, Culture, Research, and Technology Number 53 of 2023 governs internal quality assurance, which requires universities to ensure the availability and adequacy of learning resources. Thus, managing facilities and infrastructure is not merely a logistical matter but part of the effort to assure quality.

These demands are even stronger in arts learning. According to Eisner (2002), arts learning develops the ability to explore the qualities of materials, to make judgments, and to realize ideas in forms that can be experienced. This process can take place only when learners have access to practice spaces, equipment, and media appropriate to the character of the art field, such as studios, rehearsal rooms, stages, acoustic rooms, workshops, and media laboratories. A shortage or damage of such facilities directly limits learning experiences rather than merely reducing comfort.

Several studies indicate that the quality of the physical environment is related to learning outcomes. Earthman (2004) concluded that school building conditions are related to student achievement and behavior. Uline and Tschannen-Moran (2008) found a link among facility quality, school climate, and student achievement, while Barrett et al. (2015) showed that the physical characteristics of classrooms are significantly associated with students' learning progress. These findings reinforce the view that facilities and infrastructure are both an input and a process that influence learning quality. In the field of fine arts, a literature review by Abiyoga et al. (2020) concluded that complete and well-managed infrastructure has a positive effect on the fine arts learning process, in the cognitive, psychomotor, and affective domains alike. Comparable associations have been reported in other settings: student satisfaction with school facilities is modestly but significantly related to examination results (Hopland & Nyhus, 2015), and the quality of social areas, auditoriums, and libraries most strongly shapes students' overall satisfaction with university facilities (Hanssen & Solvoll, 2015).

Nevertheless, the literature reviewed here suggests that the connection between quality-management principles and the day-to-day management of educational facilities is addressed across several related but partly separate streams. A systematic review of TQM in higher education reported that facilities received less attention than some other factors in parts of the literature, while later reviews mapped TQM models, implementation barriers, customer orientation, and quality-assurance issues (Nasim et al., 2020; Jasti et al., 2022a, 2022b). In parallel, studies have addressed infrastructure planning in fine-art learning settings (Abiyoga et al., 2020; Abiyoga, 2021), and recent facilities-management research has examined maintenance practices and data-informed maintenance-budget allocation in higher education (Alhassan et al., 2026; Che-Ani, 2026). These bodies of literature provide relevant foundations, but the sources identified in this targeted search do not by themselves establish whether the specific integration of TQM principles, facilities life-cycle management, and the distinctive pedagogical and safety needs of arts learning has been comprehensively examined. In Indonesia, case studies of TQM-based facility management have focused on general schools rather than arts-learning settings and have rarely articulated how TQM principles are translated into an explicit institutional strategy (Pakpahan & Hidayati, 2021; Hasanah & Rofiki, 2026; Nurmaulidah et al., 2026). Accordingly, this article develops a context-specific conceptual synthesis rather than claiming to be the first study on educational facilities or arts-learning infrastructure.

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Total Quality Management (TQM) offers such a framework. Sallis (2002) describes TQM in education as a management philosophy that emphasizes customer satisfaction, committed leadership, teamwork, and continuous improvement. Deming (1986) stressed preventing problems in processes rather than merely inspecting results, while Goetsch and Davis (2014) summarize the elements of TQM as customer focus, a scientific approach to decision making, training, employee empowerment, and continuous improvement. Empirical studies have operationalized these principles in educational institutions, identifying leadership, strategic quality planning, process management, stakeholder focus, and measurement as critical TQM factors (Bayraktar et al., 2008; Psomas & Antony, 2017; Sfakianaki et al., 2023). Although this framework has been widely discussed in the context of educational quality management in general, discussions that specifically map TQM principles onto the management of arts learning facilities and infrastructure remain limited. A systematic review of two decades of TQM research in higher education found that existing studies tend to focus on a single factor, for example educators, and pay little attention to other factors such as facilities (Nasim et al., 2020). This is the gap that this article seeks to fill.

Based on the above, the objectives of this article are (1) to identify the role of facilities and infrastructure in arts learning quality, (2) to map the TQM principles relevant to the management of facilities and infrastructure, and (3) to formulate a strategy for developing arts learning quality through TQM-based optimization of facilities and infrastructure. The contribution of this article is conceptual, namely providing a strategic framework that can be used by managers of arts education institutions and tested empirically in subsequent research.

2. Literature Review

2.1 TQM as a Quality-Management Framework

Total Quality Management (TQM) treats quality as an organization-wide responsibility rather than an activity limited to final inspection. Its central principles include leadership commitment, attention to users' needs, employee participation, process-based management, evidence-informed decision-making, and continuous improvement. In education, these principles frame quality as an ongoing institutional process involving the people, resources, and practices that shape the learning experience (Sallis, 2002; Goetsch & Davis, 2014; Oakland, 2014). Deming (1986) similarly emphasizes designing and improving processes to prevent problems, rather than relying primarily on inspection after a failure has occurred. Empirical research supports this view. Sahney et al. (2004) argue that TQM in higher education must address teaching, learning, and administrative activities, including the support services through which students experience an institution. Bayraktar et al. (2008) identified 11 critical TQM areas in Turkish higher education institutions, including leadership, vision, measurement and evaluation, process control and improvement, and student and stakeholder focus. Psomas and Antony (2017) found that Greek higher education institutions mainly adopted student focus, leadership and top-management commitment, strategic quality planning, process management, and staff management, and that these elements were associated with improvements in quality performance and staff satisfaction. In primary education, Sfakianaki et al. (2023) developed and validated a seven-dimension instrument for studying TQM implementation, showing that the extent of TQM adoption can be measured and monitored at school level.

Applied to facilities and infrastructure, a TQM perspective therefore shifts attention from the number of assets purchased to whether facilities are suitable, reliable, safe, available when

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needed, and aligned with curriculum and user requirements. This perspective connects quality management with needs assessment, procurement specifications, inventory control, preventive maintenance, staff training, user feedback, and periodic evaluation. Reviews of TQM in higher education have examined models, implementation barriers, customer orientation, and accreditation, while also identifying areas in which the evidence base remains uneven (Nasim et al., 2020; Jasti et al., 2022a, 2022b). In this article, TQM is used as an analytical framework for integrating those management principles with the distinctive pedagogical, technical, and safety requirements of arts-learning facilities. Indonesian school-level studies illustrate this shift. Pakpahan and Hidayati (2021) concluded that many school facilities remain below required standards and that their use in learning requires continuous improvement to meet user expectations. Hasanah and Rofiki (2026) reported that applying customer focus, total involvement, and continuous improvement to facility management helped a senior high school meet national standards and maintain its accreditation, while also revealing underused rooms, unclear damage-reporting procedures, and budget constraints. Nurmaulidah et al. (2026) found that needs-based planning, structured budgeting, and preventive maintenance, supported by a quality culture and staff readiness, improved learning comfort and the utilization of school facilities.

2.2 Facilities as a Pedagogical Resource in Arts Learning

In arts learning, facilities and infrastructure are not only administrative assets. Studios, instruments, specialist equipment, materials, storage, ventilation, and safe practice spaces help shape what learners can explore and produce. Research on learning environments links physical conditions with learning experiences and outcomes, while studies of fine-art learning emphasize the importance of planning and managing facilities in relation to instructional activity (Eisner, 2002; Barrett et al., 2015; Uline & Tschannen-Moran, 2008; Abiyoga et al., 2020; Abiyoga, 2021). This context means that generic facility standards should be interpreted alongside the pedagogical, technical, and safety requirements of particular arts disciplines. Discipline-specific evidence reinforces this point. In music education, Koskinen et al. (2010) evaluated renovated teaching and practice rooms and showed that acoustic design shapes teachers' judgments of the rooms' suitability for instruction; because the study was framed within occupational safety, it also treats room acoustics as a matter of musicians' hearing protection. Arsih et al. (2025) similarly show that outcome-based arts curricula depend on aligning learning design with the practice spaces available.

2.3 Strategy and Strategic Quality Management in Educational Institutions

A strategy describes how an organization deploys its resources to move from its current position toward its intended goals, and strategic management connects long-term direction with short-term operational activities. In TQM, this connection is commonly expressed as strategic quality planning or policy deployment (hoshin kanri), in which institutional goals are translated into targets, means, and review routines at each organizational level (Sallis, 2002; Oakland, 2014). Witcher and Chau (2007) show that hoshin kanri and the balanced scorecard can work together as dynamic capabilities: the scorecard clarifies strategic objectives and measures, while hoshin kanri deploys them into daily management and periodic reviews.

Research in education supports the use of such strategic tools. Asan and Tanyas (2007) combined hoshin kanri and the balanced scorecard in a graduate engineering-management program, deploying the program's vision through a strategy map into implementation plans that were periodically reviewed. Kettunen (2005) showed that the balanced scorecard can be

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used to communicate and implement institutional strategies in continuing education by linking strategic objectives to measures and targets. Psomas and Antony (2017) found strategic quality planning to be among the TQM elements most frequently adopted by higher education institutions. Strategic thinking has also been applied to facilities: Amaratunga and Baldry (2000) argued that facilities management in higher education should be evaluated through a performance-assessment approach that links facilities practices to organizational performance.

In this article, a strategy for developing arts-learning quality is therefore understood as a coherent set of long-term choices that (a) derive facility priorities from the institution's learning goals, (b) deploy those priorities into plans, budgets, and responsibilities, and (c) are monitored through indicators and reviewed in improvement cycles. This definition links the strategy component to the TQM principles discussed in Section 2.1 and to the facility requirements discussed in Section 2.2.

2.4 Conceptual Synthesis

Taken together, the literature suggests three linked logics that guide the synthesis in Section 4. TQM principles provide the quality logic, that is, what should be managed and why; strategic management tools provide the deployment logic, that is, how priorities are translated into actions and reviewed; and the pedagogical and safety characteristics of arts disciplines provide the context logic, that is, which facility attributes matter most. The six strategies proposed in this article are developed at the intersection of these three bodies of literature.

3. Research Method

3.1 Review approach and design

This study uses a structured integrative literature review to develop a context-specific conceptual synthesis across total quality management (TQM), educational facilities management, and arts learning. An integrative approach is suitable when the purpose is to critically combine perspectives from different bodies of literature and formulate a conceptual framework, rather than estimate an intervention effect or claim exhaustive coverage of every publication (Snyder, 2019; Torraco, 2016). The review is therefore presented as an integrative review, not as a systematic review or meta-analysis.

3.2 Review questions

The review was guided by three questions: (1) Which TQM principles and practices are relevant to managing educational facilities and infrastructure? (2) Which pedagogical, functional, and safety requirements are relevant to facilities used in arts learning? (3) How can the relevant principles and requirements be integrated into a coherent set of management strategies and indicative performance measures? These questions link the literature search and synthesis to the article's conceptual objective.

3.3 Search strategy

The literature was identified through a structured exploratory search conducted on 24 October 2026 and a supplementary search conducted on 18 November 2026, using web-indexed scholarly records, publisher platforms (Emerald Insight, Taylor & Francis Online, Wiley Online Library, ScienceDirect, SAGE Journals, and Atlantis Press), the ERIC record interface, and Indonesian journal portals. The searches were organized around five themes: (a) TQM and strategic quality management in education, (b) educational facilities and learning quality, (c) arts learning and infrastructure, (d) facilities maintenance and performance management, and

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(e) review methodology. Search strings combined theme-specific terms with Boolean operators, for example ("total quality management" OR TQM) AND (education OR "higher education" OR school) AND (strategy OR "strategic planning" OR "hoshin kanri" OR "balanced scorecard"); ("school facilities" OR "university facilities" OR "learning environment") AND (achievement OR satisfaction OR "learning quality"); ("arts education" OR "music education" OR "fine art") AND (facilities OR infrastructure OR studio OR "practice room"); and ("facilities management" OR "maintenance management") AND (school OR university). Scopus and Web of Science were not searched through authenticated institutional interfaces; therefore, database-level hit counts and a PRISMA flow diagram are not reported.

3.4 Eligibility and source selection

Sources were included when they (1) addressed at least one of the five themes and directly informed at least one review question; (2) were peer-reviewed journal articles, peer-reviewed conference papers, scholarly books, research reports, or official regulations; (3) were written in English or Indonesian; and (4) had traceable bibliographic details, verified against a publisher or repository record and, where available, a DOI. Sources were excluded when they offered no empirical, conceptual, or methodological contribution relevant to the review questions, duplicated an included record, or could not be verified. The final corpus comprised 38 sources published between 1986 and 2026: 27 journal articles, 1 conference paper, 5 books, 1 research report, and 4 Indonesian regulations (Table 1). Of the 34 scholarly sources, one was published before 2000, 11 in 2000–2009, 10 in 2010–2019, and 12 in 2020–2026; 19 (56%) were published from 2015 onward. Foundational TQM books and regulations establish the conceptual and regulatory context and are not treated as empirical evidence; no source was used to support claims beyond its stated scope, context, method, or findings.

Table 1. Composition of the Reviewed Corpus by Theme

Theme	n	Years	Sources reviewed
(a) TQM and strategic quality management in education	14	1986–2023	Deming (1986); Sallis (2002); Goetsch & Davis (2014); Oakland (2014); Sahney et al. (2004); Kettunen (2005); Asan & Tanyas (2007); Witcher & Chau (2007); Bayraktar et al. (2008); Psomas & Antony (2017); Nasim et al. (2020); Jasti et al. (2022a, 2022b); Sfakianaki et al. (2023)
(b) Educational facilities and learning quality	9	2004–2026	Earthman (2004); Uline & Tschannen-Moran (2008); Barrett et al. (2015); Hanssen & Solvoll (2015); Hopland & Nyhus (2015); Kärnä & Julin (2015); Pakpahan & Hidayati (2021); Hasanah & Rofiki (2026); Nurmaulidah et al. (2026)
(c) Arts learning and infrastructure	5	2002–2025	Eisner (2002); Koskinen et al. (2010); Abiyoga et al. (2020); Abiyoga (2021); Arsih et al. (2025)
(d) Facilities maintenance and performance management	4	2000–2026	Amaratunga & Baldry (2000); Lavy & Bilbo (2009); Alhassan et al. (2026); Che-Ani (2026)
(e) Review methodology	2	2016–2019	Torraco (2016); Snyder (2019)

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Theme	n	Years	Sources reviewed
Regulatory context	4	2003–2023	Law No. 20/2003; Ministerial Regulation No. 24/2007; Government Regulation No. 57/2021; Ministerial Regulation No. 53/2023
Total	38	1986–2026	27 journal articles, 1 conference paper, 5 books, 1 research report, 4 regulations

Source: authors' compilation.

3.5 Data extraction and synthesis

For each retained source, the synthesis matrix records bibliographic details, source type and context, method or review scope where available, main finding or contribution, relevance to the review questions, and potential contribution to the article's six proposed strategies. Analysis was thematic and integrative. TQM concepts were grouped under user/customer focus, leadership and governance, process and preventive management, human-resource involvement, integration of facilities with learning and safety, and continuous improvement. The authors mapped facility-related evidence to these themes, while maintaining the distinction between empirical findings, conceptual arguments, and regulatory requirements. The six strategies are the authors' conceptual synthesis of the literature and were not empirically validated in this review. We coded each source to one primary theme (Table 1), then cross-mapped the five themes to the TQM principles and the six strategies (Table 2).

3.6 Transparency and limitations

We checked bibliographic metadata, DOIs, and abstracts against publisher pages or repository records. Several limitations should be noted. We did not perform authenticated Scopus and Web of Science searches, independent dual screening, or formal risk-of-bias assessment, and we assessed some records at the abstract level rather than in full text. Consequently, the review does not claim exhaustive coverage, and the research gap and novelty are framed as a context-specific conceptual synthesis rather than a first-ever claim. The six strategies are the authors' conceptual synthesis and require empirical validation.

4. Findings and Discussions

4.1 Thematic Synthesis of the Reviewed Literature

This section first synthesizes the reviewed literature according to the five search themes described in Section 3.3 and summarized in Table 2. The synthesis then informs the role of facilities in arts learning (Section 4.2), the mapping of TQM principles (Section 4.3), and the six strategies (Section 4.4).

Theme (a): TQM and strategic quality management in education. The reviewed studies consistently identify leadership commitment, student and stakeholder focus, strategic quality planning, process management, staff involvement, and measurement as core TQM elements in educational institutions (Sahney et al., 2004; Bayraktar et al., 2008; Psomas & Antony, 2017; Sfakianaki et al., 2023). Systematic reviews show that the field has matured in models, tools, and barrier analyses, but research has tended to focus on single factors, such as educators, with facilities receiving comparatively little attention (Nasim et al., 2020; Jasti et al., 2022a, 2022b). Studies of strategic deployment show that hoshin kanri and the balanced scorecard can translate an institutional vision into measurable objectives and periodically reviewed action plans (Kettunen, 2005; Asan & Tanyas, 2007; Witcher & Chau, 2007). This implies that facility

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quality should be embedded in the institution's strategic quality plan rather than handled as a separate logistical function.

Theme (b): Educational facilities and learning quality. Evidence from different levels of education indicates that facility conditions are associated with learning outcomes, school climate, and satisfaction. Building condition and classroom design are linked with achievement and learning progress (Earthman, 2004; Barrett et al., 2015), facility quality is linked with school climate (Uline & Tschannen-Moran, 2008), and student satisfaction with school facilities is modestly but significantly related to examination results (Hopland & Nyhus, 2015). In higher education, students' and staff's satisfaction with campus facilities depends on distinct facility attributes, such as a comfortable learning environment, public spaces, auditoriums, and libraries (Kärnä & Julin, 2015; Hanssen & Solvoll, 2015). Indonesian studies of TQM-based facility management report improvements in standards compliance, learning comfort, and facility utilization, but also persistent problems of underuse, unclear reporting procedures, and budget constraints (Pakpahan & Hidayati, 2021; Hasanah & Rofiki, 2026; Nurmaulidah et al., 2026). These findings support user-focused standards, user involvement, and satisfaction-based monitoring.

Theme (c): Arts learning and infrastructure. The arts-specific literature is comparatively small. It emphasizes that arts learning depends on exploring materials and realizing ideas in tangible forms (Eisner, 2002); that complete and well-managed infrastructure supports cognitive, psychomotor, and affective outcomes in fine-art learning (Abiyoga et al., 2020) and requires deliberate facility planning (Abiyoga, 2021); that outcome-based arts curricula require learning designs aligned with the available practice spaces (Arsih et al., 2025); and that the acoustic design of music teaching and practice rooms matters for both instructional suitability and hearing protection (Koskinen et al., 2010). The scarcity of arts-specific evidence is itself a finding: it justifies the context-specific synthesis in this article and underlines the need for discipline-specific facility standards and safety procedures.

Theme (d): Facilities maintenance and performance management. Maintenance studies show that facilities maintenance management practices in large public schools were generally of poor quality (Lavy & Bilbo, 2009), and recent research has examined maintenance management practices in public higher education institutions (Alhassan et al., 2026). Facilities management in higher education should be evaluated through structured performance-assessment approaches (Amaratunga & Baldry, 2000), and building-condition assessment combined with service-quality data can guide maintenance budget allocation (Che-Ani, 2026). These findings inform preventive asset life-cycle management and data-based continuous improvement.

Theme (e): Review methodology. Methodological sources (Torraco, 2016; Snyder, 2019) informed the choice of an integrative design, the use of a synthesis matrix, and the distinction between empirical, conceptual, and regulatory evidence. They also emphasize that integrative reviews must state their scope transparently; this is reflected in the limitations reported in Section 3.6 and in the conceptual, rather than validated, status of the proposed strategies.

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Table 2. Thematic Synthesis of the Reviewed Literature and Its Contribution to the Proposed Strategies

Theme	Main findings from the reviewed literature	Contribution to strategies
(a) TQM and strategic quality management (n = 14)	Leadership, stakeholder focus, strategic quality planning, process management, staff involvement, and measurement are core TQM elements; facilities are under-researched; hoshin kanri and the balanced scorecard embed strategy in the reviewed plans.	Strategies 2 and 6; framework for all six strategies
(b) Educational facilities and learning quality (n = 9)	Facility conditions relate to achievement, climate, and satisfaction; satisfaction depends on specific facility attributes; TQM-based facility management improves comfort and utilization but faces underuse and budget constraints.	Strategies 1, 4, and 6
(c) Arts learning and infrastructure (n = 5)	Arts learning depends on material exploration and practice spaces; infrastructure management supports learning outcomes; room acoustics affect instruction and hearing protection.	Strategies 1 and 5
(d) Facilities maintenance and performance management (n = 4)	Maintenance practices are often weak; performance assessment and condition data support maintenance prioritization.	Strategies 3 and 6
(e) Review methodology (n = 2)	Integrative reviews require transparent scope and careful separation of evidence types.	Method design and limitations

Source: authors' synthesis of the reviewed corpus (Table 1).

4.2 The Role of Facilities and Infrastructure in Arts Learning Quality

Facilities and infrastructure in arts learning have a broader function than merely providing support. First, facilities serve as a learning medium: musical instruments, studio equipment, practice materials, and media production devices are the vehicles through which arts competencies are formed. Second, spaces serve as learning conditions: the acoustics of rehearsal rooms, studio lighting, workshop ventilation, and stage size determine the quality of both the process and the resulting work. Third, facilities serve as a safeguard of safety: arts fields that use chemicals, sharp tools, machinery, or stage electrical installations require clear occupational safety standards. Fourth, facilities serve as a means of appreciation and publication: galleries, performance spaces, and documentation platforms enable learners' work to be assessed and appreciated by the public.

The national standards framework views facilities and infrastructure as components that must meet minimum criteria. For example, Regulation of the Minister of National Education Number 24 of 2007 sets out the space and equipment requirements for primary and secondary education units, including supporting spaces such as laboratories and arts rooms. However, meeting minimum standards does not guarantee learning quality. Quality is achieved only when

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the facilities match the character of the arts curriculum, are available when needed, function well, and are actually used in the learning process. Therefore, optimization, that is, the effort to maximize suitability, availability, reliability, and utilization, is a more appropriate target than merely meeting quantity requirements.

4.3 TQM Principles Relevant to the Management of Facilities and Infrastructure

TQM principles can be mapped onto the problems of managing arts learning facilities and infrastructure, as presented in Table 3. This mapping draws on TQM in education (Sallis, 2002), the elements of TQM (Goetsch & Davis, 2014), the process approach (Oakland, 2014), and the principles of prevention and continuous improvement (Deming, 1986). The mapping is also informed by the empirical findings synthesized in Section 4.1.

Table 3. Mapping of TQM Principles onto the Management of Arts Learning Facilities and Infrastructure

TQM Principle	Facilities and Infrastructure Issues in Arts Learning	Direction of Optimization
Customer focus	Procurement is determined by budget availability rather than by the needs of learners, educators, and arts partners.	Develop facility standards and priorities from curriculum needs and user input.
Leadership and commitment	Leadership attention to facilities tends to emerge only when damage occurs or accreditation approaches.	Establish a facility quality policy, a quality team, and priority-based budget allocation.
Process approach and prevention	Maintenance is corrective; asset data are not integrated.	Manage the asset life cycle: planning, procurement, inventory, preventive maintenance, disposal.
Human resource involvement and development	Studio technicians and educators have not received training in equipment operation and maintenance.	Regular training, clear division of responsibilities, and quality control circles.
Utilization and safety	Facilities are available but not integrated into learning plans; safety procedures are not standardized.	Integrate facilities into learning plans, room scheduling, and occupational health and safety (OHS) standards.
Continuous improvement and data-based decisions	Facility evaluations are not scheduled and are not followed up.	Internal audits, satisfaction surveys, performance indicators, and the PDCA cycle.

Source: authors' synthesis from Deming (1986), Sallis (2002), Goetsch and Davis (2014), and Oakland (2014), supported by the empirical findings of Bayraktar et al. (2008), Lavy and Bilbo (2009), Psomas and Antony (2017), and Hasanah and Rofiki (2026).

4.*4 Strategy for Developing Arts Learning Quality through TQM-Based Optimization of Facilities and Infrastructure*

Based on the above mapping, six interrelated strategies are formulated. They are not intended as a rigid sequence but as a mutually reinforcing system.

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Strategy 1: Establish facility and infrastructure standards focused on user needs. In TQM, the customer is the starting point for determining quality (Sallis, 2002). In arts learning, facility users include learners, educators, education staff, and partners such as communities and the creative industries. Institutions need to translate the learning outcomes of each arts field into space and equipment requirements, for example the ratio of learners to instruments, acoustic criteria, and exhibition space needs, and then compare them with national standards. The mapping results form the basis for a priority list developed with users, so procurement is driven by need rather than budget availability alone. This user-focused approach aligns with the customer-requirement orientation of TQM in education (Sahney et al., 2004) and with evidence that student and staff satisfaction depends on specific facility attributes that institutions can prioritize (Kärnä & Julin, 2015; Hanssen & Solvoll, 2015).

Strategy 2: Strengthen leadership commitment and form a facilities and infrastructure quality team. Quality improvement demands long-term commitment from leaders (Goetsch & Davis, 2014). This commitment is expressed through a written facility quality policy, the formation of a cross-unit quality team (leaders, educators, technicians, and the general affairs and finance units), and a budget allocation that treats maintenance as a fixed item rather than merely new procurement. The quality team is responsible for maintaining consistency between facility planning and the institution's strategic plan. Empirical studies identify leadership, top-management commitment, and strategic quality planning as core TQM elements in higher education (Bayraktar et al., 2008; Psomas & Antony, 2017). To deploy the facility quality policy, institutions can use a strategy map or balanced scorecard to link facility objectives with the institutional strategic plan, and hoshin kanri routines to cascade those objectives into unit-level targets and periodic reviews (Kettunen, 2005; Asan & Tanyas, 2007; Witcher & Chau, 2007).

Strategy 3: Manage the asset life cycle preventively. Deming (1986) stresses that quality is built through well-designed processes, not through inspection after problems occur. In facility management, this approach means managing assets from needs planning, procurement according to specifications, integrated inventory, and scheduled maintenance through to planned disposal (Oakland, 2014). Evidence from large public schools indicated generally poor facilities maintenance management practices (Lavy & Bilbo, 2009), whereas an Indonesian case of TQM-based facility management identified needs-based planning and ongoing preventive maintenance as key practices (Nurmaulidah et al., 2026). Recent research on higher-education facilities has also examined the role of maintenance policy, building-condition assessment, and data-informed maintenance-budget allocation (Alhassan et al., 2026; Che-Ani, 2026). Arts equipment is often sensitive to environmental conditions, for example musical instruments to humidity or media devices to dust and electrical supply, so preventive maintenance schedules and proper storage are key to reliability. Relationships with suppliers and maintenance partners also need to be managed as part of the quality chain.

Strategy 4: Involve and develop the competencies of human resources. TQM views quality as a shared responsibility and emphasizes training and empowerment (Goetsch & Davis, 2014; Sallis, 2002). Studio technicians, laboratory assistants, and educators need training in equipment operation, basic maintenance, and equipment safety. Involving educators and learners in reporting the condition of facilities, for example through a simple reporting mechanism and quality control circles, makes problem detection faster and fosters a sense of ownership of the facilities. Indonesian case evidence indicates that a quality culture and staff readiness enable all school members to take part in facility management (Nurmaulidah et al.,

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2026), whereas unclear damage-reporting procedures weaken early problem detection (Hasanah & Rofiki, 2026). Evidence from other resource-constrained organizations points in the same direction: a systematic review of strategic human resource management in social enterprises found that value-based recruitment, tailored training programs, and adaptive performance evaluation are used to address internal challenges such as resource limitations and skill mismatches (Wijaya & Senen, 2024).

Strategy 5: Integrate the use of facilities and infrastructure into learning planning and occupational safety. New facilities contribute to quality only when they are used effectively. Learning plans need to state facility requirements explicitly, and practice-room scheduling needs to be managed so utilization is high and conflicts do not occur. Project-based learning, performances, and exhibitions can be designed to use facilities optimally while also engaging the public. Efforts to design outcome-oriented arts learning, for example, the Sundanese dance learning model based on experiential learning within an outcome-based education curriculum, developed to improve the quality of arts education (Arsih et al., 2025), show that learning design and practice space requirements need to be aligned. Standard operating procedures and occupational safety standards for each type of practice room also need to be established to protect learners, in line with findings that facility quality is related to learning climate (Uline & Tschannen-Moran, 2008). Research on music teaching and practice rooms indicates that acoustic design affects both the suitability of spaces for instruction and musicians' hearing protection (Koskinen et al., 2010), while evidence of underused school rooms shows that availability alone does not guarantee effective utilization (Hasanah & Rofiki, 2026).

Strategy 6: Measure and improve continuously through the PDCA cycle. Continuous improvement is the core of TQM (Deming, 1986; Sallis, 2002). The Plan-Do-Check-Act cycle is applied to facility management: Plan, namely drawing up plans for needs, standards, and targets; Do, namely carrying out procurement, maintenance, and utilization; Check, namely monitoring through internal audits, periodic inspections, maintenance records, and user satisfaction surveys; and Act, namely following up on findings by improving standards and procedures. Recent facilities-management literature supports the relevance of maintenance indicators and data-informed prioritization in higher-education settings (Alhassan et al., 2026; Che-Ani, 2026), although these studies do not validate the full arts-learning framework proposed here. Performance-assessment approaches developed for higher-education facilities (Amaratunga & Baldry, 2000) and validated satisfaction frameworks (Kärnä & Julin, 2015) provide practical tools for the Check stage, and validated TQM instruments in education (Sfakianaki et al., 2023) show that the degree of TQM implementation itself can be monitored. Decisions should be data-driven, so institutions need clear performance indicators, as presented in Table 4.

Table 4. Examples of Quality Performance Indicators for Arts Learning Facilities and Infrastructure

Indicator	Measure That Can Be Used	Data Source
Adequacy	Ratio of learners to equipment or practice rooms compared with curriculum requirement standards.	Asset inventory, learning plans
Condition and reliability	Percentage of equipment in good condition; downtime due to damage.	Periodic inspections, maintenance records

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Utilization	Practice room usage rate relative to available hours.	Room usage schedule
Maintenance compliance	Percentage of preventive maintenance carried out as scheduled.	Maintenance log
Safety	Number of incidents and compliance with safety procedures.	Incident reports, OHS audits
User satisfaction	Learners' and educators' perception scores of the adequacy and quality of facilities.	Periodic surveys

Source: authors' formulation based on the measurement principles in TQM (Goetsch & Davis, 2014) and on facilities performance and satisfaction measurement (Amaratunga & Baldry, 2000; Kärnä & Julin, 2015).

4.5 Implications and Implementation Challenges

Managerially, this framework implies a shift in perspective from procurement to comprehensive facility quality management. Institutional leaders need to ensure that strategic plans, budgets, and internal quality assurance systems include facilities and infrastructure as a monitored component, in line with the demands of higher education quality assurance (Regulation of the Minister of Education, Culture, Research, and Technology Number 53 of 2023). For educators, the framework encourages learning planning that considers facility availability and safety from the outset. Strategically, facility objectives should be included in the institution's strategy map or balanced scorecard so that they are reviewed together with academic objectives (Kettunen, 2005; Asan & Tanyas, 2007).

Several challenges need to be anticipated. First, budget constraints can be addressed by developing data-based priorities, emphasizing preventive maintenance, and exploring partnerships with communities and industry. Second, a still-reactive work culture, which requires leaders to set an example and build habits through the PDCA cycle. Third, the diversity of needs across arts fields, which demands standards that can be adjusted for each field. Fourth, limited technical competence among management staff, which needs to be addressed through continuous training. The framework proposed in this article is conceptual; its validity and effectiveness still need to be tested through empirical research, for example, case studies or development research at specific arts education institutions.

5. Conclusion

Facilities and infrastructure serve as a learning medium, a learning condition, a safeguard of safety, and a means of appreciation in arts learning, so their management needs to be viewed as part of quality improvement efforts. The principles of TQM, namely customer focus, leadership and commitment, process approach and prevention, human resource involvement, and continuous improvement, are relevant for guiding this management. This article formulates six strategies: establishing user-focused standards, strengthening leadership commitment and quality teams, preventive asset life-cycle management, involving and developing human resources, integrating facility use with learning planning and occupational safety, and continuous measurement and improvement through the PDCA cycle. The thematic synthesis of 38 sources across five themes indicates that the evidence is strongest for the general links

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between facilities and learning outcomes and for TQM elements in education, and weakest for arts-specific facility management, which underlines both the contribution and the provisional status of the proposed strategies.

Further research is recommended to test this framework empirically in arts education institutions, for example through case studies using interview, observation, and documentation data, or through development research on a TQM-based facility management model validated by experts and practitioners. For institutional managers, the results of this study can serve as an initial reference for drafting facility and infrastructure quality policies and procedures.

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