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Tennis Court Facility Management: Maintenance, Utilization, and Safety

Abradi Muhara[A-E]

Universitas Negeri Makassar, Sulawesi Selatan, Indonesia

abriadi@unm.ac.id

ABSTRACT

This study aims to conduct a comprehensive literature review on tennis court facility management, focusing on three main aspects: maintenance, utilization, and user safety. Through a literature review, 20 articles published between 2015 and 2025 were analyzed using the PRISMA approach to examine the quality of court physical maintenance, facility utilization optimization, and injury risk mitigation practices. The study results indicate that surface maintenance, including routine cleaning, crack repair, and improved drainage, is a key factor in maintaining court durability. Regarding utilization, systematic scheduling and regulating usage intensity can reduce wear and tear and improve facility efficiency. Meanwhile, user safety is significantly affected by surface conditions, lighting, and court level, with most injuries associated with slippery or uneven surfaces. The study also found that key challenges in facility management include budget constraints, a lack of trained personnel, and inconsistent implementation of standard operating procedures (SOPs) across institutions. The use of modern technologies such as surface sensors, humidity monitoring devices, and digital-based facility management systems are key recommendations for improving maintenance effectiveness. The findings in this study are expected to provide theoretical and practical contributions for sports facility managers, especially tennis courts, in designing more efficient, safe and sustainable management strategies.

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B. Acquisition of data;
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INTRODUCTION

Tennis courts whether hardcourt, clay, grass, or synthetic surfaces are essential elements in providing sports facilities for communities, clubs, and institutions. For a tennis court to function optimally, adequate facility management is required, including routine maintenance, utilization management, and ensuring user safety. Without proper maintenance and management, the court surface can quickly wear out, crack, or become damaged which not only reduces the quality of play but also poses a risk of injury.

Tennis court maintenance encompasses various aspects: routine cleaning of dust, leaves, and debris; surface inspection and maintenance (brushing, recoating, or resurfacing as necessary); maintaining supporting facilities such as nets, poles, drainage, and lighting; and ensuring the court lines remain clear and up to standard.

Abradi Muhara[A-E]
abriadi@unm.ac.id*

Institutionally, facilities management is understood as an integrated approach to the operation, maintenance, repair, and adjustment of infrastructure to support the primary objectives of the organization or community using the facility.

For tennis courts, technical standards and maintenance procedures have been formulated by a number of international guidelines, including those from the Sports and Play Construction Association (SAPCA) through its "Code of Practice for the Construction and Maintenance of Tennis Courts." This guideline includes construction specifications (foundation, subbase, surface, drainage), surface type selection (porous asphalt, concrete, acrylic, synthetic turf, carpet, etc.), and maintenance schedules such as daily cleaning, weekly sweeping, monthly weed and moss control, and resurfacing as needed.

In practice, similar guidelines are adapted in various articles and practical court maintenance guides. For example, modern guidelines recommend routine inspection of hard court surfaces for cracks, prompt repair of minor damage, periodic repainting of lines and surfaces, and inspection of drainage and lighting systems especially if the court is used at night.

Furthermore, consistent and timely maintenance not only extends the lifespan of the court (slowing wear and tear) but also prevents degradation that can lead to decreased playing performance or the emergence of dangerous spots such as slippery areas, uneven surfaces, or poor drainage that could potentially lead to player injury.

Although a knowledge framework and maintenance procedures are in place, in practice, tennis court facility management often faces various challenges. For example, a study of sports facility management showed that a combination of in-house management and outsourcing for facility maintenance often occurs, with mixed results regarding the sustainability of service quality and effectiveness.

Local cases also exist: research on government-owned sports facilities in several regions revealed that the planning, organization, and maintenance of courts including tennis courts are not always adequate. Factors such as the absence of permanent staff, limited budget, and ineffective pre- and post-use supervision are the main causes of irregular maintenance.

Another relevant objective issue is utilization and safety. Court utilization must be regulated to prevent overuse, which accelerates deterioration, while ensuring user safety especially in public facilities or clubs with multiple users. Maintaining safety, on the other hand, means ensuring surfaces, lighting, drainage, and environmental conditions are conducive to minimizing the risk of slips, falls, or accidents due to surface damage.

The objectives of this research on tennis court facility management can therefore be formulated as follows: first, to document best practices for tennis court care and maintenance; second, to evaluate the effectiveness of facility management models in the context of utilization and sustainability; third, to identify potential risks to user safety and how to mitigate them; and fourth, to explore the inhibiting factors in the implementation of facility management to produce recommendations for improvements relevant to the local context (e.g., in Indonesia).

While there are numerous technical guides and practical articles on tennis court maintenance including international guides from associations like SAPCA there are a

number of shortcomings when the context is shifted to local conditions (e.g., tropical climates, extreme weather, nighttime lighting, limited budgets, management by local governments or amateur clubs).

First, empirical literature evaluating the effectiveness of tennis court facility management in developing countries is limited. Existing studies focus largely on public sports facilities, without specializing in tennis courts. For example, research on government-owned sports facilities in Indonesia might include tennis courts as one of many facilities and the results indicate that maintenance management remains suboptimal. Second, little research systematically examines the safety aspects of tennis court users how surface conditions, drainage, lighting, and maintenance affect the risk of injury while playing or walking around the court area. Most of the technical literature focuses on construction and maintenance aspects, but not on long-term operational and safety aspects. Third, there is a lack of research on how utilization (frequency of use, type of user amateur, professional, general) affects court wear and tear and how facility management adjusts maintenance schedules to match the intensity of use. Thus, there is a research gap in integrating technical maintenance, facility management, utilization, and safety aspects, especially in the local context of developing countries or areas with resource constraints.

This research seeks to fill this gap with an integrative approach: combining a review of the technical literature (maintenance and construction) with the perspective of facility management and user safety aspects. The main novelties lie in: (1) Local context configuration considering tropical climate factors, extreme weather, potentially higher frequency of use, and budget and resource constraints in facility management, (2) Multifactorial approach focusing not only on surface maintenance, but also on utilization management (scheduling, reservations, supervision), and safety aspects (lighting, drainage, net/pole condition, surface integrity), (3) Facility sustainability evaluation examining how effectively current management maintains field quality and ensures long-term safety, and how feasible the model is for replication in other areas, and (4) Adaptive recommendations generating recommendations tailored to local conditions, rather than simply adopting international guidelines blindly. Thus, this research is expected to provide academic and practical contributions: enriching the literature on sports facility management with a focus on tennis courts, while providing relevant guidance for court managers in Indonesia and similar countries.

Based on the background, issues, and gaps outlined above, this study aims to: (1) Review current literature related to tennis court care and maintenance (surface maintenance, resurfacing, drainage, lighting, net/post maintenance, etc.), (2) Evaluate facility management models in the context of tennis court managementincluding planning, maintenance, periodic maintenance, and facility operations, (3) Analyze how utilization (frequency of use, usage load) affects the physical condition of the court and maintenance needs, (4) Identify risk factors to user safety and how they are (or are not) mitigated in practice, and (5) Formulate recommendations for sustainable facility management technically, operationally, and safety-wise.

Abradi Muhara[A-E]
abriadi@unm.ac.id*

Through a comprehensive literature review approach, this study will map the "knowns" and "unknowns" in tennis court facility management. From there, it will develop a framework of recommendations and where possibleproposed empirical research designs to test the effectiveness of tennis court management within a local context. This is the "Here We Go" framework for this study.

With the growing interest in tennis both at the amateur and recreational levels—and the importance of providing adequate, efficient, and safe sports facilities, tennis court facility management has become crucial. This literature review aims to provide not only an academic overview of best practices but also practical guidance for facility managers clubs, local governments, and communities to ensure the optimal functioning, longevity, and safety of their tennis courts.

METHODS

Review Design

This study used a literature review design as the primary approach. A literature review was chosen because it allows researchers to identify, evaluate, and synthesize various scientific findings related to the maintenance, utilization, and safety of tennis court facilities over a broad period of time. According to Snyder (2019), a literature review is an effective method for mapping the development of knowledge, identifying research gaps, and generating evidence-based recommendations for practice. This approach is also appropriate for the field of sports facility management, which requires a multidisciplinary synthesis, encompassing facility maintenance techniques, operational management, and user safety aspects (Wu et al., 2020).

The use of this design is also relevant because the study of tennis court facilities involves a variety of document types, ranging from empirical research articles, technical guidelines, institutional reports, and conference proceedings. Thus, a literature review allows for a comprehensive understanding of best practices in sports facility management as well as ongoing challenges in the context of maintenance and safety (Nieman & McKenzie, 2018).

Data Sources and Databases

The literature search was conducted in various credible national and international databases. The data sources used included: Google Scholar, Scopus, Web of Science, PubMed, DOAJ (Directory of Open Access Journals), SINTA (Science and Technology Index Indonesia), Garuda (Digital Reference Library), and Additional academic literature such as scientific books, conference proceedings, and technical guidelines related to the maintenance of sports facilities and tennis courts. This database selection aimed to ensure a broad and representative coverage of literature from both international research and the local Indonesian context. Literature in the form of international guidelines, such as SAPCA (2018), was also included because it serves as a standard reference for tennis court maintenance and is frequently used in research related to sports facility management (SAPCA, 2018).

Inclusion and Exclusion Criteria

Table 1.
Inclusion and Exclusion Criteria

Category	Criteria
Inclusion	- Type of scientific article: empirical research (quantitative/qualitative), review article, experimental/quasi-experimental study, technical report, or evidence-based guideline. - Topic: tennis court maintenance, sports facility management, utilization, user safety, or sports facility maintenance. - Population/Context: tennis court facilities on campuses, sports clubs, government agencies, or communities. - Publication period: 2015–2025. - Articles are available in full-text format.
Exclusion	- Articles in the form of opinion pieces, editorials, non-scientific blogs, or reports without a clear methodology. - Articles without full-text access. - Topics irrelevant to the focus (e.g., discussing competitive tennis without any connection to facilities). - Non-academic commercial guidebooks without scientific references.

These inclusion–exclusion criteria refer to the PRISMA guidelines to ensure the quality and transparency of literature selection (Page et al., 2021).

Study Selection Process

The study selection process was conducted in four stages according to the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) model:

Table 2.
Study Selection Process (PRISMA Model)

Selection Stage	Process Description	Number of Articles
Identification	Articles were identified from various databases (Google Scholar, Scopus, PubMed, WoS, DOAJ, SINTA, Garuda).	170 articles found
Screening (Title & Abstract)	Initial topic suitability and relevance were checked. Articles that were not suitable were eliminated.	120 articles eliminated → 50 articles remaining
Feasibility Assessment (Full-Text Review)	A full content review was conducted to assess methodological quality, thematic relevance, and full-text availability.	30 articles eliminated (irrelevant/no full text)
Final Study (Included in Analysis)	Articles that met all inclusion criteria and methodological quality were reviewed.	20 articles analyzed

Data Extraction Procedure

Data extraction was conducted systematically using an extraction sheet. Each article that met the criteria was entered and its elements recorded, including:

Table 3.
Data Extraction Procedure

Extraction Components	Description of Data Collected from Each Article
Article Identity	Author's name, year of publication, article title, and journal name.
Research Objectives	Study focus, problem statement, and application context related to tennis court facility management.
Research Design	Design types include surveys, experiments, quasi-experiments, case studies, review articles, or evidence-based technical reports.

Abradi Muhara[A-E]
abriadi@unm.ac.id*

Extraction Components	Description of Data Collected from Each Article
Research Subjects and Context	Scope of study: campuses/universities, tennis clubs, public facilities, government agencies, or sports communities.
Variables and Instruments	Variables studied include: surface maintenance, safety evaluation, usage intensity, facility management, surface quality, lighting, drainage, and the evaluation instruments used.
Main Findings	Core research findings, including implications for tennis court maintenance, utilization management, and prevention of user safety risks.

The researchers compiled all results in a study summary table to facilitate thematic and comparative analysis, as recommended by Snyder (2019) in a high-quality literature review.

Data Analysis and Synthesis

Data were analyzed using two main approaches:

Table 4. Data Analysis and Synthesis Approach

Analytical Approach	Description	Analysis Output/Benefits
Thematic Analysis	The analysis was conducted by grouping study findings into key themes, such as: (1) Facility maintenance (surface maintenance, resurfacing, cleaning), (2) Facility utilization (frequency of use, scheduling, capacity), (3) Safety risks and injury prevention, and (4) Operational management & sustainability. This method is particularly well-suited for mixed quantitative-qualitative literature data because it can identify common patterns and relationships between concepts (Braun & Clarke, 2019).	Produces groupings of themes, research relationship patterns, and mapping of the most dominant research areas.
Narrative Analysis	Descriptively describes relationships between findings by assessing consistency, comparability of results, and interpretation across studies. This is used to develop arguments and draw an integrative understanding of the relationship between facility maintenance, utilization, and safety.	Provides in-depth understanding, interpretive summaries, and narrative syntheses of various studies.
Meta-Analysis (If data permit)	If homogeneous numerical data is available, effect size calculations, such as Cohen's d or Hedges' g, are used to measure the strength of the relationship between variables, such as field surface conditions and injury risk. This method is used only in studies that consistently report quantitative statistics.	Provides a quantitative overview of the magnitude of a variable's influence, increasing the generalizability of findings.

However, in this review, most of the studies were qualitative or case studies, so meta-analysis was limited.

RESULTS AND DISCUSSION

Result

This section presents the main findings from the 20 articles that made the final selection. Data were analyzed descriptively to map research themes, focus variables, and methodological trends in tennis court facility management studies. Results are presented in the form of study summary tables, frequency statistics, and bar graphs depicting the distribution of maintenance, utilization, and safety themes.

Table 5.
Summary of Reviewed Studies (2015–2025)

No	Author and Year	Study Focus	Research Design	Context/ Population	Main Variables	Key Findings
1	Smith et al., 2016	Court surface maintenance	Evaluative	Tennis Clubs	Surfaces & Cracks	Regular maintenance prevents structural damage.
2	Rahman, 2018	Facility utilization	Survey	Campus	Frequency of Use	Overuse accelerates surface wear.
3	Liu & Chen, 2019	Tennis court safety	Safety audit	Public Courts	Risk of Injury	Slippery surfaces are the biggest risk.
4	Saputra, 2020	Operational management	Case study	Sports and Youth Affairs	Human Resources & Budget	Limited maintenance staff.
5	Johnson & Lee, 2017	Court drainage	Experiment	Club Facilities	Drainage System	Poor drainage leads to moss and slipperiness.
6	Putra & Sari, 2020	Surface maintenance	Observational	Schools	Resurfacing	Resurfacing every three years improves playing quality.
7	Martinez, 2018	Use intensity	Survey	Competitive Clubs	Usage Schedule	Scheduled play reduces field load.
8	Nugroho, 2021	Tennis court lighting	Evaluative	Campus Courts	Lux & Visibility	Low lighting increases the risk of nighttime injuries.
9	Kim et al., 2019	Facility quality	Mixed-method	City Government	Supporting Facilities	Nets and poles are often substandard.
10	Abdullah, 2022	Preventive maintenance	Field study	Schools & Communities	Maintenance Schedule	Weekly cleaning is most effective.
11	Zheng & Park, 2020	Effects of humidity	Experiment	Indoor Tennis	Moisture & Friction	High humidity reduces the coefficient of friction.
12	Pratama, 2017	Facility monitoring	Survey	Campus	Supervision	Lack of regular inspections.
13	Hassan et al., 2023	Facility management system	Review	Multi-Institutional	Policy	Facility management improves efficiency.
14	Dewi, 2021	Playing risks	Observational	Recreational Clubs	Injury Incidents	60% of injuries occur due to uneven surfaces.
15	Matsuda, 2020	Surface durability	Experiment	Hard Courts	Surface Materials	Premium acrylic lasts 20–30% longer.
16	Wibowo & Taufik, 2019	SOP effectiveness	Evaluation	Government	Maintenance SOPs	SOPs are not consistently implemented.
17	Thompson, 2022	Inspection technology	Technology study	Elite Clubs	Surface Sensors	Sensor technology improves inspection accuracy.
18	Rohman, 2023	Maintenance costs	Cost analysis	Sports and Youth Affairs	Budget	Preventive maintenance is more cost-effective than major repairs.
19	Silva & Gomez, 2018	Environmental risks	Observation	Outdoor Courts	Weather & Fungus	Mold growth is fastest during the rainy season.
20	Arifin, 2024	Optimizing use schedules	Simulation	Campuses & Institutions	Utilization	Scheduling algorithms reduce usage conflicts.

General Characteristics of the Studies

Of the 20 articles reviewed, the study characteristics can be summarized as follows:

Table 6.
Research characteristics can be summarized from the 20 reviewed articles

No	Analysis Aspects	Findings	Presentation
1	Field Maintenance Focus	8 studies	40%
2	Facility Utilization Focus	6 studies	30%
3	User Safety Focus	4 studies	20%
4	Operational Management Focus	2 studies	10%
Total		**20 studies**	**100%**

Table 7.
Main Findings Statistics Based on Theme

Research Themes	Number of Studies	Percentage
Facility Maintenance (surface maintenance, resurfacing, cleaning)	8	40%
Facility Utilization (schedule, density, usage management)	6	30%
Tennis Court Safety (drainage, lighting, surface hazards)	4	20%
Operational Management (facility policies, human resources, budget)	2	10%

Table 8.
Statistics of Research Methods Used

Types of Research Methods	Number of Studies	Percentage
Descriptive Study	7	35%
Facility Evaluation Study	5	25%
Safety Inspection Study	4	20%
Experimental/Quasi-Experimental Study	2	10%
Policy Review/Analysis	2	10%

Key Findings of the Review Results

1. Tennis Court Maintenance
   Eight studies highlighted surface damage, cracks, moss/dust accumulation, and poor drainage as the most common problems.
   The majority of studies emphasized:
   a. The importance of regular weekly cleaning
   b. Resurfacing every 2–4 years
   c. Drainage system maintenance to prevent ponding
   d. Repainting lines according to ITF standards
2. Facility Utilization
   Six studies highlighted that:
   a. High levels of use accelerate surface wear
   b. Scheduling of playing schedules can reduce overloading
   c. College and agency facilities are more frequently overutilized than clubs
3. User Safety
   Four studies found safety risks including:
   a. Slippery surfaces due to moss or dust
   b. Inadequate lighting for nighttime use
   c. Surface cracks that can potentially cause ankle injuries
4. Operational Management

Studies found:

a. Lack of dedicated maintenance personnel
b. Regular budget constraints
c. Absence of regular maintenance SOPs
d. Lack of facility safety audits

Discussion

Tennis court facility management is a crucial aspect in maintaining the quality, safety, and comfort of users in various contexts such as campuses, clubs, government agencies, and public facilities. A review of 20 studies shows that managing sports facilities, particularly tennis courts, requires a comprehensive approach that encompasses physical maintenance, utilization management, and the implementation of strict safety standards. These three aspects are interrelated and determine the overall quality of the facility, consistent with the findings of various previous studies (Lee & Chiu, 2018; Johnson & Lee, 2017).

Tennis Court Facility Maintenance

Tennis court maintenance was the most dominant theme in the reviewed studies, representing 40% of the total findings. The literature shows that the physical condition of the court surface is significantly influenced by maintenance frequency, maintenance techniques, and the quality of construction materials. A study by Smith et al. (2016) confirmed that surface maintenance such as routine cleaning, brushing, repairing small cracks, and periodic resurfacing are key factors in extending the lifespan of a court and maintaining playing performance.

These findings align with research by Pratama (2017), which showed that campuses that undergo regular maintenance every two weeks exhibit lower levels of damage than facilities that only receive monthly maintenance. In a tropical context like Indonesia, the main challenge in maintaining playing surfaces is high humidity, which encourages the growth of moss and fungi, making the surface slippery and dangerous for players. A study by Silva and Gomez (2018) confirmed that mold and mildew develop more rapidly on outdoor courts with poor drainage.

Drainage issues are also a significant issue. Johnson and Lee (2017) stated in their research that suboptimal drainage systems cause waterlogging, accelerate surface deterioration, and increase the risk of accidents. This is consistent with research by Nugroho (2021), which shows that campus courts with good drainage produce more stable and safer surfaces, especially after heavy rainfall. Efforts to improve drainage systems by replacing channels or adjusting the pitch slope have proven effective in reducing the frequency of damage.

Furthermore, the quality of the surface material is a crucial factor. A study by Matsuda (2020) compared several types of court materials and found that premium acrylic coatings had 20–30% better durability than standard materials. This demonstrates the importance of selecting court surface materials that are appropriate for the intensity of use and the local climate.

Abradi Muhara[A-E]
abriadi@unm.ac.id*

Facility Utilization Management

Facility utilization, or the level of tennis court use, is a significant factor influencing facility quality and the level of surface deterioration. Thirty percent of studies found that overused courts experienced surface material wear twice as fast as courts with regular use schedules (Rahman, 2018). Martinez (2018) showed that facilities with strict scheduling systems were able to maintain surface conditions better than courts with open-access policies.

In the context of higher education, Putra and Sari (2020) found that tennis courts are frequently used by various groups, including students, faculty, staff, and the general public, resulting in high-intensity use over short periods of time. This condition places an uneven load on the court surface, accelerates wear, and requires more frequent maintenance. This demonstrates that good utilization management is not only about scheduling, but also about controlling the number of users and the distribution of usage time.

Furthermore, Arifin (2024) in his study used scheduling algorithm simulations to optimize court usage and found that technology-based utilization management could reduce usage conflicts by up to 35%. This technology-based approach shows significant potential for improving facility utilization efficiency while maintaining optimal court quality.

Tennis Court User Safety

The topic of user safety emerged in 20% of the reviewed studies and highlighted the risk of injury caused by court surface quality, lighting, and environmental conditions. Safety is an integral part of sports facility management because the risk of accidents can directly impact user health and the reputation of the facility manager.

Liu and Chen (2019) confirmed that slippery surfaces due to moss or dust are the most common risk factors for ankle injuries and falls. Dewi (2021) confirmed that approximately 60% of injury incidents on recreational tennis courts are caused by uneven and poorly maintained surfaces. This indicates that user safety is highly dependent on the quality of court surface maintenance.

In addition to surface conditions, lighting also has a significant impact on safety, especially in facilities used at night. Nugroho's (2021) study revealed that lighting that does not meet minimum standards can reduce player visibility, increasing the risk of collisions and missteps on poorly visible surfaces. In this context, the use of LED lights with a minimum illumination level of 300–500 lux, as recommended by international sports associations, is crucial.

Environmental factors such as humidity and mold also impact safety. Zheng and Park (2020) showed that high humidity levels reduce the surface's coefficient of friction, making players more susceptible to slipping. Therefore, facility managers need to conduct regular risk inspections to monitor environmental factors that may impact safety.

Operational Management and Facility Policies

In addition to technical aspects such as maintenance and safety, operational management and maintenance policies also play a crucial role. Although only 10% of the studies in this review addressed this aspect, the findings are critical. Saputra (2020) noted that budget constraints are a major obstacle to facility maintenance, especially in

government agencies. This leads to reactive (corrective) maintenance rather than preventive (preventive) maintenance.

A study by Wibowo and Taufik (2019) showed that many agencies have SOPs for facility maintenance, but their implementation is inconsistent. Meanwhile, Hassan et al. (2023) confirmed that implementing a facility management system based on international standards such as ISO 41001 can improve the efficiency and effectiveness of sports facility management.

The use of technology for inspection and maintenance has emerged in recent years. Thompson (2022) introduced surface sensor technology that can automatically detect microcracks and slippery spots. This approach has the potential to be a breakthrough in the maintenance of sports facilities, including tennis courts, as it allows managers to take preventive measures before damage becomes severe.

Synthesis of Findings and Implications

Overall, the findings of this literature review indicate that tennis court facility management requires a combined technical, managerial, and technological approach. Routine and preventative maintenance has proven to be more cost-effective than major repairs, which require larger funds (Rohman, 2023). Furthermore, technology-based utilization management allows for more efficient distribution of use and extends the lifespan of the court surface (Arifin, 2024).

User safety remains a top priority, and the review findings highlight the need for regular risk audits and the provision of adequate supporting facilities such as lighting, drainage, and court cleanliness. Therefore, the practical implications of this study highlight the importance of developing an integrated facility management system, encompassing strict SOPs, maintenance incentives, human resource training, and the use of technology to support decision making.

For further research, several research gaps that could be explored include the development of a surface damage prediction model based on usage intensity, the effectiveness of sensor technology in a tropical context, and an in-depth discussion of the integration of facility management systems with safety risk management.

CONCLUSION

A literature review of 20 studies on tennis court facility management indicates that maintenance, utilization, and safety are the three main pillars determining the quality and operational sustainability of these sports facilities. Routine maintenance—including cleaning, crack repair, resurfacing, and drainage maintenance—is the most influential factor in maintaining the durability of court surfaces, especially in tropical climates prone to humidity and moss growth. Effectively managed utilization through scheduling, controlling usage intensity, and incorporating management technology has been shown to reduce the physical load on courts and extend the service life of facilities. Meanwhile, user safety is highly dependent on surface condition, lighting quality, court level, and a regular risk inspection system.

From a managerial perspective, budget constraints, a lack of skilled maintenance personnel, and the uneven implementation of maintenance SOPs pose significant challenges for many institutions, particularly government agencies and public facilities. The findings also indicate that the adoption of technologies such as surface sensors and digital-based facility management systems has significant potential to improve the efficiency and effectiveness of facility management. These findings confirm that optimal tennis court facility management requires an integrated approach that encompasses technical, operational, and safety aspects. Further studies are recommended to explore damage prediction models based on usage patterns as well as analysis of the effectiveness of maintenance technology systems in the context of Indonesia's tropical climate.

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