

REVEALING THE SCENARIO OF FACILITIES MANAGEMENT AND MAINTENANCE IN MALAYSIA: A SYSTEMATIC REVIEW

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ABSTRACT

The field of Facilities Management and Maintenance (FMM) in Malaysia has undergone substantial evolution and transformation. Despite abundant research on FMM practices, conducting a systematic review on this issue has proven challenging due to the lack of review procedures. This poses a significant barrier for researchers to replicate or interpret the findings. Hence, this research aims to conduct a systematic literature review of the current FMM practices in Malaysia. The review processes comprised five key methodological steps, namely review, formulation of research questions, systematic searching strategies based on identification, screening, and eligibility on various established databases such as Scopus, Web of Science, Science Direct, and Google Scholar. This is then followed by quality appraisal, as well as data extraction and analysis. Four primary themes were identified based on the thematic analyses: (1) FMM evolution; (2) the current state of FMM; (3) technology; and (4) policy and regulation. These four themes were then divided into nine sub-themes. Findings show that despite the progress, FMM still faces challenges, particularly in standardizing the maintenance process, which impacts on overall service quality.

Keywords: *Current States, Development, Evolution, Facilities Management and Maintenance, Malaysia*



INTRODUCTION

Facilities Management and Maintenance (FMM) has often been overshadowed by the allure of architectural marvels and sophisticated mechanical endeavours (Kamaruzzaman et al., 2018). However, as Malaysia advances economically and urbanizes, effective administration and maintenance of facilities become pivotal. Preserving physical assets, encompassing buildings, transportation networks, and educational institutions, is vital for national progress and public welfare (Milala et al., 2022). FMM integrates people, processes, places, and technology to enhance core business productivity (IFMA, 2022). Notably, FMM is emphasized as more than routine expenditure; it is an investment strategy enabling cost savings through optimized maintenance practices and asset management, maximizing return on investment (Kamaruzzaman et al., 2018). Aligning with the global sustainable development agenda, FMM contributes to Sustainable Development Goals (SDGs), particularly SDG 11 - "Sustainable Cities and Communities," by efficiently optimizing building operations and resource utilization (Lok et al., 2021). Additionally, the increase of digital technologies such as Internet of Things (IoT) also improves the FMM process by enabling the predictive maintenance by improving resources management (Sidek et al., 2022)

While extensive literature exists on FMM practices, there's been limited effort to comprehensively review and identify common patterns in Malaysian FMM practices (Moayedi et al., 2023). Current literature lacks systematic evaluations, with concerns about transparency and bias in traditional reviews (Shaffril et al., 2021). This selective approach hinders reproducibility and the assessment of research comprehensiveness, posing obstacles for future researchers attempting to replicate, validate, or gauge study thoroughness. Given this gap, this research conducts a Systematic Literature Review (SLR) on current FMM practice in Malaysia. The aim is to justify empirical evidence, identify gaps, and guide future studies. The main research question guiding this review is, 'What are the current FMM practices in Malaysia?' The paper primarily focuses on the development and evolution of FMM in Malaysia.

METHODOLOGY

Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA)

The researcher employed the PRISMA guide, initially designed for healthcare research, in this systematic review. Despite its origins, PRISMA is applicable in social science, facilitating precise research questions and systematic reviews (Shaffril et al., 2021). It assists in setting inclusion/exclusion criteria and analysing literature databases within a specified timeframe (Abu Samah et al., 2021). Other methods such as Reporting Standards for Systematic Evidence Syntheses (ROSES) are also available in systematic review. However, ROSES was designed particularly for environmental management (Shaffril et al., 2021). Compared to other guidelines, PRISMA was chosen since it produces information that is more concise and transparent (Boaye Belle & Zhao, 2023).

Formulation of Research Question

The first stage in conducting a review is formulating an appropriate research question as a guide for the related procedures involved in performing SLR. Align with the aim of this research, the following research question is formulated: ‘What are the current practices of FMM in Malaysia?’.

Systematic Searching Strategies

Three systematic processes, namely identification, screening, and eligibility, as proposed by Abu Samah et al. (2021), were used to retrieve the relevant articles. Implementing these processes allows the authors to comprehensively locate and synthesise a well-organised and transparent SLR. These processes are explained as follows: -

Identification

The identification procedure aims to improve primary keywords for the review's relevance (Abu Samah et al., 2021). Five main keywords, facilities management, facilities management maintenance, maintenance, practices, and Malaysia, were identified based on the research question. To enhance these, these words are expanded with synonyms, related phrases, and variations. Various search functions, like field codes, phrase searching, wildcards, truncation, and Boolean operators, were employed to process these terms effectively. The search process was conducted in September 2023 to retrieve relevant scholarly publications from four databases such as Scopus, Web of Sciences, ScienceDirect, and Google Scholar.

Table 1. Search String Used in the Selected Database

Databases	Keywords used
Scopus, Web of Science, ScienceDirect, Google Scholar	(("facility management" OR "facility maintenance" OR "facilities maintenance" OR "facilities management maintenance " OR "facilities management" AND "practice" OR "implementation" AND "Malaysia"))

Source: Author

These techniques were either combined or used separately, depending on their appropriateness. Based on the search efforts performed, a total of 11,546 potential articles were found from the meticulously selected databases.

Screening

Screening involved the review of articles to determine their inclusion or exclusion in the study using databases or manually screened. The decision to include or exclude articles was based on a predetermined set of criteria, as outlined in Table 2. These are the type of literature, language, and year of publication. The selection of journal articles as the primary literature for this review was based on their provision of primary data, which is crucial for conducting a systematic review study.

Table 2. Inclusion and Exclusion Criteria

Criteria	Inclusion	Exclusion
Timeline	Between 2012 and 2023	2011 and earlier
Document Type	Articles (Journal Articles)	Review articles, chapter in a book, book, conference proceeding, etc
Language	English	Non-English
Subject Area	Construction, Management	Medical, Business, Computer Science and other non-construction or non-management

Source: Author

Considering the concept of the research field emphasized by Abu Samah et al. (2021), this review limited the screening process to articles published between 2012 and 2023. This timeline was chosen to ensure a sufficient number of studies for a representative review. To avoid confusion, only articles written in English were considered. Since the SLR objectives related to the management and maintenance of facilities, selecting construction and management research studies as one of the criteria was believed to increase the likelihood of acquiring relevant articles. During this stage, 11,465 articles were excluded for not meeting the inclusion criteria, leaving 81 articles for further evaluation. Additionally, 2 articles identified as duplicates were set aside, resulting in 79 articles being processed for the eligibility screening.

Eligibility

This is the third process to determine that all remaining articles from the screening process matched the established inclusion criteria. The articles were once again checked for eligibility for the review based on the title and abstract. If the authors were still unsure of the contents, then they opted to examine the contents of the selected articles. In total, 38 articles were excluded during the title screening stage, and 16 articles were removed during the abstract screening stage. Another six articles were also excluded after the content of the selected articles had been read. In total, 60 articles were removed. The remaining 19 articles were then ready for the quality appraisal stage (refer to Figure 1). During the quality appraisal stage, one article was removed due to not fulfilling the standards.

Quality Appraisal

This stage was conducted to ensure that the methodology and analysis of the selected articles were completed satisfactorily. The Mixed-Method Appraisal Tool (MMAT) by Hong et al. (2018) was adopted to assess systematic mixed studies review and encompasses the assessment of five different types of research, namely qualitative research, randomised controlled trials, non-randomized research, quantitative descriptive research, and mixed methods research. The quality of the selected articles was evaluated using five primary criteria outlined in the research design.

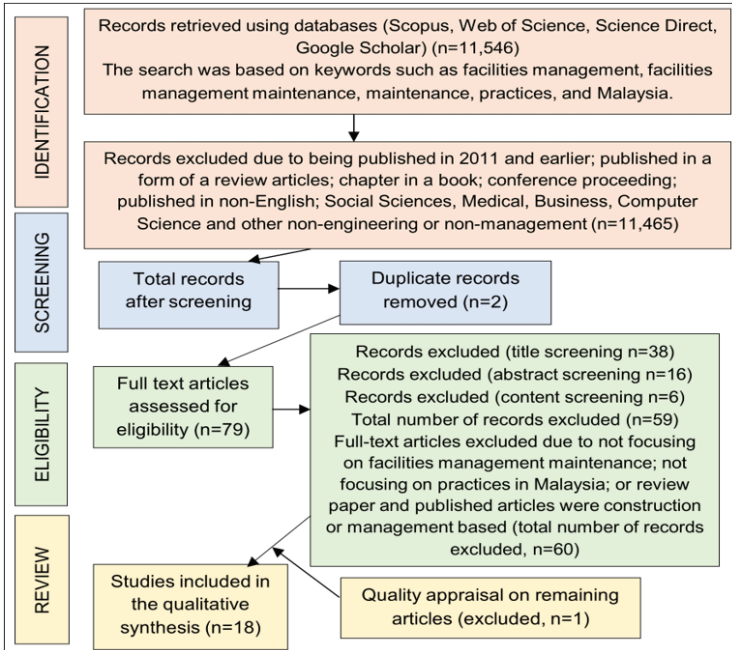


Figure 1. Flow diagram of the search process

Source: Author

Two fellow authors evaluated the quality of 19 chosen articles using the MMAT framework, focusing on clarity of research questions, confidence in assessing the questions, sampling methods, data collection, and appropriateness of statistical analysis. Each article was assessed with five criteria, rated "yes," "no," or "don't know/can't

tell." To be included, articles needed to meet at least three criteria. Decisions were based on mutual agreement, with disagreements resolved through discussion, ensuring all selected articles met the minimum quality standards for methodology and analysis.

Table 3. Assessment Criteria

Research Design	Assessment criteria
Qualitative (QI)	1.1. Is the qualitative approach appropriate to answer the research question? 1.2. Are the qualitative data collection methods adequate to address the research question? 1.3. Are the findings adequately derived from the data? 1.4. Is the interpretation of results sufficiently substantiated by data? 1.5. Is there coherence between qualitative data sources, collection, analysis and interpretation?
Quantitative randomized controlled trials (Qn (rc))	2.1. Is randomization appropriately performed? 2.2. Are the groups comparable at baseline? 2.3. Are there complete outcome data? 2.4. Are outcome assessors blinded to the intervention provided? 2.5 Did the participants adhere to the assigned intervention?
Quantitative non-randomized (Qn (nr))	3.1. Are the participants representative of the target population? 3.2. Are measurements appropriate regarding both the outcome and intervention (or exposure)? 3.3. Are there complete outcome data? 3.4. Are the confounders accounted for in the design and analysis? 3.5. During the study period, is the intervention administered (or exposure occurred) as intended?
Quantitative descriptive (Qn(d))	4.1. Is the sampling strategy relevant to address the research question? 4.2. Is the sample representative of the target population? 4.3. Are the measurements appropriate? 4.4. Is the risk of nonresponse bias low? 4.5. Is the statistical analysis appropriate to answer the research question?
Mixed methods (MM)	5.1. Is there an adequate rationale for using a mixed methods design to address the research question? 5.2. Are the different components of the study effectively integrated to answer the research question? 5.3. Are the outputs of the integration of qualitative and quantitative components adequately interpreted? 5.4. Are divergences and inconsistencies between quantitative and qualitative results adequately addressed? 5.5. Do the different components of the study adhere to the quality criteria of each tradition of the methods involved?

(Source: Hiong et al., 2018)

Table 4. Results of Quality Assessment

Study	Research Design	QA1	QA2	QA3	QA4	QA5	Number criteria fulfilled	Inclusion in the Review
Abu Bakar & Kamaruzzaman (2023)	Qn (d)	/	/	/	C	/	4/5	/
Norazman et al. (2023)	QI	/	/	/	/	/	5/5	/
(Dzulkifli et al., 2021)	QI	/	/	/	/	/	5/5	/
Razali et al. (2021)	Qn(d)	/	x	/	C	/	3/5	/
Hauashdh et al. (2020)	QI	/	/	C	/	/	4/5	/
Kayan (2019)	Qn (d)	/	/	/	C	/	4/5	/
Au-Yong et al. (2019)	Qn (d)	/	/	/	/	/	5/5	/
Khalid et al. (2019)	Qn (d)	/	/	/	/	/	5/5	/
Mong et al. (2019)	Qn (d)	/	x	/	C	/	3/5	/
Kamaruzzaman et al. (2018)	Qn (d)	/	x	/	x	/	3/5	/
Au-Yong et al. (2017)	MM	/	/	/	/	/	5/5	/
Rahmat & Nawawi (2017)	QI	x	x	x	x	x	0/5	x
Ali et al. (2016)	MM	/	/	/	/	/	5/5	/
Douglas (2016)	Qn (d)	/	x	/	C	/	3/5	/
Zawawi et al. (2016)	MM	/	/	/	/	x	4/5	/
Raja Mazlan & Mohammed (2015)	Qn (d)	/	/	/	/	/	5/5	/
Rani et al. (2015)	Qn(nr)	/	/	/	C	C	3/5	/
Myeda & Pitt (2014)	Qn (d)	/	/	/	C	/	4/5	/
Adnan et al. (2012)	QI	/	/	/	/	/	5/5	/

QA= Quality Assessment; QN (d)= Quantitative descriptive; QN (nr)= Quantitative non-randomised; QL= Qualitative; MM= Mixed Methods; C= Cannot tell

Out of them, seven articles met all the criteria, seven articles met four out of five criteria, five articles met three criteria, and one article did not meet any of the criteria, and it has been excluded from further review.

Data Extraction and Analysis

In this stage, the remaining articles were evaluated and analysed. Relevant information was extracted from each article, focusing on the research question. The review targeted primary and secondary empirical data, with attention to abstracts, results, and discussions. Data were organized into tables to facilitate synthesis. A qualitative synthesis using thematic analysis identified themes related to the current practice and development of FMM in Malaysia. Thematic analysis, as defined by Abu Samah et al. (2021) and Braun & Clarke (2019), involves identifying, investigating, organizing, describing, and reporting recurring themes. The procedures by Kiger & Varpio (2020) guided this thematic synthesis. Researchers familiarized themselves with the dataset through active and repeated readings, providing essential insights for subsequent steps.

The next stage involved generating initial codes, where researchers organized the data into more detailed and specific levels. The researchers thoroughly examined all selected articles and extracted any data related to the main research questions. In the third step, theme generation, researchers used inductive coding frameworks to identify interests, similarities, and relationships within the coded data. The themes developed were linked to the original data and reflective of the entire dataset (Braun & Clarke, 2019). Four main themes were developed, and the same procedure was applied to identify nine potential subthemes. These themes and subthemes were then presented to two FMM experts for validation and relevance to the research questions. Following this process, four themes and ten subthemes were maintained.

RESULTS

General Background of The Selected Studies

From 18 articles, a total of 11 articles focused on quantitative analyses (Abu Bakar & Kamaruzzaman, 2023; Razali et al., 2021; Au-Yong et al., 2019; Kayan, 2019; Khalid et al., 2019; Mong et al., 2019; Kamaruzzaman et al., 2018; Douglas, 2016; Raja Mazlan & Mohammed, 2015; Rani et al., 2015; Myeda & Pitt, 2014); four articles adopted on qualitative analyses (Norazman et al., 2023; Mong et al., 2021; Adnan et al., 2012). Meanwhile, three articles adopted mixed method analyses (Au-Yong et al., 2017; Chu, et al., 2016; Zawawi et al., 2016) (Figure 2).

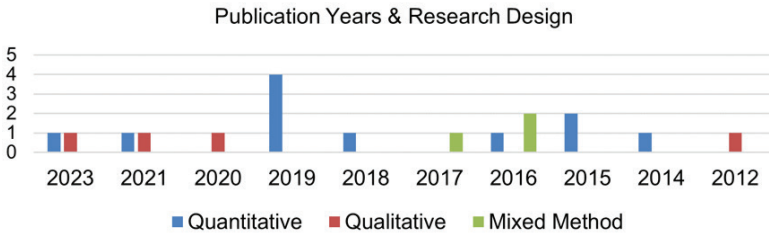


Figure 2. Publication Years and Research Designs of Selected Articles

Source: Author

Regarding the year of publication (Figure 2), two articles were published in 2023 (Abu Bakar & Kamaruzzaman, 2023; Norazman et al., 2023) and 2021 (Mong et al., 2021; Razali et al., 2021), one articles were published in 2020 (Hauashdh et al., 2020), four articles in 2019 (Au-Yong et al., 2019; Kayan, 2019; Khalid et al., 2019; Mong et al., 2019), one article in 2018 (Kamaruzzaman et al., 2018), one article in 2017 (Au-Yong et al., 2017), three articles in 2016 (Ali, Chu, et al., 2016; Douglas, 2016; Zawawi et al., 2016), two articles in 2015 (Raja Mazlan & Mohammed, 2015; Rani et al., 2015), one article in 2014 (Myeda & Pitt, 2014) and one article in 2012 (Adnan et al., 2012).

Table 5 revealed that one article was published in Journal of Surveying, Construction and Property (Abu Bakar & Kamaruzzaman, 2023); two articles in the International Journal of Building Pathology and Adaptation (Norazman et al., 2023; Hauashdh et al., 2020); one article in Estudios de Economia Aplicada (Mong et al., 2021) and two articles in Property Management (Razali et al., 2021; Au-Yong et al., 2017); one article in Journal of Cultural Heritage Management and Sustainable Development (Kayan, 2019); one article in Journal of Engineering Research (Au-Yong et al., 2019); two articles in Facilities (Khalid et al., 2019; Myeda & Pitt, 2014); one article in International Journal of Engineering and Advanced Technology (Mong et al., 2019); One article in Social and Behavioral Sciences (Rani et al., 2015); two articles in Journal of Facilities Management (Kamaruzzaman et al., 2018; Douglas, 2016); two articles in Jurnal Teknologi (Ali et al., 2016; Raja Mazlan & Mohammed, 2015); one article in Journal of Sustainable Environment (Zawawi et al., 2016); one article in Journal of Building Engineering (Dzulkifli et al., 2021); and one article in Journal of Engineering and Applied Sciences (Adnan et al., 2012). All selected journals demonstrated high quality as the journals were indexed by both Scopus and Web of Science databases.

Table 5. Selected Journals and Their Rankings

Journal	Articles No.	Indexed by WoS	Wos Quartile	Indexed by Scopus	Scopus Quartile
Journal of Surveying, Construction and Property	1	-	-	√	Q3
International Journal of Building Pathology and Adaptation	2	√	Q3	√	Q2
Estudios de Economia Aplicada	1	√	Q4	√	Q4*
Property Management	2	√	Q4	√	Q3
Journal of Cultural Heritage Management And Sustainable Development	1	√	Q4	√	Q1
Journal of Engineering Research	1	√	Q3	√	Q3
Facilities	2	√	Q3	√	Q1
International Journal of Engineering and Advanced Technology	1	-	-	√	Q4
Journal of Facilities Management					

Jurnal Teknologi	2	√	Q3	√	Q2
Journal of Sustainable Environment	2	√	Q3	√	Q3
Social and Behavioural Sciences	1	√	Q4	√	Q1
Journal of Building Engineering	1	√	Q1	√	Q1
Journal of Engineering and Applied Sciences	1	-	-	√	Q3*

*Last ranking before the journal was discontinued
 Source: Author

The Developed Themes

The thematic analysis identified four main themes and nine sub-themes related to the current practice of FMM in Malaysia (Table 6). The four main themes, ranked in order of emphasis, are as follows (1) Current state of FMM; (2) FMM Evolution; (3) Policy and Regulations and (4) Technology. Meanwhile, the nine subthemes are (1) Early FMM Practices (EPA); (2) Emergence of Professional Associations (EFP); (3) Overview of the Present FMM (OCF); (4) Keys Players and Stakeholders (KPS); (5) FMM Management Level (FML); (6) Common FMM Challenges (CFC); (7) Adoption of Technology (AT); (8) Government Policies and Initiatives (GPI) and (9) Compliances and Regulations (CR). However, it is noteworthy that the technology theme is intentionally left unexplored in this study due to limited sources available to cover the technology aspect.

Table 6. Themes and Subthemes

Authors/ Themes	FMM Evolution		Current State of FMM				Technology	Policy and Regulatory	
	EFP	EPA	OCF	KPS	FML	CFC		AT	GPI
Abu Bakar & Kamaruzzaman (2023)			√				√		
Norazman et al. (2023)	√		√			√	√	√	
(Dzulkifli et al., 2021)			√		√	√		√	√
Razali et al. (2021)				√	√		√		
Hauashdh et al. (2020)					√	√			
Kayan (2019)			√			√			
Au-Yong et al. (2019)			√			√			
Khalid et al. (2019)			√		√	√		√	√

Mong et al. (2019)			√	√	√	√		√	
Kamaruzzaman et al. (2018)	√	√	√	√	√			√	
Au-Yong et al. (2017)				√		√			
Ali et al. (2016)						√			√
Douglas (2016)		√	√		√	√			√
Zawawi et al. (2016)	√	√	√	√		√			
Raja Mazlan & Mohammed (2015)	√		√	√		√			
Rani et al. (2015)	√		√		√	√		√	√
Myeda & Pitt (2014)	√	√	√	√	√	√	√		
Adnan et al. (2012)			√	√	√	√			
Overall Rank	2		1				4	3	

FMM Evolution

For FMM evolution, 10 out of 18 articles mentioned the evolution of FMM in Malaysia. Six articles focused on the early FMM practices, and four articles on the emergence of professional associations.

a. Early FMM practices (EFP)

This subtheme delved into the origins of FMM in Malaysia. It examines how early FMM concepts were implemented and managed in Malaysia. Kamaruzzaman et al. (2018) highlighted the early implementation of FMM practices in Malaysia, shedding light on the historical context of FMM in the region. It is noteworthy that the 1990s marked the period when FMM was first implemented in Malaysia (Raja Mazlan & Mohammed, 2015). In addition, Rani et al. (2015) explore the potential for FMM definitions to be altered by changing demands and emerging trends within the field. Zawawi et al. (2016) and Myeda & Pitt (2014) highlighted that the evolution of FMM within Asian nations like Hong Kong, Singapore, and Malaysia is anchored on three key facets: practice, research, and education.

b. Emergence of Professional Association (EPA)

The emergence of professional associations in FMM is very significant and plays a crucial role in shaping and advancing FMM in Malaysia. The establishment of the Malaysian Association of

Facilities Management (MAFM) in 2001 and the National Assets and Facilities Management Convention (NAFAM) in 2007 made a great impact on FMM development in Malaysia (Douglas, 2016; Zawawi et al., 2016). These associations respond to several factors and challenges related to the knowledge and practice of FMM in Malaysia (Kamaruzzaman et al., 2018). However, Myeda and Pitt (2014) stated that these associations make no remarkable outcome in promoting FMM locally.

Current state of FMM

This theme encompassed the majority of articles being reviewed, with 17 out of 18 articles. It consists of four subthemes. The first subtheme, with 14 articles, discussed the overview of the current state of FMM in Malaysia. The second subtheme, explored in 8 articles, focused on the major players and stakeholders involved in FMM. The third subtheme, addressed in 11 articles, examines the level of FMM in Malaysia. Lastly, the fourth subtheme, discussed in 17 articles, is on common issues in FMM practices in Malaysia.

a. Overview of Current FMM (OCF)

FMM practices in Malaysia are applied in various projects, including commercial spaces such as office buildings and shopping centres, industrial facilities, healthcare institutions, government buildings, and public infrastructures. Each project presents different unique challenges and requirements, thus necessitating tailored FMM strategies. The progress of FMM in Malaysia is still at the infancy level (Rahmat & Nawawi, 2017) and remains far behind the USA or UK in terms of professional development and knowledge (Raja Mazlan & Mohamed, 2015). Despite of lack of awareness and guidance in FMM (Zawawi et al., 2016; Kamaruzzaman et al., 2016; Myeda & Pitt, 2014; Adnan et al., 2012), current FMM practice is implemented based on an ad hoc or reactive basis (Khalid et al., 2019; Au-Yong, 2019). As a result, FMM in Malaysia is at a low service quality level (Abu Bakar, 2023; Rani et al., 2015). Meanwhile, Kayan (2019) pointed out that most of the corrective maintenance was carried

out during the defect liability period, and maintenance work is usually performed when there is budget allocation (Dzulkifli et al., 2021; Au-Yong et al., 2017). Meanwhile, Zawawi et al. (2016) and Douglas (2016) highlighted that the current approach to implementing FMM is by outsourcing every service.

b.Key Players and Stakeholders (KPS)

Government agencies, especially Public Work Departments (PWD), played a pivotal role in influencing the development of FMM in Malaysia (Razali et al., 2021; Kamaruzzaman et al., 2018). PWD has established several legislation, standards, and guidelines about FMM practises (Myeda & Pitt, 2014). The Facilities Management Unit in every agency and local authority is responsible for managing and implementing operation and maintenance (O&M) of the building facilities and assets to ensure they perform satisfactorily (Adnan et al., 2012). Besides PWD, the Construction Industry Development Board (CIDB) also contributes to Malaysia's FMM development, especially in modern maintenance techniques (Kamaruzzaman et al., 2018). Property Management Division (PMD) under the Prime Minister Department also plays a role in FMM to approach the current system for government assets and facilities under the government (Razali et al., 2021). The involvement of stakeholders such as maintenance managers, maintenance service providers, maintenance staff, organisations, and users also have an impact on the quality of FMM service level in Malaysia (Hauashdh et al., 2020; Raja Mazlan & Mohamed, 2015).

c.FMM Management Level (FML)

FMM operates at three main levels of management, namely strategic, tactical, and operational level (Dzulkifli et al., 2021; Kamaruzzaman et al., 2018; Douglas, 2016; Myeda & Pitt, 2014; Adnan et al., 2012). These three levels should work together to achieve the FMM's objectives (Mong et al., 2019). Hauasadh et al. (2020) and Au-Yong et al. (2017) state that the management level of stakeholders has an essential relationship with productivity and the effectiveness

of FMM services. This is in line with Razali et al. (2021) and Khalid et al. (2019), stating that an effective management level is required to obtain a high impact of FMM services. The FMM management needs to plan a strategic FMM strategy to help minimize facility failures and expenses (Abd Rani et al., 2015; Adnan et al., 2012).

d.Common FMM Challenges (CFC)

As organizations strive to optimize the performance and longevity of their assets, they must navigate a complex situation marked by diverse obstacles and difficulties. According to Dzulkifli et al. (2021) and Hauashdh et al. (2020), issues and challenges in FMM can be classified into management, technical, and financial issues. Among management-level issues are the lack of collaboration between FMM staff and contractors and consultants (Ali et al., 2016), lack of FMM approach (Khalid et al., 2019; Abd Rani et al., 2015; Raja Mazlan & Mohammed, 2015); and lack of clear FMM policies and guideline (Noraman et al., 2022; Mong et al., 2019; Myeda & Pitt, 2014). For technical issues and challenges, Ali et al. (2016) explained that using traditional ways to report defects has made the diagnosis process difficult and time-consuming. Financial issues entail inadequate or inaccurate budget allocation from the government (Au-Yong et al., 2019; Kayan, 2019; Khalid et al., 2019; Adnan et al., 2012).

Policy and Regulatory

a.Government policies and initiatives (GPI)

GPIs are important in shaping the landscape of FMM practices in Malaysia (Kamaruzzaman et al., 2018) to uphold and improve essential infrastructure, and public facilities, the Malaysian government has allocated a substantial amount of budget and FMM policies as an initiative to boost maintenance works (Norazman et al., 2023; Dzulkifli et al., 2021; Kamaruzzaman et al., 2018; Rani et al., 2015). Among the policies are the Government Asset Management Policy, Total Quality Management Guidelines, Total Asset Management, Asset and Facility Management Manuals, and the

Building and Common Property (Maintenance and Management) Act 2007 (Norazman et al., 2022). These policies play a pivotal role in promoting rules and regulations to ascertain the maintenance direction and principle (Khalid et al., 2019).

b.Compliance and Regulations (CR)

Compliance with regulations and standards is important for effective FMM practice. In Malaysia, FMM practitioners are guided by a range of standards and regulations such as ISO 9001, ISO 14001, and BS 3811 (Dzulkifli et al., 2021; Khalid et al., 2019; Ali et al., 2016; Douglas, 2016; Rani et al., 2015). These CRs are important to elevate the quality and reliability of maintenance practices. Compliance with all these standards will ensure safety, sustainability, and great tools for monitoring the quality of the FMM services (Dzulkifli et al., 2021).

DISCUSSIONS

Evolution and Current Practices of FMM in Malaysia.

FMM in Malaysia took shape around 1990, gaining noticeable attention by the early 2010s (Kamaruzzaman et al., 2018; Raja Mazlan & Mohammed, 2015). Factors like increased awareness of maintenance needs for public facilities, driven by growing infrastructure complexity, led to the gradual adoption of FMM practices (Mong et al., 2019). Myeda & Pitt (2014) underscore the shift in perspective due to incidents in government offices, emphasizing the critical need for effective FMM in ensuring the safety and functionality of public facilities. In response to these challenges, Malaysia recognized the strategic importance of adopting FMM practices to address maintenance-related issues (James et al., 2022). Despite transitioning from reactive to preventive maintenance, challenges persist, with FMM progress considered in its infancy compared to the USA and UK (Rahmat & Nawawi, 2017; Mohd Isa et al., 2016). Thus, FMM in Malaysia may face challenges in achieving

a comparable level of professional development and knowledge. The lack of awareness and guidance in FMM in Malaysia, as highlighted by Zawawi et al. (2016); Douglas (2016), and Adnan et al. (2012), coupled with the tendency for ad hoc or reactive implementation outlined by Khalid et al. (2019), collectively contributes to a situation where the overall service quality level of FMM in Malaysia is notably low. The absence of a structured approach and insufficient awareness may lead to challenges in establishing comprehensive and proactive FMM practices (Simpeh et al., 2022). Hamid et al. (2021) highlighted that the initiatives to promote education and awareness within the industry, along with the establishment of clear guidelines and standards, can contribute to a more structured and effective implementation of FMM practices.

Key Players and Stakeholders and Professional FMM Associations

The active participation of government agencies, industry bodies like CIDB, alongside the engagement of diverse stakeholders, collectively contribute to shaping and advancing the field of FMM in Malaysia (Razali et al., 2021; Adnan et al., 2012). Government entities, such as PWD, have played a crucial role in developing FMM by establishing legislation and standards (Myeda & Pitt, 2014). These regulations ensure that facilities, particularly public facilities, are effectively maintained and comply with predetermined safety and quality criteria (Isa et al., 2016). The involvement of various stakeholders plays a crucial role in influencing the quality of FMM service levels (Hauashdh et al., 2020; Au-Yong et al., 2017). These stakeholders contribute directly to the service quality through their execution of maintenance tasks and expertise; thus, this involvement is important to achieve optimal maintenance outcomes and ensure the long-term sustainability of facilities (Hamid et al., 2021). The emergence of professional associations in FMM also signifies a noteworthy development and maturation of FMM in Malaysia. MAFM and NAFAM underscore a collective endeavour to confront

challenges and elevate the knowledge and practice of FMM in the country (Kamaruzzaman et al. (2018); Douglas (2016); Zawawi et al. (2016) and serve as crucial platforms for knowledge exchange, enabling practitioners to stay abreast of industry insights, best practices, and technological advancements (CIDB, 2023; Hamid et al., 2021).

FMM Management Level

The delineation of FMM into strategic, tactical, and operational levels, as noted by various scholars (Dzul kifli et al., 2021; Kamaruzzaman et al., 2018; Myeda & Pitt, 2014; Adnan et al., 2012), underscores the complexity of managing diverse aspects within the field. At the strategic level, the formulation of a well-defined FMM strategy by the management is paramount. A well-defined FMM strategy helps in efficient FMM, promoting extensions in the building's life and achieving life-cycle cost savings (Yoon & Cha, 2018). To attain a high impact on FMM services, Razali et al. (2021) and Khalid et al. (2019) argue for the necessity of an effective management level. This involves not only strategic planning but also tactical and operational execution, ensuring that day-to-day activities align with the broader strategic vision. The tactical level is associated with the decision support system (Gremion et al., 2019), where funds and resources are allocated wisely based on priorities and budget considerations. The operational level involves day-to-day administration activities and is responsible for executing operational tasks, to ensure the facilities function optimally (Ikediashi, 2023). The interplay between strategic, tactical, and operational management levels in FMM is an essential feature. A well-crafted strategic plan sets the tone, while effective coordination between levels and stakeholder management ensures the successful execution of FMM objectives (Gremion et al., 2019).

Common FMM Challenges

Dzulkifli et al. (2021) and Hauasadh et al. (2020) highlight management, technical, and financial issues, revealing the multifaceted challenges faced by FMM. These challenges, identified by Ali et al. (2016), include fostering effective collaboration with external entities like contractors and consultants, impacting the overall efficiency of FMM services (Sedhom et al., 2023) emphasizing the need for improved communication and coordination among all involved parties. Another management-level challenge is the absence of a comprehensive FMM approach, which is crucial for consistency and optimal resource allocation across all levels (Ikediashi, 2023). The lack of clear policies and guidelines in FMM (Noraman et al., 2022; Mong et al., 2019), leads to decision-making ambiguity and hinders standardization (Backus & Bruhl, 2022). Technical challenges within FMM, as highlighted by Ali et al. (2016), include the inefficiencies associated with traditional methods of reporting defects. Relying on conventional ways of reporting defects can impede the diagnosis process and prove time-consuming (Ismail, 2018). The financial challenges within FMM are notably characterized by issues related to inadequate or inaccurate budget allocation (Au-Yong et al., 2019); Khalid et al., 2019); Mong et al., 2019); Adnan et al., 2012). Inadequate budget allocation can lead to a range of challenges for FMM, such as insufficient resources for maintenance activities, the inability to address emerging issues promptly, and overall hindrance to achieving optimal facility performance (Hou et al., 2016; Weerasinghe et al., 2022).

Government Policies and Regulations

The Malaysian government's commitment to the maintenance and improvement of essential infrastructure and public assets is evident in its substantial budget allocations (Norazman et al., 2023; Dzulkifli et al., 2021; Mong et al., 2019; Kamaruzzaman et al., 2018). This strategic initiative is designed to enhance maintenance efforts and address the evolving needs of the nation, particularly focusing on

crucial public facilities (Ministry of Economy, 2022). By allocating a significant budget for maintenance works, the government aims to prevent deterioration, mitigate the risk of unexpected failures, and bolster the overall resilience of public assets (Pendi & Samuel, 2020). Additionally, the Malaysian government has implemented a comprehensive policy framework to elevate FMM practices, providing guidelines, rules, and regulations for standardized and strategic maintenance practices (Norazman et al., 2022; Dzulkifli et al., 2021; Khalid et al., 2019). This policy framework serves as a valuable resource for FMM professionals, offering insights into best practices, standardized procedures, and industry benchmarks (Hamid et al., 2021). FMM practitioners in Malaysia adhere to a variety of regulations and standards, encompassing both national and international benchmarks, to elevate the quality of FMM services (Shende et al., 2023).

CONCLUSION

In brief, the field of FMM in Malaysia has gradually transformed, influenced by a growing emphasis on safety considerations and evolving operational methodologies. The present condition of the system places significant emphasis on the aspects of prevention and efficiency, with the active involvement of key stakeholders and management personnel at all levels. The adoption and compliance of technology are indicative of adherence to international standards, whereas government initiatives necessitate alignment with pragmatic requirements. This research contributes to FMM field by providing a comprehensive analysis on the current state of FMM in Malaysia, highlighting the areas for improvement, particularly in terms of aligning local practices with international standards and effectively implementing government policies. In the context of future research on FMM in Malaysia, conducting an in-depth assessment of the challenges encountered by the FMM sector and identifying the root cause of these challenges is imperative.

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CONFLICT OF INTEREST

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REFERENCES

- Abu Bakar, Z., & Kamaruzzaman, S.N. (2023). Assessing Key Technology for Facilities Management in Malaysia. *Journal Surveying, Construction & Property*, 14(1), 40–54.
- Abu Samah, A., Shaffril, H. A. M., Fadzil, M. F., Ahmad, N., & Idris, K. (2021). A Systematic Review on Adaptation Practices in Aquaculture Towards Climate Change Impacts. *Sustainability (Switzerland)*, 13(20), 1–20.
- Ali, A. S., Chu, S. J. L., & Ag Ali, D. B. (2016). Issues And Challenges Faced by Government Office Buildings in Performing Maintenance Work. *Jurnal Teknologi*, 78(11), 11–23.
- Au-Yong, C. P., Ali, A. S., Ahmad, F., & Chua, S. J. L. (2017). Influences Of

- Key Stakeholders' Involvement in Maintenance Management. *Property Management*, 35(2), 217–231). Emerald Group Publishing Ltd.
- Au-Yong, C. P., Ali, A. S., & Chua, S. J. L. (2019). Maintenance Priority in High-Rise Housings: Practitioners' Perspective Versus Actual Practice. *Journal Of Engineering Research*, 7(2), 167–177.
- Douglas, M. U. (2016). Finding The Niche Towards Performance Excellence. *Journal Of Facilities Management*, 14(4), 330–349. <https://doi.org/10.1108/JFM-10-2015-0028>.
- Dzulkifli, N., Sarbini, N. N., Ibrahim, I. S., Abidin, N. I., Yahaya, F. M., & Nik Azizan, N. Z. (2021). Review On Maintenance Issues Toward Building Maintenance Management Best Practices. *Journal Of Building Engineering*, 44(10), 102985.
- Hauashdh, A., Jailani, J., Abdul Rahman, I., & AL-Fadhali, N. (2020). Building Maintenance Practices in Malaysia: A Systematic Review Of Issues, Effects And The Way Forward. *International Journal of Building Pathology and Adaptation*, 38(5), 653–672.
- Hong, Q. N., Pluye, P., Fabregues, S., Bartlett, G., Boardman, F., Cargo, M., Dagenais, P., Gagnon, M.-P., Griffiths, F., Nicolau, B., O'Cathain, A., Rousseau, M.-C., & Vedel, I. (2018). *Mixed Methods Appraisal Tool (MMAT) Version 2018 User Guide*. BMJ Open.
- Kamaruzzaman, S. N., Myeda, N. E., Zawawi, E. M. A., & Ramli, R. M. (2018). Developing Facilities Management (FM) Competencies for Malaysia. *Journal Of Facilities Management*, 16(2), 157–174. <https://doi.org/10.1108/JFM-08-2017-0036>.
- Kayan, B. A. (2019). Sustainable Built Heritage: Maintenance Management Appraisal Approach. *Journal Of Cultural Heritage Management and Sustainable Development*, 9(3), 266–281.
- Khalid, E. I., Abdullah, S., Hanafi, M. H., Said, S. Y., & Hasim, M. S. (2019). The Consideration of Building Maintenance at Design Stage in Public Buildings: The Current Scenario in Malaysia. *Facilities*, 37(13–14), 942–960.
- Milala, S. I., Ariffin, K. M., & Kasim, R. (2022). Facilities Management

Business Opportunities. *International Journal of Sustainable Construction Engineering and Technology*, 13(2), 258–267.

- Moayedi, F., Klufallah, M., Tanko, B., Hasmori, F., & Khit, S. (2023). Sustainable facilities management in Malaysia: Adoption challenges and the way forward for improvements. *IOP Conference Series Earth and Environmental Science*, 1205(1), 012028. <https://doi.org/10.1088/1755-1315/1205/1/012028>.
- Mong, S. G., Mohamed, S. F., & Misnan, Mohd. S. (2019). Current Issues and Barriers of Maintenance Management Practices for Public Facilities in Malaysia. *International Journal of Engineering and Advanced Technology*, 8(5c), 119–125.
- Myeda, N. E., & Pitt, M. (2014). Facilities Management in Malaysia: Understanding the Development and Practice. *Facilities*, 32(9–10), 490–508.
- Rahmat, N., & Nawawi, A. H. (2017). Facilities Management in Malaysian Local Authorities- Identifying Current Issues. *Medwell*, 12(5), 755–761.
- Raja Mazlan, R. M., & Mohammed, A. H. (2015). Facilities Management Relevant Competencies for Malaysian Public School. *Jurnal Teknologi*, 74(2), 73–78.
- Shaffril, H. A. M., Samah, A. A., & Kamarudin, S. (2021). Speaking of the Devil: A Systematic Literature Review on Community Preparedness for Earthquakes. *Natural Hazards*, 108(3), 2393–2419.
- Zawawi, Z. A., Samsulzamani, W., Hamdan, W., Ahmad, A., & Zahari, F. (2016). The Identification of Facilities Management Standard Service Category for Industry. In *Malaysian Journal of Sustainable Environment* 1(2), 50-63.