

Maintenance Management Challenges to the Need of Facilities for Persons with Disabilities in Public Hospital Buildings

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ABSTRACT

This study proposes a Building Maintenance House Rules Framework to improve accessibility for Persons with Disabilities (PwDs) in Malaysian public hospitals. Although legal provisions such as the Persons with Disabilities Act 2008 and the amended Uniform Building By-Laws (UBBL) exist, maintenance practices remain inconsistent and inadequately enforced. A quantitative cross-sectional survey was conducted in Hospital Kuala Lumpur, Hospital Shah Alam, and Hospital Putrajaya involving PwDs, elderly users, and pregnant women. Data were analysed using IBM Statistical Package for the Social Sciences (SPSS) through descriptive statistics and cross-tabulations. The findings reveal recurring maintenance issues, poor integration of universal design, and limited user feedback mechanisms. These results highlight the need for a structured, inclusive, and proactive maintenance framework tailored to accessibility needs.

INTRODUCTION

Maintenance management of public facilities in Malaysia including hospitals and universities faces a range of significant challenges. Local authorities often struggle with high maintenance costs and ineffective management practices, resulting in declining service quality and growing public dissatisfaction (Mong et al., 2019). In hospital settings, common building defects such as algae growth and damaged sanitary fittings negatively affect performance, safety, and operational efficiency (Jesumoroti & Cheen, 2021). For Persons with Disabilities (PwDs), accessibility remains a persistent issue across public institutions. Research

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indicates that many facilities intended for PwDs are insufficient and frequently fail to comply with universal design standards (Amin et al., 2019). For example, individuals with spinal cord injuries (SCI) experience not only physical and emotional challenges but also face increased hardship due to the lack of appropriate infrastructure (Abdul Razak & Drani, 2022). To overcome these pressing challenges, it is essential for authorities to implement proactive maintenance strategies, reevaluate existing management systems, and enforce inclusive policies that safeguard the rights and address the needs of PwDs (Amin et al., 2019; Jesumoroti & Cheen, 2021).

Inadequate Maintenance of Accessibility Features in Public Hospitals

In Malaysia, public hospitals continue to face persistent challenges in maintaining accessibility features and overall service quality. While many hospitals are initially constructed to comply with accessibility regulations, essential features such as wheelchair ramps, elevators, tactile indicators, and accessible toilets often fall into disrepair due to irregular maintenance, poor inspection routines, and delayed responses to breakdowns (Jesumoroti & Cheen, 2021). Sarantis et al. (2024) found that public hospitals lag private and university hospitals in digital services and accessibility, including online appointment systems and community engagements. Effective maintenance depends on responsiveness and innovation, areas often overlooked in public facilities (Wong et al., 2021). According to Amin et al. (2019), similar accessibility gaps exist in higher education institutions. In-patient satisfaction studies have revealed a focus on spatial and environmental comfort over accessibility, as supported by Aljunid et al. (2020), indicating a disconnect between actual needs and user perceptions.

Absence of Accessibility-Specific Focus in Maintenance Standard Operating Procedures (SOPs) and House Rules

SOPs for building maintenance in public hospitals tend to focus on overall repairs without prior identification of the maintenance of accessibility features. Challenges in facilities management and maintenance (FMM) in hospitals regarding accessibility for PwDs, difficulties in standardising maintenance processes, and impacts on service quality (Syed Shabahar et al., 2024). In public hospitals, common defects such as algae on the concrete floors and damage to sanitary appliances necessitate a re-evaluation of maintenance approaches (Jesumoroti & Cheen, 2021). According to Hussain et al. (2023), bathroom and toilet designs for elderly users should focus on safety, ease of use, and cost-effectiveness. Essential features include slip-resistant surfaces, support handrails, and accessible layouts that comply with PwD-friendly guidelines, ensuring a secure and comfortable environment. The concept of Shariah-compliant hospitals is gaining traction, highlighting key elements such as *ibadah*-friendly facilities, gender segregation, halal-certified services, and adherence to Islamic medical ethics in patient care and hospital management (Ilyani Che Jamaludin et al., 2023). Consequently, important features such as accessible washrooms, automatic doors, and clear directional signage tend to fall outside the routine maintenance schedule (Ahmad Zawawi et al., 2024). The failure to include these within the House Rules reflects the need for a specific framework incorporating accessibility-oriented tasks.

Lack of Coordination between Policy, Practice and Maintenance Execution

Despite the existence of the Uniform Building By-Laws (UBBL) and the Persons with Disabilities Act 2008, there remains a persistent lack of coordination among regulatory authorities, maintenance contractors, and hospital management. This disconnect contributes to inconsistent enforcement of accessibility standards in building maintenance, ultimately leading to fragmented efforts and substandard service delivery for PwDs (Kadhim & Altaie, 2023; Ullah et al., 2023). Insufficient financial resources, a shortage of qualified personnel, and ineffective management practices, further compound the challenges. To address these issues, critical success factors for improving maintenance performance include timely

responsiveness to user needs, integrated and holistic strategies, innovative solutions, and a focus on cost-effectiveness (Wong et al., 2021).

Maintenance Planning Does Not Reflect the Real Needs of PwDs

Active involvement of end-users in hospital planning is essential, as their insights are crucial for addressing the complex requirements of healthcare facilities. Incorporating the perspectives of PwDs ensures that the planning process accommodates diverse needs and results in more inclusive, functional, and user-centred environments. According to Febriana and Pribadi (2020), the inadequate provision of accessible facilities for PwDs often stems from a prevailing mindset among planners and designers who perceive such requirements as burdensome, leading to a lack of sensitivity and inclusivity in public building designs. To overcome these challenges, a comprehensive strategy that integrates universal design principles with targeted accommodations is necessary. Considering accessibility needs during the early design phase not only promotes inclusivity but also reduces the financial burden of costly retrofitting later (Badawy et al., 2020). Furthermore, the absence of proper maintenance documentation poses a significant barrier to effective maintenance management in healthcare facilities, particularly hindering the implementation of advanced solutions (Ebiloma et al., 2023).

Purpose of the Study, Research Questions and Contribution

This study aims to evaluate the current maintenance practices of accessibility features in Malaysian public hospitals and to develop a Building Maintenance House Rules Framework that better reflects the real needs of PwDs. Specifically, the study seeks to determine to what extent accessibility facilities are effectively maintained from the user perspective, which aspects of existing maintenance procedures most directly hinder accessibility, and how these procedures can be restructured into a more inclusive, user-centred framework. By addressing these research questions, this study contributes a practical solution that bridges the disconnect between policy and implementation, offering a structured and accessibility-focused maintenance framework that institutionalises universal design elements within daily hospital operations.

LITERATURE REVIEW

Building Maintenance in a Public Hospital

Hospital building maintenance remains a critical concern for public healthcare facilities. Several key factors influence the effectiveness of maintenance practices, including poor design, insufficient funding, inadequate staff training, and the improper use of facilities (Kadhim & Altaie, 2023). Additionally, hospital size, inappropriate usage patterns, weak budgeting processes, and high-performance expectations contribute significantly to escalating maintenance costs (Olanrewaju & Ooi, 2022). Common building defects observed in healthcare settings include algae growth, weather-related damage, and issues with sanitary appliances (Jesumoroti & Cheen, 2021). To enhance service delivery, critical success factors such as responsiveness to user needs, integrated maintenance solutions, innovative approaches, and cost-effectiveness must be prioritised (Wong et al., 2021). The implementation of proactive maintenance procedures can also mitigate building deterioration and reduce long-term repair expenses (Jesumoroti & Cheen, 2021). A clear understanding of these factors is crucial for maintenance managers to formulate effective strategic plans and allocate resources efficiently in maintaining hospital infrastructure (Kadhim & Altaie, 2023).

In the Malaysian context, maintenance issues are further intensified by high occupancy rates and continuous public usage, particularly in large public hospitals such as Hospital Kuala Lumpur (HKL), Hospital Shah Alam, and Hospital Putrajaya. These facilities experience heavy footfall from patients, caregivers, staff, and visitors, placing significant pressure on building services and accessibility-related infrastructure. Local reports frequently highlight issues such as malfunctioning lifts, poorly maintained ramps, worn tactile indicators, and recurring leakages in public corridors, which directly disrupt mobility and safety for PwDs. Although Malaysia has national accessibility standards (MS 1184:2014) and legal provisions under the Persons with Disabilities Act 2008, enforcement at the maintenance level remains inconsistent. This suggests that accessibility in public hospitals is not only a matter of compliant building design but also a long-term maintenance responsibility that must be embedded within routine facility management practices.

Existing literature on maintenance practices indicates that the primary challenges in ensuring facility functionality arise more from governance and managerial shortcomings than from technical limitations. Rahman et al. (2025) emphasise that the absence of a structured maintenance management plan, combined with limited staff competency and weak governance mechanisms, has resulted in an overreliance on corrective rather than preventive strategies. This institutional tendency reinforces a reactive maintenance culture and restricts long-term planning capacity. A comparable trend is evident within hospital environments, where maintenance priorities are frequently cost-driven and oriented towards technical infrastructure rather than user-centred facilities (Olanrewaju & Ooi, 2022). While these studies collectively highlight systemic weaknesses in maintenance governance, none explore how such shortcomings translate into accessibility performance for PwDs in healthcare settings. This underscores a critical research gap concerning the integration of accessibility considerations within maintenance decision-making and governance frameworks in public hospitals. The subsequent section therefore examines the typologies of maintenance approaches to determine the extent to which current practices support, or fail to support, sustained accessibility in hospital facilities.

Types of Maintenance

Maintenance is categorised into several types based on purpose and execution:

Table 1. Types of Maintenance

Type of Maintenance	Application in Hospitals	Impact on PwDs Accessibility
Preventive maintenance	Scheduled inspections and servicing of lifts, ramps, handrails, automatic doors, and public toilets to prevent breakdowns	Ensures accessibility features remain functional before failures occur
Corrective maintenance	Repairs carried out only after a fault occurs, e.g., fixing a lift after it breaks down or replacing damaged tactile indicators	May temporarily restrict PwDs' mobility or independence while waiting for repair
Predictive maintenance	Use of sensor data and monitoring systems to detect early signs of malfunction in elevators, escalators, fire alarms, or lighting systems	Reduces likelihood of sudden failures that can trap or endanger PwDs
Proactive maintenance	Addresses root causes such as design flaws or poor material selection for example, improving ramp gradient or replacing slippery flooring	Improves long-term usability and safer navigation for wheelchair users
Condition-based maintenance (CBM)	Maintenance triggered only when accessibility equipment shows wear or usage thresholds (e.g., elevator usage logs, TSGI damage checks)	Ensures timely intervention before total facility failure

Total productive maintenance (TPM)	Shared responsibility model where nurses, cleaners, security guards, and technicians also monitor accessibility issues during daily duties	Early problem reporting improves responsiveness for PwD-related facility failures
Scheduled & emergency maintenance	Planned periodic works (scheduled) vs urgent repairs (emergency), such as restoring lift power supply or unblocking accessible toilets	Critical for ensuring uninterrupted access to essential healthcare services

Source: West (2024); Molęda (2023), Cheikh et al. (2024), Tseremoglou (2024)

In Malaysian public hospitals, however, maintenance practices are often more heavily inclined toward corrective and emergency maintenance rather than predictive or condition-based approaches. This reactive culture is largely due to budget constraints, delayed approvals for replacement parts, and manpower limitations within hospital facility management units. For example, breakdowns of lifts or automated doors in facilities such as Hospital Kuala Lumpur and Hospital Shah Alam are frequently addressed only after complaints are lodged, indicating a gap in preventive and predictive monitoring. Furthermore, TPM principles are not fully institutionalised in Malaysian hospitals, as maintenance responsibility is typically centralised under a facility management team rather than shared across departments. This inconsistency between theoretical maintenance frameworks and actual on-ground practice reflects the need for a more structured and accessibility-focused maintenance mechanism that ensures critical features supporting PwDs always remain functional.

House Rules and Universal Design in Building Maintenance

Hospital building maintenance is essential for ensuring a safe, functional, and comfortable environment for patients, staff and visitors. House Rules refer to internal SOPs, checklists and response protocols guiding maintenance actions. In public hospital buildings, such House Rules are essential to systematise the upkeep of accessibility features. However, several factors influence maintenance effectiveness, including poor design, limited funding, inadequate training, and improper use of facilities (Kadhim & Altaie, 2023). Current SOPs often generalise maintenance tasks, failing to identify and prioritise components critical for PwDs access. To enhance maintenance service delivery, critical success factors such as responsiveness to user needs, integrated service solutions, and the adoption of innovative practices should be emphasised (Wong et al., 2021). Furthermore, applying Universal Design principles can improve the usability, well-being and social inclusion of all users within healthcare environments.

In Malaysian public hospitals, House Rules relating to accessibility are typically embedded within broader facility management SOPs rather than addressed as a standalone component. As a result, maintenance teams may prioritise mechanical, safety, and clinical infrastructure over accessibility features such as ramps, tactile indicators, handrails, or accessible toilets, which are critical for PwDs. While Universal Design is recognised under national standards such as MS 1184:2014, its translation into daily maintenance practice remains inconsistent. For example, hospitals like HKL and Hospital Shah Alam often experience delays in repairing non-functional accessibility features because these components are not explicitly monitored under accessibility-based House Rules. This indicates that Universal Design is more widely adopted at the construction approval stage than in long-term maintenance planning. Accordingly, there is a growing need for operationalised House Rules that incorporate Universal Design principles into routine inspection, monitoring, and repair cycles to safeguard continuous usability for PwDs.

Types of Persons with Disabilities (PwDs)

Persons with Disabilities (PwDs) represent a heterogeneous group with distinct accessibility needs:

Table 2. Types of Persons with Disabilities (PwDs)

Types of Disabilities	Descriptions
Hearing Disabilities	It includes conductive and sensorineural hearing loss, often requiring clear visual alerts and acoustic enhancements
Visual Disabilities	It ranges from partial sight to complete blindness, requiring tactile signage and high-contrast wayfinding systems
Speech Disabilities	It affects communication, help seeking, and service interaction
Physical Disabilities	It affects movement and dexterity, necessitating ramped access, grab bars and step-free circulation routes
Learning and Mental Disabilities	It often involves cognitive barriers, requiring simplified signage, calm environments and staff assistance
Elderly and Pregnant Women	While not traditionally categorised as disabled, they benefit from similar accessibility features due to temporary or age-related mobility limitations.

Source: Pinto (2021)

In the Malaysian context, PwDs are formally recognised under the Persons with Disabilities Act 2008, which categorises disability into seven classifications, including physical, visual, hearing, speech, learning, mental, and multiple disabilities. However, public hospital environments often encounter a broader spectrum of users who face mobility or sensory challenges, such as elderly individuals and pregnant women, who rely on the same accessibility features as registered PwDs. Hospitals such as HKL, Hospital Shah Alam, and Hospital Putrajaya serve a high volume of elderly patients with chronic illnesses, making accessible circulation pathways, clear signage, and functional lifts particularly critical. This broader inclusivity context highlights that accessibility in hospital buildings is not only a legal obligation toward PwDs but also an operational necessity to support a wider vulnerable user group. Accordingly, maintenance strategies must accommodate diverse accessibility needs to ensure continuous usability for multiple categories of users.

Accessibility Facilities for PwDs in Public Hospital Buildings

Accessibility facilities in public hospital buildings ensure that PwDs can navigate access and utilise healthcare services independently and safely. These facilities must comply with national standards, such as Malaysian Standard MS 1184:2014, which emphasises universal design principles for public infrastructure. According to Amin et al. (2019) suggests that although some accessibility provisions exist, they are frequently inadequate and do not fully align with the principles of universal design. Many public buildings, including hospitals, schools, and universities, still lack essential accessibility provisions, which hinders PwDs from fully engaging in everyday social, educational, and healthcare settings (Banik & Banik, 2021). Accessibility features are categorised under vertical circulation (movement between floors) and horizontal circulation (movement across a single level). The effectiveness of these features depends not only on their initial design but also on regular maintenance to ensure continuous functionality. Improving accessibility in public buildings is crucial for ensuring equal opportunities and non-discrimination for PwDs, enabling them to contribute their talents and abilities to society (Banik & Banik, 2021).

Table 3. Accessibility Facilities by Circulation Type

Circulation Type	Facility	Description or Purpose
Vertical Circulation	Elevator with Braille buttons	Enables visually impaired users to identify floors independently
	Audio floor announcement system	Assists users with vision loss to know their floor location
	Wide elevator doors and low control panels	Facilitates access for wheelchair users and those with limited reach
	Emergency intercom system in the elevator	Allows users to call for help during emergencies
	Ramps with handrails	Provides step-free access for wheelchairs and users with mobility aids
	Platform or stair lifts	Alternative for locations without elevators
	Escalator with visual/audio signals	Assists partially sighted or elderly users when escalators are available
Horizontal Circulation	Wide corridors and doorways	Ensures smooth movement for wheelchairs and stretchers
	Tactile ground surface indicators (TGSi)	Guides visually impaired users along pathways and directional changes
	Handrails along corridors	Offers support for elderly or physically impaired individuals
	Non-slip flooring	Reduces fall risk, especially for users with mobility difficulties
	Clear, high-contrast signage (with Braille)	Aids navigation for visually impaired and elderly users
	Level thresholds / step-free transitions	Eliminates barriers for wheelchairs, walkers, or crutches
	Automatic doors with motion sensors	Provides barrier-free entry/exit without needing physical force

Source: Sholanke (2020)

In Malaysian public hospitals, however, the presence of accessibility facilities does not always guarantee functionality. Several local assessments and user reports show that lifts with Braille buttons are often operational, but accompanying audio announcements may be faulty or muted, limiting ease of use for visually impaired patients. Similarly, tactile indicators are sometimes worn out, detached, or obstructed by hospital furniture, reducing their effectiveness. Ramps and handrails are generally available, but poor gradient control and lack of maintenance can compromise user safety. At facilities such as HKL and Hospital Shah Alam, accessibility constraints are often reported during peak hours, where high user volumes intensify dependency on lifts, ramps, and automatic doors. These examples illustrate that accessibility compliance at the design stage is insufficient without systematic maintenance protocols to ensure long-term functionality. Therefore, accessibility must be treated as an operational priority rather than a one-time design obligation.

Management and Maintenance Hierarchies

Effective hospital maintenance requires coordination across multiple management levels. Each level plays a distinct role in ensuring that buildings are operationally efficient, inclusive and accessible to all users, particularly PwDs. Embedding accessibility priorities into all strategic, tactical and operational levels ensures that compliance, functionality and user experience are consistently maintained. The table below the

responsibilities at each level and highlights how accessibility considerations should be integrated into daily practice. According to Carlsson et al (2023); Martín (2024); and Pérez-delHoyo (2021), accessibility integration is not merely a technical provision of facilities, but a multi-level governance responsibility embedded across strategic, tactical, and operational management layers. These studies collectively emphasise that accessibility for PwDs must be institutionalised through long-term policy direction at the strategic level, transformed into actionable procedures at the tactical level, and sustained through daily implementation and monitoring at the operational level

Table 4. Accessibility Integration by Management Level

Management level	Key responsibilities	Accessibility integration
Strategic	Long-term planning and budgeting	Allocate resources for accessible upgrades
	Policy development	Ensure policies align with PwDs regulations (e.g., MS 1184, UBBL)
	Regulatory compliance monitoring	Support universal design integration in capital projects
Tactical	Coordination between departments	Embed accessibility into maintenance SOPs
	Supervision of SOP implementation	Plan audits for accessibility features
	Performance monitoring	Train middle management in inclusive practices
Operational	Daily scheduling of maintenance tasks	Prioritise prompt repairs to accessibility features (e.g., lifts, ramps)
	Supervising repair crews	Conduct daily checks on critical PwDs facilities
	Ensuring staff readiness and equipment availability	Respond to feedback from PwDs users

Source: Pérez-delHoyo (2021), Carlsson (2023), Martín (2024)

In the Malaysian public healthcare system, these management responsibilities are typically shared between the Ministry of Health (strategic level), hospital engineering and facility departments (tactical level), and on-site maintenance contractors or in-house technicians (operational level). However, accessibility-related tasks are often not explicitly delineated across these layers, resulting in a blurred chain of responsibility when accessibility features fail. For instance, a malfunctioning lift or damaged tactile indicator in Hospital Kuala Lumpur or Hospital Shah Alam may be logged as a general maintenance fault rather than an accessibility-critical defect, delaying prioritisation. This suggests that although governance structures exist, accessibility-specific maintenance remains weakly embedded within operational workflows. Strengthening the governance hierarchy with explicit accessibility accountability at each level is therefore essential to ensure sustained inclusivity in Malaysian public hospitals.

Legal and Regulatory Frameworks for Accessibility

Accessibility provisions in Malaysian public hospital buildings are mandated through several national legal and regulatory instruments, most notably the Persons with Disabilities Act 2008 (Act 685), the UBBL 1984 (Amended 1990), and the Malaysian Standard MS 1184:2014 on Universal Design. These frameworks collectively establish the legal obligation for hospital buildings to provide and maintain accessible infrastructure for PwDs.

Table 5. Legal Frameworks for Accessibility Maintenance

Legal Framework	Key Provisions	Implications for Public Hospital Maintenance
Persons with Disabilities Act 2008 (Act 685)	Section 26(1): Equal right to access public facilities and buildings Section 35(1–2): Right to healthcare services and rehabilitation	Hospital infrastructure must be barrier-free for PwDs Maintenance teams must ensure continuous accessibility (e.g., functioning lifts, ramps, toilets, signage)
Uniform Building By-Laws (UBBL) 1984 (Amended 1990)	By-Law 34a mandates buildings accessible to PwDs Submission of plans must follow MS 1183 & MS 1184 Applies to public-use buildings: hospitals, offices, terminals, etc.	Design must be inclusive from the planning stage Maintenance must preserve built-in accessibility elements in working condition (e.g., handrails, tactile surfaces, door width)
Malaysian Standard MS 1184:2014 (Universal Design)	Specifies design requirements for accessible circulation, signage, and facilities Based on 7 universal design principles	Maintenance SOPs must align with technical criteria (e.g., slope ratios for ramps, positioning of Braille signage, alarm systems for the hearing-impaired) Regular audits are recommended

Source: Persons with Disabilities Act (2008), UBBL (1984), MS 1184:2014 (2014)

Although Malaysia has established a comprehensive regulatory framework through the Persons with Disabilities Act 2008, the UBBL (Amendment 1990), and MS 1184:2014, compliance remains inconsistent in public hospitals. The continued presence of accessibility barriers indicates that legislation alone does not guarantee inclusivity, as the key challenge lies in the weak operationalisation, monitoring, and enforcement of these requirements.

In practice, accessibility provisions are largely treated as design-stage criteria for obtaining planning approval, with far less emphasis on post-occupancy maintenance and functional upkeep. Hospitals may initially satisfy regulatory specifications, but accessibility features often deteriorate over time due to inadequate asset monitoring, irregular audits, and the absence of clear accountability mechanisms. Additionally, budget allocations tend to prioritise clinical upgrades and medical equipment, leaving accessibility maintenance perceived as secondary or “non-urgent.”

This enforcement gap is further compounded by fragmented institutional responsibility, where no single authority is tasked with continuous oversight of accessibility conditions. As a result, non-functional facilities such as defective tactile indicators, malfunctioning lifts or emergency intercoms, and inaccessible toilets frequently persist without intervention unless they pose immediate safety risks. Ultimately, the problem is not the lack of legislation, but the absence of structured, life-cycle-based enforcement and maintenance culture to ensure sustained accessibility performance in public hospitals.

RESEARCH METHODOLOGY

This study adopted a quantitative, cross-sectional survey design to investigate user perceptions of accessibility maintenance in public hospital buildings and to inform the development of a Building Maintenance House Rules Framework for PwDs. The research was conducted at three major public hospitals in the Klang Valley region, namely Hospital Kuala Lumpur, Hospital Shah Alam, and Hospital Putrajaya. The target population comprised PwDs, elderly individuals (aged 60 and above), and pregnant

women, as these groups have a heightened reliance on accessible infrastructure and are more vulnerable to maintenance deficiencies.

Although simple random sampling was initially intended, convenience sampling was ultimately employed due to practical and ethical constraints within hospital environments, especially since access to respondents depended on medical schedules and public area availability. Participants were approached in outpatient clinics, waiting areas, and public corridors. A total of 300 respondents were surveyed with approximately 100 participants recruited from each hospital. The sample size was determined with reference to the Krejcie and Morgan (1970) formula for large populations which recommends a minimum of approximately 384 respondents at a 95% confidence level. However, given the restricted and vulnerable nature of the hospital population, a feasible and statistically acceptable sample of 300 respondents was adopted. Equal allocation of 100 respondents per hospital ensured balanced representation and enabled meaningful cross-site comparison.

Data were collected using a structured questionnaire developed based on the Malaysian Standard MS 1184:2014 and the Persons with Disabilities Act 2008. The instrument comprised closed-ended and Likert-scale items (1 = Strongly Disagree to 5 = Strongly Agree), which assessed user satisfaction with key accessibility features such as elevators, ramps, tactile indicators, directional signage, and toilets. Additional items were included to measure the frequency of maintenance disruptions and user perceptions of maintenance responsiveness and stakeholder engagement.

The quantitative data was analysed using IBM SPSS. Descriptive statistics, including frequencies, percentages, and mean scores, were used to summarise overall accessibility performance. Cross-tabulations were applied to examine differences between user categories such as PwDs, elderly users, and pregnant women and specific accessibility features. The tabulated results facilitated interpretation and comparison across the three study locations, thereby providing an empirical foundation for developing the proposed Building Maintenance House Rules Framework.

RESULTS AND ANALYSIS

Demographic Distribution of Respondents

This study involved 300 respondents across three public hospitals in the Klang Valley region of Malaysia: Hospital Shah Alam (n = 100), Hospital Kuala Lumpur (n = 100) and Hospital Putrajaya (n = 100). The respondents comprised a diverse mix of users, focusing on vulnerable groups that benefit most from accessibility features.

Table 6. Respondent Demographics by Category

Category	Frequency	Percentage (%)
Persons with Disabilities (PwDs)	97	32.3%
Pregnant Women	43	14.3%
Elderly (aged 60 and above)	29	9.7%
Other Respondents (General Users)	131	43.7%
Total	300	100%

Source: Authors (2025)

The sample includes a significant proportion of individuals who directly rely on accessible infrastructure, with 32.3% being PwDs, 14.3% pregnant women and 9.7% elderly. The sample includes a meaningful proportion of individuals who directly rely on accessible infrastructure, with 32.3% being PwDs, 14.3% pregnant women and 9.7% elderly. This provides sufficient coverage of key user groups most affected by accessibility maintenance, although it does not claim statistical representativeness due to the use of convenience sampling. The remaining respondents, classified as general users, often serve as caregivers or companions and interact regularly with accessibility features while assisting others. Their feedback is equally valuable as they experience first-hand the usability and reliability of hospital environments designed for vulnerable groups. The mix of direct users and supporting individuals helps provide a holistic assessment of the current conditions of accessibility facilities.

Overall Satisfaction with Accessibility Facilities

Table 7. Satisfaction Scores and Issues by the Facility

Facility or Feature	Mean	Most Common Issues Reported
Elevator Crowdedness	2.95	Overcrowded during peak hours
Bad Smell in Circulation Areas	2.96	Poor ventilation in waiting zones
Lighting Quality	3.51	Occasional dimness in corridors
Elevator Response Time	3.26	Delayed arrival, especially during high traffic
Elevator Travel Time	3.34	Perceived slowness in older lifts
Elevator Door Operation	3.46	Malfunctioning or slow-closing doors
Elevator Start/Stop Performance	3.49	Mostly smooth, with occasional jerky stops
Elevator Floor Indicators	3.55	Effective, but lacking Braille support

Source: Authors (2025)

The average satisfaction scores range between 2.95 and 3.55, indicating moderate performance across the assessed facilities. Lower ratings for elevator crowding and ventilation reflect discomfort and inefficiency in managing high user volume during peak hours. These issues are particularly challenging for users with mobility or sensory limitations, as they rely more heavily on lifts for vertical circulation. However, while elevator-related challenges were the most frequently reported, other accessibility features such as corridor handrails, Tactile Ground Surface Indicators (TGSI), and automated doors generally received fewer complaints and were perceived as functioning adequate during normal operating hours. This suggests that structural elements supporting horizontal circulation remain relatively stable, whereas facilities exposed to continuous mechanical strain such as lifts experience higher rates of functional disruption. The dominance of elevator-related feedback therefore reflects their critical centrality in accessibility provision within multi-story hospitals, rather than a lack of relevance of other features. This pattern highlights that partial accessibility compliance is present: basic infrastructure may be available, but specialised accessibility features require more targeted oversight and preventive maintenance to ensure consistent universal access.

Comparison Across Hospitals

Table 8. Accessibility Feature Scores by Hospital

Facility or Feature	Kuala Lumpur	Shah Alam	Putrajaya
Elevator Crowdedness	2.97	2.94	2.95
Bad Smell	2.91	2.97	3.01
Lighting Quality	3.51	3.52	3.49
Elevator Response Time	3.24	3.26	3.29
Elevator Travel Time	3.25	3.32	3.44
Elevator Door Operation	3.38	3.48	3.52
Elevator Start/Stop	3.46	3.49	3.52
Elevator Floor Indicators	3.54	3.53	3.58

Source: Authors (2025)

Hospital Putrajaya consistently recorded the highest satisfaction scores across most accessibility features, particularly in elevator functionality and air quality. This suggests the need for better facility planning, newer infrastructure, or more proactive maintenance practices. Hospital Kuala Lumpur, in contrast, showed lower performance, likely due to older building conditions and higher daily user traffic that strain maintenance systems. Shah Alam performed moderately across most categories. These findings confirm that accessibility performance varies by location and reflects the effectiveness of hospital-specific maintenance strategies, staff responsiveness and capital investment in infrastructure renewal. The data also reinforces the need for localised maintenance planning rather than a one-size-fits-all policy.

User Feedback on Maintenance Response

Table 9. User Feedback on Accessibility Maintenance Practices

Maintenance Feedback Statement	Agree (%)	Disagree (%)
Maintenance responds quickly to accessibility-related complaints	42%	58%
Regular inspection is conducted on accessibility facilities	39%	61%
The hospital involves PwDs in maintenance-related feedback or planning	27%	73%

Source: Authors (2025)

The results show that fewer than half of the respondents perceive maintenance as timely or consistent. Only 42% agreed that complaints about accessibility issues are addressed quickly, and just 39% believed that inspections are conducted regularly. Most notably, only 27% felt that PwDs are included in any maintenance planning or feedback aspect. These points point to a reactive maintenance culture where problems are address only after user complaints rather than through preventive strategies or ongoing user engagement. The lack of participatory feedback loops and structured inspection routines undermines the long-term functionality of accessibility features. It highlights systemic weaknesses in how hospitals integrate accessibility into their maintenance operations.

DISCUSSIONS

This study examined the current state of accessibility-related maintenance practices in three public hospitals in the Klang valley. The findings reveal that although accessibility infrastructure is generally present, its long-term performance is undermined by maintenance inconsistencies, particularly in facilities that support vertical circulation such as elevators. These outcomes are consistent with past literature by Amin et al. (2019); Wong et al. (2021), which highlights that accessibility in Malaysian public buildings is often treated as a design-stage requirement rather than a sustained operational responsibility. The relatively lower satisfaction levels reported among PwDs, pregnant women, and elderly users indicate that accessibility gaps are not merely physical in nature but rooted in governance and maintenance prioritisation. The results further suggest that existing house rules and sops do not sufficiently integrate universal design principles into routine maintenance cycles, leading to service fragmentation and delayed responses when accessibility features fail. Therefore, the key issue is not the absence of accessibility infrastructure, but the inadequacy of maintenance systems in safeguarding continuous functionality for vulnerable user groups.

Diverse Respondents Reflect Inclusive Realities

The demographic distribution of respondents indicates meaningful representation from PwDs, pregnant women, and elderly users, which strengthens the relevance of the findings for vulnerable populations that depend most on accessibility infrastructure. Unlike general users, these groups experience a higher dependency on barrier-free circulation and supportive facilities, meaning disruptions disproportionately affect their mobility and autonomy. This aligns with findings by Amin et al. (2019); Banik and Banik (2021) who reported that accessibility challenges are experienced most acutely by users with functional limitations rather than the public. The inclusion of caregivers and companions in the sample further reflects the social dimension of accessibility, as these individuals often navigate hospital spaces on behalf of PwDs. Therefore, the sample does not merely describe user experience but highlights differentiated accessibility burdens across user groups, reinforcing the argument that maintenance planning should be user-sensitive rather than infrastructure-led.

Accessibility Features Show Moderate Functionality but Poor Optimisation

Although most accessibility features scored within the moderate satisfaction range (3.2–3.5), the lower ratings for elevator usability, ventilation, and waiting times indicate that functionality alone is insufficient without optimisation. These findings suggest that accessibility in hospitals is currently treated as a structural provision, rather than as a performance-based service, which is consistent with Wong et al. (2021) who argue that accessibility compliance in Malaysian public buildings often declines post-occupancy due to operational neglect. The results further show that elevators represent a functional bottleneck in high-density environments, particularly for PwDs who cannot use alternative circulation routes such as stairs. This confirms Amin et al. (2019) who noted that lift dependency heightens accessibility vulnerability for mobility-impaired users. The comparatively better scores for passive features such as handrails, corridor width highlight that infrastructure that requires less mechanical operation tends to remain reliable, while active systems requiring ongoing maintenance degrade more quickly. Therefore, the issue is not merely the availability of facilities but the extent to which maintenance strategies align with actual usage pressure and vulnerability profiles.

Gaps in Maintenance Planning and Execution

The findings indicate that maintenance in public hospitals remains predominantly reactive rather than preventive, with only 42% of respondents agreeing that accessibility-related complaints are resolved

promptly and just 39% perceiving regular inspections. This reflects a structural weakness in maintenance governance, where issues are addressed only after users report breakdowns rather than through systematic monitoring. Such a pattern is consistent with Olanrewaju and Ooi (2022) who observed that Malaysian facilities often prioritise corrective maintenance due to budget-driven and manpower-driven constraints, resulting in short-term fixes rather than long-term service reliability.

The lack of user involvement evidenced by only 27% of respondents reporting that PwDs are consulted in maintenance feedback further demonstrates that maintenance planning is supply-driven, not user-informed. This undermines universal design principles, which emphasise co-production of accessibility outcomes through active engagement with end-users. Similar observations have been made by Banik and Banik (2021) who argued that accessibility failures persist not because facilities are absent, but because maintenance cycles do not incorporate the lived experience of vulnerable users.

Consequently, the gaps in planning and execution are not merely operational but institutional: without structured feedback channels, facilities teams may overlook latent accessibility barriers until they escalate into functional failures. These findings reinforce the need for a dedicated maintenance framework that embeds user consultation and proactive monitoring as standard practice rather than discretionary actions.

Variation across Hospital Performance Highlights the Need for Localised Strategies

The comparison between the three hospitals shows noticeable variation in user satisfaction scores, with hospital Putrajaya performing more consistently than hospital Kuala Lumpur. These differences indicate that accessibility outcomes are strongly influenced by building condition, management culture, and maintenance capacity rather than regulatory compliance alone. This aligns with Carlsson (2023) who argues that accessibility effectiveness depends not only on infrastructure provision but on institutional readiness to maintain it. Hospitals with newer infrastructure or better resource planning, such as hospital Putrajaya, are more capable of sustaining accessibility performance compared to older facilities experiencing higher usage pressure and progressive deterioration, such as hospital Kuala Lumpur.

The results also suggest that centralised national policies do not adequately address contextual needs across different hospital environments. A uniform compliance-based model assumes equal capacity across facilities, but in practice, factors such as user volume, age of building systems, and maintenance staffing ratios create divergent accessibility realities. This supports the view of Pérez-delHoyo (2021) who emphasises that standardised building codes require localised implementation strategies to remain functionally effective. In the absence of such adaptation, hospitals risk technical compliance but functional inaccessibility, where infrastructure meets design guidelines at handover but fails to serve users consistently over time.

The variation in performance therefore demonstrates that accessibility is not a singular state, but a dynamic outcome shaped by environmental stress, maintenance governance, and user dependency levels. As a result, improvement strategies must be tailored to hospital-specific conditions rather than applying a one-size-fits-all approach.

Maintenance Must Align with Accessibility Policy and Real-World Usage

Although Malaysia has a comprehensive legal framework governing accessibility including the Persons with Disabilities Act 2008, UBBL 1984, and MS 1184:2014. The findings indicate a disconnect between policy intent and operational delivery. The inconsistency in inspection routines and the absence of structured feedback channels for PwDs suggest that accessibility is treated as a regulatory requirement

during design and construction, but not as a sustained maintenance obligation. This gap reflects what Martín (2024) terms as policy compliance without functional continuity, where buildings technically adhere to standards but fail to maintain usability over time.

The limited involvement of PwDs in maintenance oversight further compounds this issue, as accessibility decisions are being made by facility managers rather than the users most affected by infrastructure breakdowns. This institutional exclusion contradicts international best practice in Universal Design, which emphasises co-design and continuous engagement with vulnerable groups. As highlighted by Wong et al. (2021), accessibility is not achieved through infrastructure provision alone but through governance mechanisms that ensure continuous functionality.

Therefore, a shift is required from design-based compliance to maintenance-based accountability. Hospitals need structured accessibility-oriented House Rules that explicitly define repair priorities, user reporting mechanisms, and inspection cycles. Without embedding accessibility within daily operational governance, policies remain aspirational rather than actionable. The development of a dedicated Building Maintenance House Rules Framework is thus necessary to bridge the gap between regulatory obligations and real-world usage conditions.

CONCLUSION

This study finds that although accessibility features such as elevators, circulation pathways and tactile systems are available in Malaysia's public hospitals, their functional performance remains inconsistent due to reactive maintenance practices, limited inspection routines, and insufficient involvement of PwDs in decision-making. The variation in performance across the three hospitals shows that accessibility is influenced not only by regulatory requirements but also by institutional capacity, infrastructure age, and user load, meaning that compliance at the design stage does not guarantee long-term usability. These findings reinforce past literature suggesting that accessibility failures are governance-related rather than infrastructure-related, and demonstrate the need for a proactive, user-centred maintenance model that goes beyond technical provision. Therefore, a dedicated Building Maintenance House Rules Framework is necessary to operationalise accessibility in practice and ensure sustained functionalities for all vulnerable users.

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest related to the publication of this article.

AUTHORS' CONTRIBUTIONS

Calvin Rico Satap Anak Sumping, a doctoral candidate at the Faculty of Built Environment, UiTM Shah Alam, Malaysia, was responsible for conducting the research, performing data analysis, and drafting and revising the manuscript. Mohamad Ridzuan Yahya conceptualised the central research idea, developed the theoretical framework, and jointly designed the study. He also provided supervisory oversight throughout the research process, led the critical review of the manuscript, contributed significant revisions, and approved the final version for submission. Asiah Abdul Rahim reviewed the manuscript and approved its final version for publication.

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