



The Implementation of Maintenance System in Malaysia's Public Housing at Kota Bharu, Kelantan

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Abstract: Establishing an effective maintenance system in public housing buildings is essential in ensuring the building operates optimally and enhances residents' satisfaction. However, the maintenance management in Malaysian public housing is considered low, particularly on leaky roofs, dysfunctional elevators and obstructed pipes. Consequently, the deterioration of facilities and services makes the residents dissatisfied. Consequently, the study aims to determine the current implementation and effectiveness of the maintenance system for public housing by focusing on the residents' satisfaction level and the practice of the maintenance personnel. Surveys were conducted with residents and maintenance personnel from the Projek Perumahan Rakyat Kota Bharu's public housing. A total of 230 questionnaires were considered valid and analyzed to rank the residents' satisfaction level towards public housing maintenance and the practice of the maintenance personnel in public residential buildings. The data was analyzed using the Mean Analysis in the Statistical Package for Social Science (SPSS). The result revealed that the residents are satisfied with the maintenance system's performance, with an electrical system as the most satisfying maintenance performance rated by the residents, compared with other aspects of the maintenance performance factors, with a mean score of 3.94. However, several aspects of the maintenance system, namely cleaning services, security system, and time for repairing the defects, still need improvement to enhance the maintenance quality of public housing in Malaysia.

Keywords: Building maintenance, public housing, maintenance system

1. Introduction

The rapid growth in Malaysia's population, especially in urban areas, has resulted in higher housing demand [1]. However, only some have the luxury of purchasing a home, particularly the low-income community. According to [2], the public sector will provide houses for lower-income and public employees, while the private sector will be held responsible for the market demand. Construction projects for the public housing program are initiated by the Ministry of Housing and Local Government (MHLG) through the National Housing Department (NHD). Since the government has many public housing projects, many issues are actively explored to contribute to those public housing developments. In other words, the housing agenda must provide ways to sustain the existing public housing buildings. Moreover, more emphasis should be put on maintaining the current buildings to improve housing effectiveness. Maintenance is required to ensure the building functions properly, which improves the quality of life for the residents living inside the building. Nevertheless, it is significant to adapt the level of quality in the maintenance of houses to provide sufficient, affordable, and quality housing. The facility's maintenance ensures that the facility is reliable and can be operated without interruptions.

In most countries, the residents are dissatisfied with their dwelling units due to the government's management of public housing, often labelled as poor maintenance. The management of public housing in Malaysia is also not exempted from managing the units [3]. Reckless construction, poor design, and insufficient maintenance have rapidly deteriorated public housing. The Malay Mail [4] reported that a significant proportion of the Public Housing Program (PPR) residents in Selangor faced severe maintenance problems, particularly with leaky roofs and dysfunctional elevators obstructed pipes [5]. Maintenance management is inconclusive in Malaysia as it does not consider risk factors when formulating maintenance policies. As reported in [6], tenants' poor civic-mindedness attitude among tenants is the cause of many PPR problems. Despite having numerous methods, approaches, and campaigns implemented by the authorities to encourage the owners to take responsibility and ownership of their homes, they feel they need to be more entitled to maintain their home services and facilities. The lift system is a significant service and facility that requires maintenance to upkeep the condition and stringent safety requirements. A documented 111 incidents involving faulty lifts and escalators since 2010, resulting in 11 fatalities, have been reported in the Department of Occupational Safety and Health (DOSH), which was mentioned in [7]. The majority of the lift systems failed to follow the maintenance standards. Therefore, this paper intends to study the current implementation of a maintenance system for public housing. The maintenance system's effectiveness is studied on the residents' satisfaction level and the maintenance system. The residents' satisfaction is classified into three main factors: physical and environmental, building services, and building management.

1.1 Maintenance System and Management

Maintenance was defined as a set of all technical and related administrative measures designed to retain or restore an item in a state where the required function can be carried out [8]. Besides, maintenance work differs from construction work in nature and is therefore carried out in combination with in-house and outsourced maintenance work [9, 10]. Buildings frequently deteriorate due to climate change's wear and tear and decline in distinct conditions. The occupancy rate in the building should be taken into account. It requires adequate care and maintenance to slow down the deterioration rate and prolong the building's systems' lives in an acceptable operating condition. Maintenance is the work done to repair or renovate the building to ensure that the building follows an appropriate standard and works well [11]. The rising complexity of the design and processes has contributed to higher maintenance. In the Strata Management Act 2013, the most critical duties of building a management body are maintaining and managing the building properly and taking action that is fit or appropriate for the residential area's proper maintenance.

Maintenance management is related to the various resources' management and organization to monitor the industrial unit's availability and output at a defined level. It can also be viewed as a remedial function of production management to maintain equipment and plant facilities always available in the proper operating condition. Effective maintenance management is vital for public housing to enhance housing efficiency and services. Therefore, building maintenance has generated considerable interest in following maintenance management procedures to improve Malaysian buildings [12]. Also, Malaysia's ineffective maintenance management is a fundamental problem that needs to be monitored, revised, and reassessed maintenance procedures with careful consideration of health and safety requirements [13]. Thus, there is a need for further improvement in maintenance management to ensure the buildings' sustainability.

Maintenance systems are components of residents' housing services by managing housing, communal facilities, and amenities, intending to improve housing quality and promote social perceptions concerning their housing [14]. Maintenance systems include procedures that can inhibit decay in houses, reduce deterioration, and minimize health hazards [15]. The maintenance system aims to ensure that the property's value is maintained and the living environment is kept high [16]. Furthermore, every building has different maintenance, especially maintenance work [17]. Maintenance work is defined by the resident's incident, urgent or routine requirements, complexity, cause of failure, and buildings' age [18]. The interrelationships between the management team that provides the services and the people who view how the service is provided and those services' outcomes are an integral part of the performance studies [15]. The lack of maintenance personnel, low quality, and bad experience reduced maintenance performance [19]. To ensure the maintenance system's efficiency at public housing, the management department should provide excellent services to the residents.

1.2 Types of Maintenance

Generally, maintenance is classified into: (i) unplanned maintenance, and (ii) planned maintenance. In terms of maintenance, there are four types: preventive maintenance, corrective maintenance, condition-based maintenance, and scheduled maintenance.

1.2.1 Unplanned Maintenance

Unplanned maintenance is also known as emergency or reactive maintenance, whereby an add-on concerning unexpected scenarios leads to an expensive maintenance system. The task is performed urgently or when there is an issue with the building. For example, when elevator breakdown and repairs are necessary.

1.2.2 Planned Maintenance

They are commonly used in the maintenance management of buildings. An effective remedy for maintenance is using reliable and accurate data whereby the management plans the maintenance personnel's priorities according to the maintenance systems and components-performing routine cleanings of the floor weekly for cleaning of the window and in a year to check the building facade's exterior. There are three types of planned maintenance that are typically performed in housing and building maintenance:

1.2.2.1 Corrective Maintenance

Corrective maintenance must be performed after a breakdown has occurred before the item can function correctly. When breakdowns and requests occur, corrective maintenance tasks often come in response. It is the most straightforward maintenance approach whereby each system and component will be maintained until its breakdown. Besides, it describes all available actions to correct a component that has failed to perform its intended function. However, corrective maintenance can be costly because the breakdown and failure of particular components can cause vital damage to other parts of a building. Nevertheless, ensuring the system and components are functioning correctly and well-maintained is essential in corrective maintenance strategies. Furthermore, corrective maintenance is related to the correction of unforeseen variances. Therefore, it must be some emergency modus operandi, leading to an inevitable expenditure and imperative to reduce this maintenance's impact.

1.2.2.2 Preventive Maintenance

Preventive maintenance has been developed to overcome the disadvantages of maintaining the correction by reducing the number of breakdowns and reducing damage caused. Hence, periodically assessing the equipment's efficiency will prolong the equipment's life. Preventive maintenance is performed at standard or predetermined times, depending on operational time. Preventive maintenance can be carried out accurately and in advance due to the reliable availability of parts and labour costs. While building maintenance costs can be reduced by arranging maintenance properly, dealing with damaged components, and not creating health and safety concerns. Besides, preventive maintenance keeps a building at optimal performance levels. The preventive maintenance approach is most suitable because the costs of replacing failed components and long-term service contracts would be proportional to the original expenditure of good repair. Furthermore, preventive maintenance would apply to systems subject to usage deterioration. This occurrence breakdown pattern could be modelled effectively and purposely to their potential. Hence, the maintenance system and components' breakdown can be minimized, building's quality is preserved.

1.2.2.3 Condition-Based Maintenance

Condition-based maintenance is carried out whenever a situation develops, representing a significant deterioration in the maintenance system's condition and performance. The basic principle of the condition-based maintenance strategy is that manual and automatic systems periodically evaluate all systems' equipment and components to measure conditions and identify the degradation of the maintenance performance systems. The replacement and maintenance will then occur according to the monitoring and inspection data analysis. Hence, this maintenance approach is performed when a measurable condition requires replacement or repair. Furthermore, this strategy is used to identify maintenance system problems and schedule downtime for the most effective and budget-friendly time. Therefore, this maintenance approach will maximize accessibility, reduce unscheduled downtime and minimize unplanned maintenance.

1.2.2.4 Scheduled Maintenance

Scheduled maintenance is any work that is performed within set time frames. It explains when maintenance tasks are performed and who does them. Scheduled maintenance is administered periodically or in response to work requests by the management. For example, maintenance may sometimes be scheduled to fulfil an inventory item. When a problem is discovered, it is resolved with close coordination from maintenance and a maintenance planner to address the issue. In addition to scheduling tasks and assigning hands, scheduled maintenance entails determining who performs them. The time allotted for the job is compared to the amount of work to be accomplished within the timeframe. Therefore, the process ensures that those who should operate can do so. Besides, coordinating construction schedules with maintenance workers and contractors is necessary to provide a timely work schedule, which invariably compromises schedule compliance. Hence, the performance reviews of scheduled maintenance often occur repeatedly throughout the year, such as each year. As a result, the scheduled maintenance improved work culture, higher cost-savings on asset maintenance, and increased safety of the building's efficiency when it is conducted properly.

1.3 Priorities of Maintenance Work

Maintenance management's priority can be described as allocating resources and prioritizing the specific work task in response to demands and complaints on operational productivity. For example, in the building maintenance system, the priority for general repairs tends to be reactive and usually responds to either breakdown that gives the most significant problems or complaints. Hence, responsive or breakdown maintenance is a common strategy in building maintenance.

Building maintenance management's most crucial goal is to provide high-quality services to the residents. Production and demand forecasting are essential elements of integrated maintenance and production planning; maintenance forecasting and adjusting plans will allow for efficient supply, service, and capital equipment management. Thus, using the maintenance management system, it is necessary to properly manage the flow of information, coordinate internal systems with the maintenance staff, and establish proper communication between residents and maintenance personnel. According to [20], the priorities of maintenance work are indicated in Table 1.

Table 1 - Distinguish between emergency, urgent, normal, scheduled, and postponable maintenance work priorities

Code	Name	Types of Work	Timeframe of work
1	Emergency	Defects that have an immediate effect on the safety, environment, quality of operation	Immediately
2	Urgent	Defects that likely to has an impact on the safety, environment and quality of operation	Within 24 hours
3	Normal	Defects that likely impact the production within a week	Within 48 hours
4	Scheduled	Preventive maintenance and routine; all programmed work	As scheduled
5	Postponable	Defects that do not immediately impact the safety, health and environment of the operation	Work should start when resources are available or at shutdown period

1.4 Maintenance Performance

Maintenance performance management helps to evaluate the maintenance activities' strengths and weaknesses. The performance measurement results will help the management team make a better plan and appropriate decision for public housing's future maintenance strategy. Moreover, maintenance is key to the building's ability to perform optimally and ensure its high quality of life. However, despite being essential to perform building maintenance, several factors make it difficult for the building to perform correctly and negatively affect the residents' satisfaction with the building's maintenance.

1.4.1 Residents Satisfaction

Residential satisfaction is defined as the level of contentment one feels with a house's services and qualities. Residential satisfaction is residents' positive or negative feelings about where they live [21]. Residential satisfaction is used to evaluate residential development projects' performance. Any housing developer's goal has always been to provide adequate residential housing. Residential satisfaction significantly improves the residents' overall quality of life and housing [22]. The management must consider the expectations, influencing residents' satisfaction level. From the early 1980s to today, residential satisfaction has been a critical tool for evaluating housing developers' productivity and critical government policies related to housing. Hence, resident satisfaction is evaluated to living quality and acts as a sub-factor affecting residential mobility.

Thus, this paper intends to study the current implementation of a maintenance system for public housing. An effective maintenance system will help the maintenance management team to maintain the building and help the residents to maintain their housing units. Initially, the current maintenance system implemented in public housing is identified, followed by determining the residents' satisfaction level with the current maintenance performed in public housing.

2. Methodology

This study adopts a quantitative approach by using a survey to evaluate the current implementation of the maintenance system in public housing in Kota Bharu, Kelantan. The survey consists of items related to the maintenance system in place and the residents' satisfaction with the system itself. The development of the questionnaires has been adapted from a variety of resources.

2.1 Location of Study

The scope of this study is limited to public housing in Kota Bharu, the highest Kelantan population among the ten districts, as it meets all the criteria set: strategic location, public housing, and a rapidly developed area. The Projek Perumahan Rakyat Kota Bharu was selected as a newly constructed public housing near Kota Bharu. The area is well-developed, with adequate infrastructure and facilities. As the project is still new, the maintenance performance is adequate for this study.

2.2 Population and Sampling

There are two types of population in this study: the maintenance personnel and the residents of Projek Perumahan Rakyat Kota Bharu. The first population is the maintenance personnel involved in the Projek Perumahan Rakyat Kota Bharu, including building managers, supervisors, technicians, and other building management personnel. They can provide credible information and specific details related to the building maintenance practices in the residential building. On the other hand, the Projek Perumahan Rakyat Kota Bharu is equipped with only two maintenance personnel. Hence, both will be the respondents that identify the current maintenance system implemented in public housing.

The second population is the residents of Projek Perumahan Rakyat Kota Bharu, which are 600 residents. The sample size table designates the minimum sample size for a research population of 600 as 234, based on the Table for Determining Sample Size from a Given Population [23]. A simple random sampling method is used where selection is made from the population and becomes a subset of respondents for this study. Hence, the questionnaire was randomly distributed to the public housing residents' potential respondents. These respondents provided the residents' satisfaction level with the maintenance performed in the Projek Perumahan Rakyat Kota Bharu.

2.3 Instrument Development and Data Collection

There are two sets of questionnaires being developed for this study. Each questionnaire will cover different target respondents with different objectives. The first set was distributed to the first population, which were maintenance personnel. There are two parts to the questionnaire: A and B. Part A covers the demographics questions, and Part B acquires questions related to the maintenance and its system implemented in the public housing.

The second questionnaire focuses on the residents of Projek Perumahan Rakyat Kota Bharu. It also has two parts: Part A addresses the demographic questions, and Part B focuses on the residents' satisfaction with maintenance performance and implementation. The questionnaires are distributed through online platforms using Google Forms and the pen-and-paper approach.

The questionnaires were randomly disseminated among 244 Projek Perumahan Rakyat Kota Bharu residents. The response rate was recorded to be 94% (230 responses). The respondents' data were analyzed using descriptive statistics and Mean Analysis.

3. Results

3.1 Current Maintenance System Implemented in Public Housing

The research found three procedures for reporting defects and getting the work done. As shown in Fig 1, 50% of the residents ordinarily call the maintenance office to report any defects detected. In comparison, 25 % use social media, and the remaining 25% use other channels, such as filling in the complaint form available at the office.

In terms of the frequency of monitoring and inspection of the Projek Perumahan Rakyat, the execution by the maintenance personnel is monthly. The minimum monitoring and inspection of the buildings is performed once, and the maximum is twice per month as indicated in Fig 2.

Fig 3 depicts the maintenance personnel's time to respond to the residents' complaints. The highest percentage, with 67%, is between 2-4 working days, while the remaining 33% will do so immediately.

The maintenance system practice in the Projek Perumahan Rakyat Kota Bharu can be classified into two categories: (i) preventive, and (ii) corrective and preventive maintenance. As shown in Fig 4, 50% of the maintenance personnel use preventive maintenance to ensure the quality of housing maintenance, while the remaining 50% implement corrective and preventive measures to sustain the quality of housing maintenance.

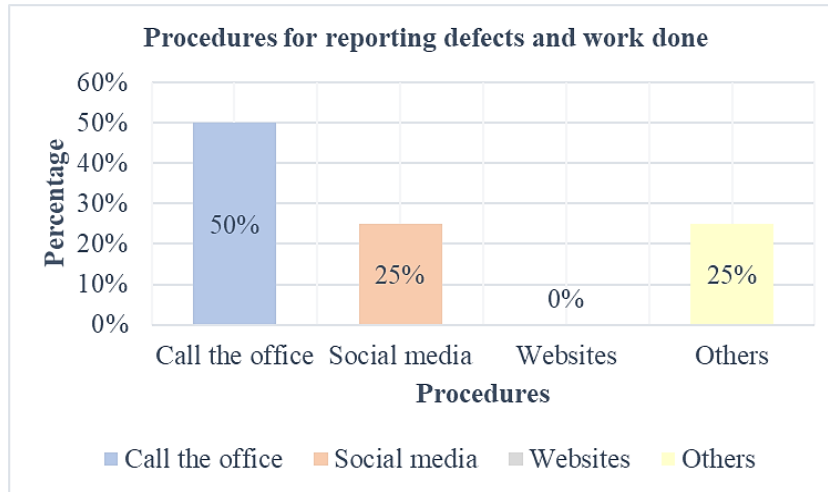


Fig. 1 - Procedures for reporting defects and getting the work done

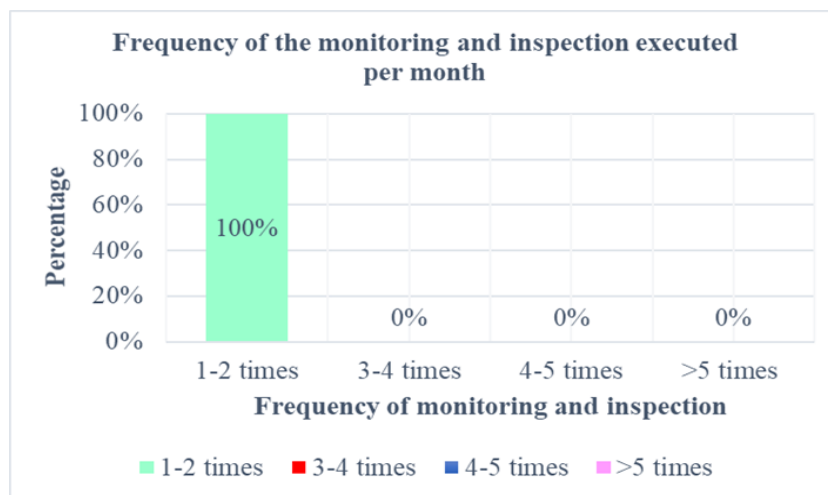


Fig. 2 - Frequency for monitoring and inspection executed monthly

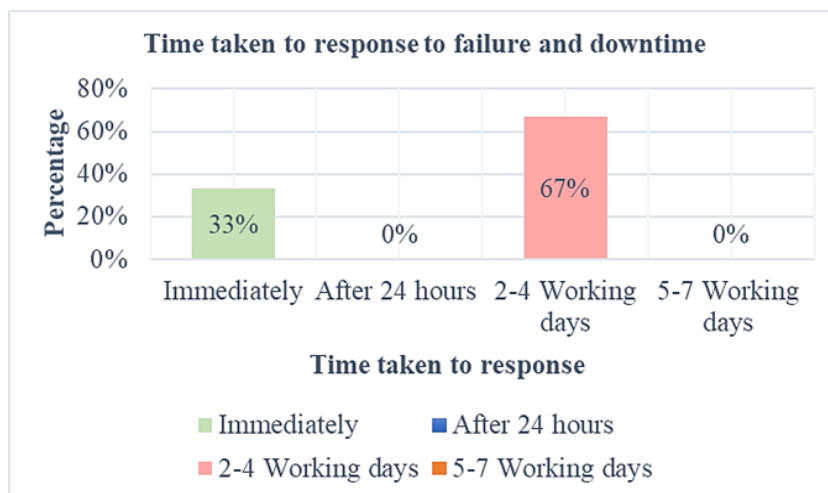


Fig. 3 - Time taken to response to failure and downtime

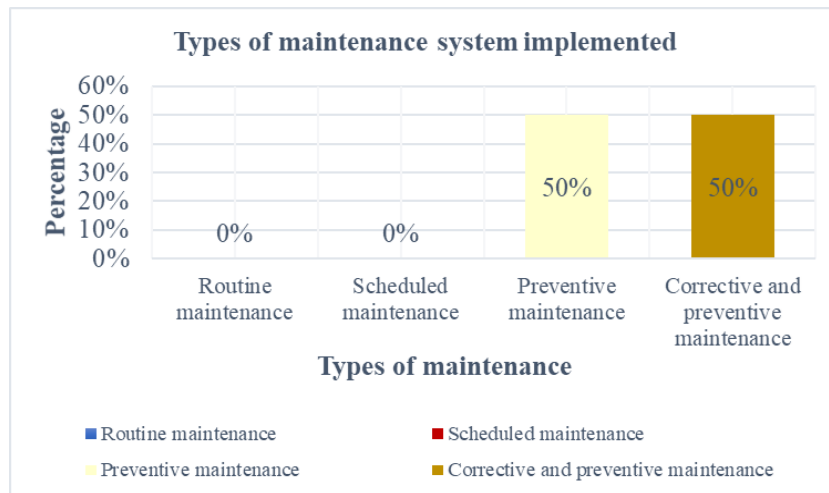


Fig. 4 - Types of maintenance system implemented

3.2 Residents' Satisfaction Level

The factors affecting the residents' satisfaction level with the maintenance performed were assessed. As a result, demographic data obtained indicates that 191 respondents out of 266 total respondents (84.51%) living at the Projek Perumahan Rakyat own the unit, and 15.49%, which is 35 respondents, are tenants.

The factors affecting the residents' satisfaction level with maintenance performance can be classified into three significant factors: physical and environmental factors, building service factors, and building management factors. Table 2 indicates the mean analysis of factors affecting the resident satisfaction level with the maintenance performance of the Projek Perumahan Rakyat Kota Bharu. There are 19 factors under the three significant aspects. Based on the data collected, the electrical system is the most satisfying maintenance performance rated by the residents, compared with other maintenance performance factors, with a mean score of 3.94, and ranked first among the other aspects. This is because the general electrical code requires regular testing and maintenance of all light switches, electrical outlets, and connecting wires. Hence, this aspect's maintenance performance is the most satisfying maintenance performed by the maintenance personnel. While for cleaning services, which ranked last with a 3.15 mean score, the residents are not satisfied with the maintenance performance. In the residents' opinion, the cleaning services should be improved to sustain the quality of public housing.

Table 2 - Mean analysis for the factors affecting the resident satisfaction level

Rank	Factors	Elements in the Factors	Mean (N = 230)
1	Building service	Electrical system	3.94
2	Building service	Lighting in the common area	3.61
3	Building management	The frequency of maintenance is being performed	3.61
4	Building service	Drainage system	3.54
5	Building management	The behaviour of maintenance staff	3.51
6	Building service	Plumbing and piping system	3.45
7	Physical and environment	Condition of paint	3.44
8	Building management	Quality of repairs by maintenance staff	3.46
9	Building management	Maintenance department's complaint response	3.45
10	Physical and environment	Condition of floor finishes	3.41
11	Physical and environment	Cleanliness of common area	3.40
12	Physical and environment	Condition of walls	3.36
13	Building management	Procedure for reporting defects	3.36
14	Physical and environment	Condition of ceiling	3.34
15	Building service	Performance of lift	3.33
16	Physical and environment	Condition of roof tiles	3.32
17	Building management	Time is taken for repairing the defects	3.31
18	Building service	Security system	3.18
19	Building service	Cleaning services	3.15

4. Conclusions

Based on the findings obtained from this study, it was found that the current maintenance system utilizes four procedures for reporting defects and getting the work done. The procedures include (i) calling the office, (ii) use of social media, (iii) using websites and other mediums. Most residents prefer to call the maintenance office to lodge any defect reports compared to the rest of the procedures listed. As for the residents' satisfaction, almost all are satisfied with the overall maintenance performance of the public housing.

In particular, for public housing's physical and environmental, cleanliness is a significant concern for a building's users. Moreover, the residential building's cleanliness is imperative to ensure the residents' safety. Out of the six variables in the physical and environmental factors, the residents are least satisfied with the maintenance performance of the walls' condition in the buildings (mean value = 3.36). Therefore, the building management should employ a maintenance system that emphasizes cleanliness in the common area, the condition of ceiling condition of the ceiling and walls, condition of roof finishes, the condition of the paint, and floor finishes. Hence, proper maintenance should maximize the lifespan of buildings.

Also, building services' development and maintenance are fundamental in ensuring their functionality. The residents are most satisfied with the electrical system's maintenance performance in the building service factors, as indicated by the mean value of 3.94. The electrical system has become the most critical function required to maintain the electrical power system's integrity and reliability, in contrast to facilities and residents' safety. The least satisfying element is the cleaning services (mean value = 3.15). Resident cleaning services usually perform standard maintenance at residential high-rise buildings. The maintenance manager needs to ensure that cleaning maintenance has a regulated schedule as it ensures the residents' health through the environment's cleanliness.

In general, the residents' satisfaction helps determine the efficiency of public housing maintenance performance. The buildings' efficiency will help to reduce building failure's downtime maintenance measure towards the buildings' maintenance interval. Even though the maintenance system implemented in public housing is adequate, the building management should establish a better framework to improve the maintenance system's effectiveness in the future.

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References

- [1] Masram S. H. & Misnan H. (2019). Evolution of policy for affordable housing programmes in Malaysia. *International Journal of Accounting, Finance and Business*, 4 (17), 86-98.
- [2] Economic Planning Unit (1965). *First Malaysian Plan (1966-1970)*. Malaysia: Prime Minister's Department.
- [3] Salleh N. A., Yusof N., Salleh A. G. & Johari N. (2011). Tenant satisfaction in public housing and its relationship with rent arrears: Majlis Bandaraya Ipoh, Perak, Malaysia. *International Journal of Trade, Economics and Finance*, 2(1), 10–18. <https://doi.org/10.7763/ijtef.2011.v2.72>
- [4] *Bernamea Malay Mail* (2016, October 9). Serious maintenance problems at PPR houses and flats in Selangor. *Malay Mail*.
- [5] Zailan M. I. (2001). The management of public property in Malaysia. *New Technology for New Century International Conference*, FIG (International Federation of Surveyors), Seoul, Korea, <http://www.fig.net/pub/proceedings/korea/full-papers/session29/mohd-isa.htm>
- [6] *The Star* (2018, January 19). Tenants' poor attitude the cause of many PPR problems. *The Star (Nation)*, pp. 2, *New Straits Time*. (2016, February 11). Escalator safety guidelines. *New Straits Times*.
- [7] BS 3811 (1984). *Maintenance Management Terms in Terotechnology*.
- [8] Blessing O., Richard J. & Emmanuel A. (2015). Assessment of building maintenance management practices of higher education institutions in Niger State – Nigeria. *Journal of Design and Built Environment*, 15(2), 1-14.
- [9] Khodeir L. (2015). Suggested guidelines for integrating maintenance considerations into the life cycle of the building. *Engineering Research Journal*, 38(2) 145–156. <https://doi.org/10.21608/erjm.2015.66803>
- [10] Mohit M. A., Ibrahim M. & Rashid Y. R. (2015). Assessment of residential satisfaction in newly designed public low-cost housing in Kuala Lumpur, Malaysia. *Habitat International*, 34(1) 18–27.
- [11] Lateef O. A. (2009). Building maintenance management in Malaysia. *Journal of Building Appraisal*, 4(3), 207–214. <https://doi.org/10.1057/jba.2008.27>
- [12] Au-Yong C. P., Ali A. S. & Ahmad F. (2014). Optimizing maintenance cost performance with skilled technicians. *Structural Survey*, 32(3), 238–245. <https://doi.org/10.1108/SS-01-2014-0005>
- [13] Samaratunga T. & O' Hare D. (2013). High density high rise vertical living for low income people in Colombo, Sri Lanka: learning from Pruitt-Igoe. *Architecture Research*, 2(6), 128–133. <https://doi.org/10.5923/j.arch.20120206.03>

- [14] Lai A. W. Y. & Pang P. S. M. (2016). Measuring performance for building maintenance providers. *Journal of Construction Engineering and Management*, 136(8), 864–876. [https://doi.org/10.1061/\(ASCE\) CO.1943-7862.0000191](https://doi.org/10.1061/(ASCE)CO.1943-7862.0000191)
- [15] Au-Yong C. P., Ali A. S., Chua S. J. L. & Che-Ani A. I. (2016). Maintenance interval towards different facilities and services in high-rise housing. *Journal of Design and Built Environment*, 54–61. <https://doi.org/10.22452/jdbe.sp2018no1.5>
- [16] Lam T. Y. M. (2018). Procuring professional housing maintenance services. *Facilities*, 26 (1/2), 33–53. <https://doi.org/10.1108/02632770810840291>
- [17] Donnelly M. & White E. P. (2018). Assessing the quality of a local authority conference and hospitality venue using the ServQual model. *Nang Yan Business Journal*, 1(1), 15–20. <https://doi.org/10.2478/nybj-2014-0003>
- [18] Au-Yong C. P., Ali A. S. & Chua S. J. L. (2019). A literature review of routine maintenance in high-rise residential buildings: a theoretical framework and directions for future research. *Journal of Facilities Management*, 17(1), 2–17. <https://doi.org/10.1108/JFM-10-2017-0051>
- [19] Sivanathan S., Juhari N. H., Khair N., Thanaraju P., Azmi A. & Khan P. A. M. (2019). Assessment of residents' satisfaction with building maintenance in low-cost public housing. *International Journal of Recent Technology and Engineering*, 8(1), 260–265.
- [20] Soares C. G., Duarte J. C. & Garbatov Y. (2010). *Framework for Maintenance Planning. Safety and Reliability of Industrial Products, Systems and Structures*, Taylor & Francis Group, London, 33-52.
- [21] Ross L. M., Shlay A. B. & Picon M. G. (2012). You can't always get what you want: the role of public housing and vouchers in achieving residential satisfaction. *Cityscape: A Journal of Policy Development and Research*, 14(1), 35–54. <https://doi.org/10.2307/41553080>
- [22] Ibem E. O. & Aduwo E. B. (2013). Assessment of residential satisfaction in public housing in Ogun State, Nigeria. *Habitat International*, 40, 163–175. <https://doi.org/10.1016/j.habitatint.2013.04.001>
- [23] Krejcie R. V. & Morgan D. W. (1970). determining sample size for research activities. *Educational and Psychological Measurement*, 30, 607-610.