

THE EFFECTIVENESS OF MAINTENANCE MANAGEMENT AT
GOVERNMENT SCHOOL IN JOHOR

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DEDICATION

I dedicate this achievement to my father Ahmad Sulor and my mother Jamaliah Jastan who with love and effort have accompanied me in this process, without hesitating at any moment of seeing my dreams come true.

To Siti Farahida binti Baharudin, who has been my support in the difficulties.

To my beloved husband Aszuan Ahmad, to my beautiful children Amniya Amani and Ammar Amsyar, to my siblings Iszwan, Jeffry, Nurazlin and Haziq and to all those who have made this achievement possible: love and unlimited gratitude.

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ABSTRACT

School buildings are categorized as one of the major facilities provided by the Government in the national education sector. In order to ensure that the public facilities provided are in good and safe condition, the maintenance aspect must be taken into account by the department involved which are, State Department of Education (JPN) and District Education Office (PPD) as an agency coordinating maintenance work for Government schools. This study aims to identify challenges in maintenance management practice, and to determine the implementation level of government school building maintenance carried out at Johor state level. An online questionnaire was conducted to 64 respondents in JPN and PPD who were directly involved in the maintenance of government school buildings in Johor. Review on related literatures had identified 24 challenges of maintenance management practice in government school buildings and 16 criteria for implementation of maintenance management practice based on the PDCA-ISO 41001 framework. The challenges and levels of implementation of school building maintenance practice were analyzed by using the mean value score 14 main challenges have been identified in maintenance management practice of government school building. Among the top three main challenges that have the highest mean score are, the current state of some school buildings is obsolete and poor, limited annual allocation for school building maintenance and application for additional allocation of building maintenance is very limited. The results also show that implementation level of maintenance management practice at government school based on the mean score value was at a average level and meets minimum requirements of PDCA-ISO 41001 framework. Therefore, this study provides recommendations and basic reference guidelines to achieve effectiveness in maintenance management practice at government school building through various strategies of improvements.

ABSTRAK

Bangunan sekolah dikategorikan sebagai salah satu kemudahan utama yang disediakan oleh Kerajaan dalam sektor pendidikan negara. Bagi memastikan kemudahan awam yang disediakan ini berada dalam keadaan baik dan selamat, aspek penyenggaraan perlu dititiberatkan oleh jabatan yang terlibat khususnya, Jabatan Pendidikan Negeri (JPN) dan Pejabat Pendidikan Daerah (PPD) selaku agensi yang menyelaras kerja penyenggaraan bagi sekolah Kerajaan. Kajian ini bertujuan untuk mengenalpasti cabaran utama dan tahap pelaksanaan bagi kerja-kerja penyenggaraan bangunan sekolah yang dilaksanakan di peringkat negeri Johor. Soal selidik secara dalam talian telah dilaksanakan ke atas 64 orang responden di JPN dan PPD yang terlibat secara langsung dalam urusan penyenggaraan bangunan sekolah kerajaan di Negeri Johor. Penelitian yang dibuat menerusi kajian literatur ke atas isu ini juga telah mengenalpasti terdapat 24 cabaran dalam pengurusan penyenggaraan di bangunan sekolah dan 16 kriteria tahap pelaksanaan penyenggaraan yang dilaksanakan berdasarkan kerangka PDCA-ISO 41001. Analisa bagi mengenalpasti cabaran dan tahap pelaksanaan penyenggaraan bangunan sekolah telah dibuat menggunakan skor nilai min dan hasil kajian menunjukkan sebanyak 14 cabaran utama telah dikenapasti dalam pelaksanaan kerja-kerja penyenggaraan di bangunan sekolah di mana tiga cabaran utama yang mendapat nilai skor min tertinggi adalah keadaan semasa beberapa sekolah yang usang dan uzur, peruntukan tahunan yang terhad bagi penyenggaraan bangunan sekolah dan permohonan peruntukan tambahan bagi kerja penyenggaraan bangunan sekolah adalah sangat terhad. Keputusan kajian juga turut menunjukkan tahap pelaksanaan pengurusan penyenggaraan bangunan sekolah Kerajaan berdasarkan kepada nilai skor min berada pada tahap yang sederhana dan memenuhi kriteria minimum kerangka PDCA-ISO 41001. Oleh itu, kajian ini memberikan cadangan dan panduan rujukan asas ke arah amalan pengurusan penyelenggaraan bangunan sekolah untuk mencapai kecekapan penyelenggaraan menerusi strategi penambahbaikan yang berkesan.

TABLE OF CONTENTS

	TITLE	PAGE
	DECLARATION	iii
	DEDICATION	iv
	ACKNOWLEDGEMENT	v
	ABSTRACT	vi
	ABSTRAK	vii
	TABLE OF CONTENTS	viii
	LIST OF TABLES	xi
	LIST OF FIGURES	xii
	LIST OF ABBREVIATIONS	xiii
	LIST OF SYMBOLS	xiv
	LIST OF APPENDICES	xv
CHAPTER 1	INTRODUCTION	1
1.1	Introduction	1
1.2	Research Background	4
1.3	Problem Statement	7
1.4	Research Question	12
1.5	Research Objective	13
1.6	Scope of the Study	14
1.7	Significance of Research	15
1.8	Research Methodology	17
1.9	Thesis Structure	19
CHAPTER 2	CHALLENGES IN MAINTENANCE MANAGEMENT	21
2.1	Introduction	21
2.2	Issues In Building Maintenance Practice	21
2.2.1	Planning and Management	23

	2.2.2	Financial	25
	2.2.3	Staff Competency	27
	2.2.4	Technical	28
	2.2.5	Technology	30
CHAPTER 3	EFFECTIVENESS	IN	MAINTENANCE
	MANAGEMENT		33
3.1		Introduction	33
3.2		Overview of School Building	34
3.3		Maintenance of School Building	36
	3.3.1	Type of School Maintenance	40
3.4		Effective Maintenance Management	42
	3.4.1	Plan	48
	3.4.2	Do	48
	3.4.3	Check	49
	3.4.4	Act	49
CHAPTER 4	RESEARCH METHODOLOGY		51
4.1		Introduction	51
4.2		Research Design	51
	4.2.1	Quantitative Approach	52
	4.2.2	Questionnaire Survey	52
	4.2.3	Research Selection and Sampling	58
	4.2.4	Data Collection Procedure	61
4.3		Data Analysis	62
	4.3.1	Descriptive Analysis	62
4.4		Summary	63
CHAPTER 5	FINDINGS AND DISCUSSIONS		65
5.1		Introduction	65
5.2		Reliability of The Study	65
5.3		Respondent's Demographic	69
	5.3.1	Gender	69
	5.3.2	Age	70

5.3.3	Grade of Current Post	71
5.3.4	Level of Education	72
5.3.5	Years of Service	73
5.3.6	Years At Current Post	74
5.3.7	Level of Management	75
5.3.8	Current Position	76
5.3.9	Types of Organization	77
5.4	Findings and Achievement of the First Objective: Challenges In Maintenance Management Practice At Government School	79
5.5	Findings and Achievement of the Second Objective: Determine The Implementation Level of Maintenance Management Practice In Government Schools	89
5.6	Summary	96
CHAPTER 6	CONCLUSION AND RECOMMENDATION	97
6.1	Introduction	97
6.2	Conclusion	97
6.2.1	Achievement Objective 1	98
6.2.2	Achivement Objective 2	98
6.3	Contribution & Implication of The Research Findings	99
6.3.1	Contribution To Industry	99
6.3.2	Contribution To Body of Knowledge	100
6.4	Recommendation For Future Research	101
6.5	Limitations of Study	101
REFERENCES		103
APPENDICES		109

LIST OF TABLES

TABLE NO.	TITLE	PAGE
Table 1.1	Application of School Maintenance Work In Johor as of May 2022	8
Table 1.2	Summary of dilapidated schools in Malaysia as at 31st July 2019 (MOE, 2019)	10
Table 4.1	Questionnaire participants of the study	60
Table 5.1	Rule of thumb of results	66
Table 5.2	Reliability statistics for the challenges in implementation of maintenance management practice in government schools	66
Table 5.3	Item-total statistics for the challenges in implementation of maintenance management practice in government schools	67
Table 5.4	Reliability statistics for the effectiveness of maintenance management practice of government schools in Johor	68
Table 5.5	Item-total statistics for the effectiveness of maintenance management practice of government schools in Johor	68
Table 5.6	Distribution of grade respondents' interviews	71
Table 5.7	Distribution of respondents' level of education	72
Table 5.8	Distribution of respondents' experience in service	73
Table 5.9	Distribution of respondents' years of experience in current post	74
Table 5.10	Distribution of level of management among respondents	75
Table 5.11	Distribution of current position among respondents	76
Table 5.12	Distribution of types of organization	78
Table 5.13	Summary of distribution of frequency and mean of the criteria for challenges in maintenance management	80
Table 5.14	Summary of distribution of frequency and mean of the criteria for implementation level of maintenance management practice in government school building	90

LIST OF FIGURES

FIGURE NO.	TITLE	PAGE
Figure 1.1	School infrastructure requirements Malaysia Education Blueprint (Ministry of Education Malaysia, 2013a)	6
Figure 1.2	Impact Grade Score For Government School Maintenance Provisions Guideline Year 2020 (MOE, 2020)	9
Figure 1.3	Research Methodology Framework	18
Figure 3.1	School building components (Photo from Education Funding Agency, 2014)	35
Figure 3.2	Maintenance needs vs school building years (Handler, 1960)	39
Figure 3.3	Plan-Do-Check-Act (PDCA) Process Methodology For Maintenance Management Practice	47
Figure 5.1	Distribution of respondents by gender	69
Figure 5.2	Distribution of respondents age	70
Figure 5.3	Distribution of grade of interview respondents	71
Figure 5.4	Distribution of respondents' level of education	72
Figure 5.5	Distribution of respondents' experience in service	73
Figure 5.6	Distribution of respondents' years of experience in current post	74
Figure 5.7	Distribution of level of management among respondents	75
Figure 5.8	Distribution of current position among respondents	76
Figure 5.9	Distribution of types of organization	78
Figure 5.10	Summary of 14 main challenges of school maintenance at government schools in Johor based on category	89
Figure 5.11	Mean score of Plan (PDCA-ISO 41001)	92
Figure 5.12	Mean score of Do (PDCA-ISO 41001)	93
Figure 5.13	Mean score of Check (PDCA-ISO 41001)	94
Figure 5.14	Mean score of Act (PDCA-ISO 41001)	95

LIST OF ABBREVIATIONS

MOE	-	Ministry of Education
JPN	-	Johor State Department of Education
PPD	-	District Education Offices
SJKC	-	Sekolah Jenis Kebangsaan Cina
SJKT	-	Sekolah Jenis Kebangsaan Tamil
RMLT	-	Five Years Strategic Plans / Rancangan Malaysia Lima Tahun
RMKe-12	-	12th Malaysian Plan / Rancangan Malaysia Ke-12
JKR	-	Public Works Department
JPA	-	Public Service Department or Jabatan Perkhidmatan Awam
SPM	-	Sijil Pelajaran Malaysia
MEB	-	Malaysian Education Blueprint
DPAK	-	Government Asset Management Policy
AP	-	Treasury Instruction / Arahan Perbendaharaan
ICT	-	Information and Communication Technology
HVAC	-	Heating, ventilating and air conditioning
CIOB	-	The Chartered Institute of Building
PDCA	-	Plan-Do-Check-Act
KPI	-	Key Performance Indicators
CMMS	-	Computerized Maintenance Management System

LIST OF SYMBOLS

n	-	Desired sample size
N	-	Population of the study
e	-	Precision of sampling error

LIST OF APPENDICES

APPENDIX	TITLE	PAGE
Appendix A	Online Questionnaire Survey	109
Appendix B	Official Letter To JPN Johor	126

CHAPTER 1

INTRODUCTION

1.1 Introduction

The adoption of maintenance management is an important component of building management and may contribute to the asset and building's life span. For public buildings built by the Government, maintenance factors need to be given primary attention to ensure that the projects are well delivered and meet users' expectations. Nowadays, there is increasing concern regarding maintenance management practice in both private and public sectors, therefore it is crucial for maintenance practitioners involved in this process to understand the concerns and obstacles in managing building maintenance, as well as the key aspects that contribute to maintenance management effectiveness.

According to Abdul Lateef, Khamidi, and Idrus (2011a), the value of a building declines unless it is properly maintained. As a result, it is critical for Malaysian maintenance practitioners, whether in the public or private sectors, to focus on the best practises in building maintenance management. As a result, maintenance work is the best option to maintain and expand the life span and the value of the building. It agrees that maintenance is necessary because it affects user comfort and productivity.

This requirement should be applied to the maintenance management in government schools, as large allocations have been spent on the development of school projects nationwide. According to Baker and Peter (1963), because schools are occupied by young people, the management of maintenance issue would be more challenging, as it will cause more wear and tear in addition to any expected weathering and obsolescence. Furthermore, it is the responsibility of education

department/ministry to focus on its care and operation of maintenance management in every government schools in Malaysia.

In 2011, MStar reported that the Ministry of Education (MOE) has pointed out, 600 out of 10,000 schools audited were rated in poor condition and urgent maintenance work is required. This has resulted in significant number of allocation for the maintenance budget of school buildings for the year 2012 (Malaysia, 2011). According to Berita Awani (2020), MOE will prioritize the school maintenance project to ensure that all students in Malaysia can attend learning sessions in a more comfortable environment. Therefore, tracking and monitoring the performance of maintenance management should be the main priority of school adminstrator.

Maintenance management needs to be done properly in school building as it can develop a good environment for learning. Effective facility maintenance maximises the use of newer facilities while extending the life of older facilities. There is also a plethora of information highlighting the significance of school facility maintenance. Among of the findings is statement by Nhlapo (2009), the upkeep of school facilities ensures that the school provides a safe and secure learning environment. According to Carter and Carter (2001), physical building maintenance is central to constructing and ensuring school building safety. Szuba (2003) argues that facility maintenance is far more important compare to other resource management like procurement, use, and upkeep. Overall, maintenance management is concerned with keeping a clean and safe environment for learners, as well as creating an acceptable and adequate physical environment for learning.

A solid facilities maintenance plan demonstrates that the MOE takes proper care of school facilities and any negligent involves facility maintenance planning might lead to serious issues like safety and social problems. When buildings and equipment deteriorate or warranties are voided, large capital investments can be squandered. Failure to effectively maintain school infrastructure may also harm our educational system's reputation. School facility maintenance has an impact on the physical, educational, and financial foundations of the school organisation and

should thus be a focus of both its day-to-day operations and long-term management priorities.

However, awareness about the importance of school maintenance management in Malaysia remains low and there is still much room for improvement (Yong & Sulieman, 2015). Thus, officers who are closely involved in day to day assessment, repair, and maintenance of school facilities must play an active role and give full commitment in the facilities maintenance management. Indeed, maintenance management is not solely the responsibility of the technical or facilities departments, but it necessitates coordination of resources and commitment at all levels of the organisation, as well as among political masters.

According to Theron (2007), the school organisation is a cooperative social system that consists of people standing in relation to one another and working together to achieve certain common objectives. According to the justification given above, the school is made up of three parts: people, facilities, and educational programmes. In terms of people, the school has staff, students, and parents as immediate stakeholders; facilities include buildings, grounds, and the service systems that keep them running; and educational programmes include all curricular activities, including the hidden school curriculum (De Bruyn et al., 2007). To summarise, the coordination of the interface between people's activities and school programmes is part of school maintenance management.

Therefore, this study intends to comprehensively identify challenges in maintenance management and to determine implementation level of maintenance management practice in government school by Johor State Department of Education or Jabatan Pendidikan Negeri Johor (JPN) and District Education Office or Pejabat Pendidikan Daerah (PPD). It is expected that the findings of this study will be made possible for the improvement of maintenance management process and contribute to the effectiveness of maintenance practices among officers at JPN and PPD offices.

1.2 Research Background

In recent years, Malaysia had tremendous growth in many sectors of economy including construction, manufacturing, electronic, agriculture, real estate, retailing and hospitality industry. While in government sector, billions of dollars has been spent to provide basic facilities in rural and urban areas in order to improve the standard of living in our country. All of these facilities need proper maintenance practise in order to have a longer life expectancy and to remain in good condition. If the maintenance aspect is not prioritised, the government will have to incur significant costs for repairing and rebuilding the facilities (Minister of Housing and Local Government, 2003).

Former Prime Minister Tun Abdullah Ahmad Badawi stated in a speech in March 2003 that Malaysia has "First World Infrastructure" but a "Third World Mentality." This mentality is reflected in the weaknesses and dissatisfaction level of managing public facilities and infrastructures maintenance in all government buildings. This assertion is supported by the Minister's speech during the Building Maintenance Competition & National Housing Park of 2003, the problem of maintenance management not only burdens the Government and public users, but it also creates a negative perception among foreigners, investors and tourists from abroad about the culture of public facilities maintenance in the country (Minister of Housing and Local Government, 2003).

In Budget 2022, MOE was among other Ministries who receive highest distribution for the development in education sector with total allocation received is RM52.6 billion. From that figure, a total of RM1.0 billion allocation has been approved for maintenance and repairing work and based on this distribution, a total of RM900 million will be distributed to 10,000 schools, RM140 million to tahfiz/religious schools and RM120 million to Sekolah Jenis Kebangsaan Cina (SJKC) and Sekolah Jenis Kebangsaan Tamil (SJKT). Therefore, it is very important that the school facilities that has been built should be maintained in the best way so that the functions and operations are not affected.

Generally, school building is one of the main infrastructure project implemented under Five Years Strategic Plans or Rancangan Malaysia Lima Tahun (RMLT). The implementation of RMLT projects will be categorized by year, and the latest one is under 12th Malaysian Plan or Rancangan Malaysia Ke-12 (RMKe-12). Among the issues and challenges faced in RMKe-12 project management include poor implementation and lack of infrastructure and facilities maintenance management due to budget constraints. Lower priority has been given to the distribution of maintenance allocation due to fiscal constraints. As a result, more allocation has been focused on corrective maintenance and less priority was given to preventive and scheduled maintenance. Insufficient of maintenance allocation will affect the quality of the infrastructure and posing a risk to it user. This will lead to significant damage in long term and ultimately contribute to higher cost for maintenance and recovery work in future (Rancangan Malaysia Kedua Belas, 2021-2025).

Based on RMKe-12 guideline, a new directional plan will be designed to improve management and infrastructure maintenance in government facilities. Best practices of maintenance management will reduce costs, downtime and extend the life of the asset in the long run (Rancangan Malaysia Kedua Belas, 2021-2025). As such, the role of Facility Management Unit in Public Works Department (JKR) will be strengthened for coordinating all maintenance works across ministries and agencies, as well as ensuring all maintenance works to comply with the standards. In addition, provision of road maintenance, buildings and other government assets will be given more priority and small contractor will be given greater opportunities in project maintenance implementation.

Besides that, Public Service Department or Jabatan Perkhidmatan Awam (JPA) through General Circular No.2 1995- Maintenance Management - Establishment of Planned Maintenance System has also emphasized that, it is the Government's intention to focus more on the aspects of maintenance management and it must be carried out efficiently and effectively not only to protect government assets and human security, but also to avoid the occurrence of unwelcome incidents.

In its MEB plans for 2015-2025, the MOE also recognises the importance of school infrastructure in providing a conducive learning environment. (Ministry of Education Malaysia, 2013a). To that end, the MOE reiterates its commitment to continuing to upgrade and maintain basic infrastructure in schools covered by the framework in order to ensure that all schools are in good standing and have access to basic infrastructure, as illustrated in Figure 1.1 (Ministry of Education Malaysia, 2013a).

























Basic (2013-2015)	Baseline (2016-2020)	Future (2021-2025)
For all schools to at least achieve the bare essentials required for a safe, hygienic and conducive environment for teaching and learning	To provide the minimum level of facilities to enable curriculum and pedagogical delivery	To create an exciting environment for 21st century learning
Requirements to be further tailored, based on school type (e.g. urban, rural, SKM, schools with hostels)		
 Physical structure (roof, walls, wiring, paint)	 1 sporting facility	 Internet connectivity: At least 10 Mbps for all schools
 Classrooms that meet ratio of 15-20 sq ft/student	 24-hour Internet access at speeds of at least 4-10 Mbps	 1 device/student at secondary level
 Toilets that meet ratio of 1 toilet bowl/ 50 students	 At least 1 device for every 10 students in all schools	 At least 1 video conferencing facility to support distance learning
 12 hours electricity , except for schools with hostels which require 24 hour supply	 1 library/resource centre	 Accessibility features for the disabled, such as ramps and toilets
 Treated water , that is safe for drinking	 Designated places for Islamic education activities	 At least 1 advanced sports facility per state
 1 table and chair per student	For secondary schools (subject to size of school):	
 1 workspace per teacher	 Science (Biology, Chemistry and Physics) + General Science labs	 Further changes to school design may be required based on requirements of new curriculum (e.g. specialist teaching room based on student grade and performance)
 1 whiteboard or blackboard per classroom	 Living Skills workshops (e.g. Home Economics, Agriculture)	
 At least 1 ICT device for every 20 students in all schools	 Hostel for rural school students who travel more than one hour to school daily	
 Internet connectivity at minimum speed of 2 Mbps		

Figure 1.1 School infrastructure requirements Malaysia Education Blueprint (Ministry of Education Malaysia, 2013a)

1.3 Problem Statement

From a practice that began in industrial sector, maintenance management has evolved significantly over the years. Nowadays, the needs for maintenance management has involved not only to private sector, but it also gives greater impact to the government sector. The same practice applies in all government schools administered under the responsibilities of MOE at national level, and JPN at state level. As a lead Ministry who managed policy for education, MOE plays a major role to provide well-functioned building and facilities for all schools across the country. This is required to ensure that schools have safe infrastructure, teaching, and learning processes. Each government building and physical facility in the public sector must be well managed and maintained in order for the government to achieve its operational goals. MOE must develop and implement a plan for effective facilities maintenance management in government schools. A specific mechanism or method for identifying the state of the building facilities in schools by conducting impact grade score analysis as an improvement in determining the level of physical component or facilities in schools (Garis Panduan Peruntukan Penyenggaraan Sekolah Bantuan Kerajaan Tahun 2020).

Based on RMKe-12 guidelines, a new directional plan with an action plan will be designed to improve management and infrastructure maintenance in government facilities. Best practices of maintenance management will reduce costs, downtime and extend the life of the asset in the long run (Rancangan Malaysia Kedua Belas, 2021-2025). In 2022 Budget, MOE has provides a concept of calculating or setting up a maintenance distribution ceiling that is said to be more transparent by considering the number of schools rather than the type of school. A total of RM52.6 billion allocation was received by MOE in 2022 representing 16 percent of the Federal's overall budget. From the total allocation, RM1.0 billion has been allocated for the scope of maintenance work for 10,000 government schools in Malaysia (Bajet 2022). According to JPN Johor, total application for maintenance work applied in Johor as of May 2022 by the Bahagian Pembangunan JPN Johor as in Table 1.1 below:

Table 1.1 Application of School Maintenance Work In Johor as of May 2022

No	Category	Budget Applied (RM)	Number of Projects
1.	Sekolah Kebangsaan	RM10,900,000	164
2.	Sekolah Jenis Kebangsaan Cina (SJKC)	RM1,880,000	26
3.	Sekolah Jenis Kebangsaan Tamil (SJKT)	RM330,000	5
4.	Emergency Projects	RM1,000,000	Based on cases
5.	Lab Science	RM200,000	2
	TOTAL	RM14,31,000	197

Action should be taken by the department to sort out this issue by identifying the application for maintenance works thoroughly and based on the data given by JPN Johor, from 197 projects, a total of 183 projects (92%) have been categorized in scale 5-7 which involve in safety issue based on the scale grade impact of Garis Panduan Peruntukan Penyenggaraan Sekolah Bantuan Kerajaan Tahun 2020.

No.	Definition	Scale
1.	KESELAMATAN Keadaan fizikal komponen/fasiliti bangunan yang tidak sempurna, tidak berfungsi dan tidak selamat digunakan yang boleh mendatangkan ancaman/bahaya berbentuk kecederaan/kecelakaan atau kehilangan nyawa manusia atau hidupan yang telah mendapat pengesahan tidak selamat dan mengancam nyawa daripada Jurutera Bertauliah.	7
2.	KESELAMATAN Keadaan fizikal komponen/fasiliti bangunan yang tidak sempurna, tidak berfungsi dan tidak selamat digunakan yang boleh mendatangkan ancaman/bahaya berbentuk kecederaan/kecelakaan atau kehilangan nyawa manusia atau hidupan yang telah mendapat	6

	pengesahan daripada pegawai teknikal dalam bidang kejuruteraan.	
3.	KESELAMATAN Keadaan fizikal komponen/fasiliti bangunan yang tidak sempurna, tidak berfungsi dan tidak selamat digunakan yang boleh mendatangkan ancaman/bahaya berbentuk kecederaan/kecelakaan atau kehilangan nyawa manusia atau hidupan berdasarkan persepsi pengguna semasa.	5

Figure 1.2 Impact Grade Score For Government School Maintenance Provisions Guideline Year 2020 (MOE, 2020)

Based on the clarification above, JPN Johor must pay special attention in order to improve the organization's maintenance management process and ensure that the school's building and environment are safe and secure for its users. This statement is also supported by Szuba (2003), because school buildings are built to provide a conducive, clean, and safe environment for teaching, it must be properly maintained. It is also critical to create a physical environment that is conducive to learning. Among of the basis of the importance and significance of this research is to focus on the aspect of learning environment of government schools in Johor. This statement is also supported by Nhlapo (2009) that, school facility maintenance should be regarded as an integral and prominent aspect of all school operations, and it should receive special attention in all educational planning and development of the organisation in charge.

However, the maintenance management of government schools in Malaysia is still subpar, resulting in numerous complaints appearing in the media and journals. According to Yacob (2005), in Malaysia, public property management, including public schools, is distributed among various government departments and is frequently managed reactively. Inadequate maintenance work planning can lead to other issues such as safety and an unhealthy environment. The most recent scenario demonstrates that the MOE faced enormous challenges as a result of issues and increased responsibilities in maintenance management in government schools. The building cannot be protected from the elements and the ageing process. According to (Madureira, Flores-Colen, de Brito, & Pereira, 2017), the structure can protect the state of the buildings by having proper and adequate maintenance activities.

(Olanrewaju & Abdul-Aziz, 2014) have also indicated that effective maintenance management practises are essential for successful maintenance management. Although there are numerous factors that contribute to poor building performance, the majority of issues are also related to building maintenance practises.

School building defects are common in Malaysia, and it have a negative impact on the learning environment. A number of complaints have surfaced in the media and newspapers in this regard, alleging that Malaysian school buildings are in disrepair and require immediate intervention by school authorities (Yong et al., 2015). Below are the summary of MOE Project Implementation Status For Dilapidated Schools in Sabah, Sarawak and Peninsular Malaysia (data as July 2019) shown in Table 1.2.

Table 1.2 Summary of dilapidated schools in Malaysia as at 31st July 2019 (MOE, 2019)

LOCATION	YEAR	COMPLETED PROJECT		TOTAL	ON GOING PROJECT		TOTAL	GRAND TOTAL
		JKR	KPM		JKR	KPM		
SARAWAK	2016	-	20	20	0	0	0	20
	2017	4	22	26	0	4	4	30
	2018	50	25	75	0	41	41	116
TOTAL		54	67	121	0	45	45	166
PENINSULAR MALAYSIA	2017	20	36	56	0	4	4	60
	2018	156	0	156	2	0	4	158
TOTAL		176	36	212	2	4	8	218
SABAH	2017	30	0	30	0	0	0	30
	2018	37	38	75	0	45	45	120
TOTAL		67	38	105	0	45	45	150
GRAND TOTAL		297	141	438	2	94	96	534

Based on the recent news reported in the media, there are still school buildings that have major defects and being categorized as dilapidated and can pose a danger to the students. For example, MOE has urged JPN Johor and Kota Tinggi District Education Office to take immediate action against the damage of infrastructure in 4 schools at Kota Tinggi District which involved the facilities like roofs, toilets and windows (23 February 2022, Berita Harian). According to the Minister of Education, Datuk Dr. Radzi Jidin, this action need to be taken seriously because it may give impact to the safety of students who will sit for the Sijil Pelajaran Malaysia (SPM) exam in Mac 2022. MOE had also identified 11 schools in Kulai and Muar District that have major damage and needed immediate repair works. These include roof damage in academic and administrative blocks, extremely volatile toilets, collapsed ceilings and air conditioning equipments are not functioning well (18 February 2022, Dagang News).

According to the news reported in Utusan Malaysia, as of May 2022 there were 1,311 out of 10,220 primary and secondary schools nationwide has been categorized with dilapidated building and this figure will increase if MOE failed to overcome it to date. In this regard, a policy or blueprint should be established by introducing approaches to address the issue of dilapidated schools in Malaysia. By having specific timelines and strategy, MOE can design more systematic development and maintenance plans for all schools in Malaysia. In 2021, MOE also reported that there were 1,311 dilapidated schools across the country and from that figure, 73 schools have been categorized in seven score, which means the building are not safe. In fact, another 1,238 schools were in six score and have been categorized as unsafe by the PPD and JPN. It is estimated that the cost for upgrading and redevelopment work is about RM15.077 billion (20 Mei 2022, Utusan Malaysia).

Apart from the problems above, it is important for the department involved to play a robust and proactive role in facility maintenance management in order to improve the performance of maintenance practice in government school buildings at an optimum level and to safeguard national interests as a whole. This study is conducted to evaluate the responses and actions taken by related government departments/agency on the maintenance management practice in Malaysia. Among of the focus of study is to identify the challenges of maintenance management and to determine implementation level of maintenance management practice at government schools in Johor. Government facility and sustainability of maintenance management will also enable the government's desire to improve maintenance culture and continue the effort for effective maintenance management facilities for the benefit of the stakeholders as a whole.

1.4 Research Question

The research attempts to answer the following question:

Q1: What are the challenges in maintenance management practice in government school?

The answer to this question will identify main challenges faced by JPN and PPD in maintenance management practice for government school.

Q2: What are the effectiveness of maintenance management in government school?

The answer to this question will determine implementation level of maintenance management by JPN and PPD and to provide basic reference guidelines of maintenance management in government schools.

1.5 Research Objective

Addressing the issues mentioned in 1.3, this research aim:

- i. To identify challenges in maintenance management practice in government school.
- ii. To determine the implementation level of maintenance management in government school.

The objectives of this research will be divided into two progressive steps:

- i. To identify challenges in maintenance management practice in government school**

The first objective aims to identify the main challenges or issues faced by JPN and PPD team in managing maintenance practice in government school and issues that have been identify. Thus, it is significant to identify the main challenges and issues of maintenance management in government school context.

- ii. To determine the implementation level of maintenance management in government school.**

The second objective aims to identify the implementation level of maintenance management by JPN and PPD based on the propose framework. Thus, it is significant to identify the effectiveness and of maintenance management in government school context.

1.6 Scope of the Study

According to Malaysian Education Blueprint (MEB) 2013-2025, the government is committed to transform Malaysia's education system to a holistic approach, and the MOE has set targets for quality, equity, and access within the next 13 years. Among of the priority set by MOE through this blueprint are to improve resource productivity by strengthening the link between desired outcomes and the effective allocation of resources, as well as efficient implementation of high impact programmes to enhance the quality of the education system (Education, 2013). In order to achieve this, one of the main target is to ensure that 100% schools in Malaysia must meet basic infrastructure requirements by 2015, to provide a safe, healthy, and conducive learning environment regardless of location, size, or type. It shows that school building maintenance plays a major role in education development and contribute to better infrastructure for its users.

Based on the observation, most of the research about school building have been implemented in developed countries like United States (Fisher, 2000; Higgins et al., 2005; Woolner et al., 2007), while there are limited studies about school buildings in Malaysia (Hafni, 2003; Akasah and Amirudin, 2006). Most of the research study about school building in Malaysia are focus on technical aspects evaluation, by looking at the design and details components that support the function and effectiveness of the school building itself ((Yacob, 2005) (A. Ali, Keong, Zakaria, Zolkafli, & Akashah, 2013). So this research study will fill the gap and focus about maintenance management knowledge by expanding the scope and highlight about the challenges and implementation level of maintenance management practice specifically to the government schools context in Johor.

In light of this argument, this study will assist JPN and PPD in establishing and sustaining good practice of maintenance management process in government school building. The study will recognise the main challenges faced by the departments in managing maintenance management project at schools, and assist the department to implement best practices approach towards the effectiveness of the maintenance management process.

This research will be implemented at all government schools building in Johor who receive annual maintenance allocation from MOE and it will focus on two groups of respondent who involve in the process and implementation of maintenance management in government school, specifically officers who in charge in Technical Unit, Budget Unit, and Infrastructure and Development Unit of JPN Johor and PPD. These groups of population have been selected based on the findings in the literatures that the role they play in the maintenance management.

This study includes two groups of respondents: those in charge of maintenance management at JPN and PPD offices. These two groups of population have been selected based on the findings in the literatures that recognised their role they play in the maintenance management process in school. Their views on the implementation of maintenance management and the effectiveness of the maintenance management process identified in this research will be the foundation on the achievement of the research objectives.

1.7 Significance of Research

This research contributes to:

i. Providing a guideline for the implementation of maintenance management process and procedure in government school

The findings of this study can serve as an important guideline for carrying out management practices in school buildings. Adoption of this guideline can assist the relevant parties to implement the maintenance management process based on the propose framework. This will help them to achieve efficiency towards best practices in school maintenance management.

ii. Improve policy making and maintenance management system

Maintenance management is often overlooked, despite the fact that it has been shown to contribute to the good reputation of the physical building and the organisation as a whole. This study would become a starting point for JPN and PPD to improve the existing process and procedures of maintenance management in government school by implementing proper maintenance management system and technology.

In order to support this argument, this study will assist JPN and PPD offices to establish and sustain good practice of maintenance management in school facilities and building. This study will also help to identify challenges faced in maintenance management of government schools, and, thus measure the effectiveness of the work process, in developing a whole-school approach that integrates maintenance management into the strategic planning process. It will also help the departments to review the outcome of the maintenance management project that has been done to all school building by assessing the effectiveness of the project.

Therefore, by conducting this study and go through all the process of examining previous literature review regarding the subject, it will help the author to identify the main challenges and issues in maintenance management practices based on standard benchmarking and giving consensus to the maintenance practitioner in education sector. In addition, these findings can be suggested as standards of procedures to the government, especially for JPN and PPD in measuring the quality and efficiency of maintenance management for government school buildings and facilities.

1.8 Research Methodology

This study is primarily concerned with determining the state of school building maintenance issues at a single point in time (Creswell, 2003; Bryman, 2012). The researcher chose the quantitative methods approach to conduct the topic research in the context of this study. The following arguments are used to justify the use of quantitative methods in this study. The quantitative aspect of the research would allow the researcher to collect general information as well as identify potential salient points on the issue of school building maintenance.

Figure 1.3 shows the methodology flow chart of this research. The framework in the research methodology aims to identify the challenges and effectiveness of maintenance management from the literatures. Based on a research by (Lavy & Bilbo, 2009), *Facilities Maintenance Management In Large Public Schools In Texas*, the author has taken the same research methodology approach by using questionnaire to obtain input from the target respondent. Chapter 4 provides a detailed discussion of the research methodology.

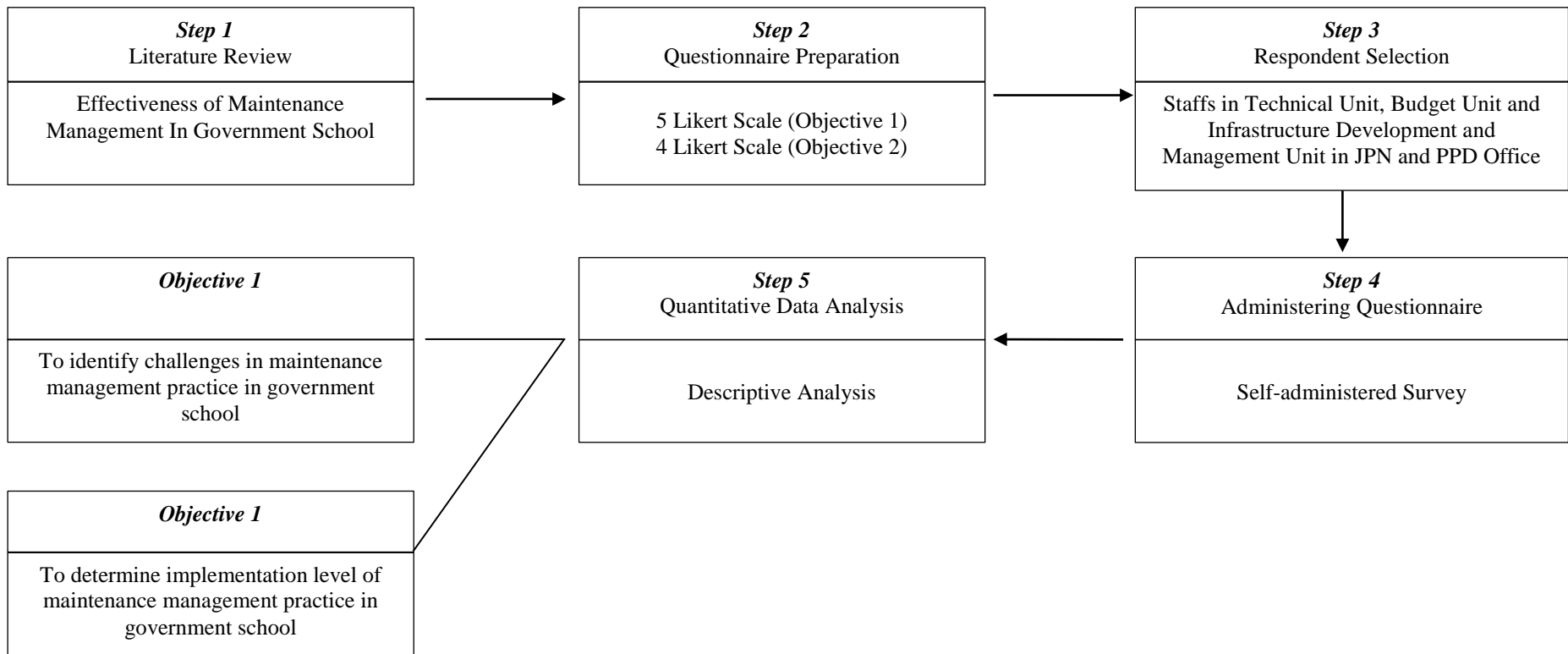


Figure 1.3 Research Methodology Framework

1.9 Thesis Structure

The thesis of chapters in this research thesis is as follows: Chapter 1 (Introduction): Chapter 1 discusses the background information of the research comprising the problem statement, research questions, research objectives, scope of the study, the significance of the research, an explanation on the methodology of the research and research structure.

Chapter 2 (Challenges In Maintenance Management): Chapter 2 focuses on the challenges in maintenance management. This chapter discusses the components that contribute to maintenance management challenges and the impact of it towards the maintenance management process in the organization.

Chapter 3 (Effectiveness In Maintenance Management): Chapter 3 initially discusses the concept of maintenance management process, overview of the school building and types of maintenance involve in school building and this chapter then discusses the effectiveness of maintenance management practice based on the PDCA-ISO 41000 framework and approaches by previous study.

Chapter 4 (Research Methodology): Chapter 4 discusses the methodology employed in the research. The chapter talks about the questionnaire design developed from the theoretical components and requirements from Chapter 2 and Chapter 3. This chapter subsequently discusses the selection of respondents, data collection works and analysis methods employed.

Chapter 5 (Data Analysis): This chapter explains the analysis undertaken for achieving the research objective.

Chapter 6 (Results and Discussion): This chapter discusses the results obtained and the extent to which the result fulfil the objectives of this research.

Chapter 8 (Conclusion and Recommendations): The last chapter concludes the findings and overall research works that have been undertaken. This chapter explains the contribution and implications of the findings towards the implementation of maintenance management practices government school building in Johor. The limitations and possible improvements for future undertakings will also be discussed. Suggestions for future studies shall be conveyed in the final part of this chapter.

REFERENCES

- Abd Elghaffar, M. A. E. (2007). A practical guide for school buildings maintenance. *Ass. Univ. Bull. Environ. Res*, 10(1).
- Abdul-Lateef, O. A. (2010). Quantitative analysis of criteria in university building maintenance in Malaysia. *Australasian Journal of Construction Economics and Building, The*, 10(3), 51-61.
- Abdul Lateef, O. A., Khamidi, M. F., & Idrus, A. (2011a). Appraisal of the building maintenance management practices of Malaysian universities. *Journal of Building Appraisal*, 6(3), 261-275.
- Abdul Lateef, O. A., Khamidi, M. F., & Idrus, A. (2011b). Behavioural issues in maintenance of university buildings. *Journal of Retail & Leisure Property*, 9(5), 415-428.
- Agostinho, F., Silva, T. R., Almeida, C. M., Liu, G., & Giannetti, B. F. (2019). Sustainability assessment procedure for operations and production processes (SUAPRO). *Science of the total environment*, 685, 1006-1018.
- Ali, A., Keong, K., Zakaria, N., Zolkafli, U., & Akashah, F. (2013). The effect of design on maintenance for school buildings in Penang, Malaysia. *Structural Survey*.
- Ali, A. S., Chua, S. J. L., & Ali, D. B. A. (2016). Issues and challenges faced by government office buildings in performing maintenance work. *Jurnal Teknologi*, 78(11).
- Alshehri, A., Motawa, I., & Ogunlana, S. (2015). The common problems facing the building maintenance departments. *International Journal of Innovation, Management and Technology*, 6(3), 234.
- Barberá, L., Crespo, A., Viveros, P., & Stegmaier, R. (2012). Advanced model for maintenance management in a continuous improvement cycle: integration into the business strategy. *International Journal of System Assurance Engineering and Management*, 3(1), 47-63.
- Bastidas, P. (1998). Maintenance Manual for School Buildings in the Caribbean.
- Ben-Daya, M., Duffuaa, S. O., Raouf, A., Knezevic, J., & Ait-Kadi, D. (2009). *Handbook of maintenance management and engineering* (Vol. 7): Springer.

- Buys, F., & Nkado, R. (2006). A survey of maintenance management systems in South African tertiary educational institutions. *Construction Management and Economics*, 24(10), 997-1005.
- Crespo Márquez, A., Moreu de León, P., Gómez Fernández, J. F., Parra Márquez, C., & López Campos, M. (2009). The maintenance management framework. *Journal of Quality in Maintenance Engineering*, 15(2), 167-178. doi:10.1108/13552510910961110
- Creswell, J. W. (2014). *Research design: Qualitative, Quantitative, and Mixed Methods Approaches*. 4th edn. Thousand Oaks, California: Sage Publications.
- De Bruyn, P., Erasmus, M., Janson, C., Mentz, P., Steyn, S., Theron, A., & Xaba, M. (2007). *Schools as Organizations*. Pretoria. In: South Africa: Van Schaik Publishers.
- Deris, M. S. B. M. (2007). Tahap Keberkesanan Pengurusan Penyelenggaraan Fasiliti Bangunan Di Sektor Awam Malaysia. *University of technology Malaysia*.
- Education, M. M. o. (2013). Malaysian Ministry of Education (2013). Malaysia Education Blueprint 2013-2025.
- Ferreira, S., Martins, L., Silva, F., Casais, R., Campilho, R., & Sá, J. (2020). A novel approach to improve maintenance operations. *Procedia Manufacturing*, 51, 1531-1537.
- Grasmick, S., Hall, R., Collins, A., Maloney, T., & Puddester, F. (2008). Guidelines for maintenance of public schools facilities in Maryland. *Maryland: Interagency Committee on School Construction*.
- Hauashdh, A., Jailani, J., & Rahman, I. A. (2020). Building maintenance practices in Malaysia: a systematic review of issues, effects and the way forward. *International Journal of Building Pathology and Adaptation*.
- Howard, M. (2006). Best practices maintenance plan for school buildings. *Idaho: State Department of Education*.
- Ihsan, B., & Alshibani, A. (2018). Factors affecting operation and maintenance cost of hotels. *Property Management*.
- Illankoon, I. C. S., & Lu, W. (2019). Optimising choices of 'building services' for green building: Interdependence and life cycle costing. *Building and Environment*, 161, 106247.
- Ismail, Z.-A. (2020). Analysing the gaps in the conventional e-complaint method for maintenance management at Malaysian polytechnics. *Social Responsibility*

Journal.

- 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*.
- Lateef, O. A. (2009). Building maintenance management in Malaysia. *Journal of Building Appraisal*, 4(3), 207-214.
- Lavy, S., & Bilbo, D. L. (2009). Facilities maintenance management practices in large public schools, Texas. *Facilities*, 27(1/2), 5-20. doi:10.1108/02632770910923054
- Madureira, S., Flores-Colen, I., de Brito, J., & Pereira, C. (2017). Maintenance planning of facades in current buildings. *Construction and building materials*, 147, 790-802.
- Mohd-Noor, N., Hamid, M., Abdul-Ghani, A., & Haron, S. (2011). Building maintenance budget determination: an exploration study in the Malaysia government practice. *Procedia Engineering*, 20, 435-444.
- Mong, S. G., Mohamed, S. F., & Misnan, M. S. (2019). Current issues and barriers of maintenance management practices for public facilities in Malaysia. *International Journal of Engineering and Advanced Technology*, 8(5), 119-125.
- Muzir, A. K. K. (2017). *School buildings maintenance in Malaysia: current practices, key challenges and implications*. Newcastle University,
- Nayak, M., & Narayan, K. (2019). Strengths and weaknesses of online surveys. *Technology*, 6(7), 0837-2405053138.
- Neyestani, B. (2017). Seven basic tools of quality control: The appropriate techniques for solving quality problems in the organizations. Available at SSRN 2955721.
- Ng, C. S. P., Gable, G., & Chan, T. (2003). *An ERP maintenance model*. Paper presented at the 36th Annual Hawaii International Conference on System Sciences, 2003. Proceedings of the.
- Nhlapo, V. A. (2009). *A whole-school approach to facilities maintenance*. North-West University,
- Olanrewaju, A. L., & Abdul-Aziz, A.-R. (2014). *Building maintenance processes and practices: The case of a fast developing country*: Springer.
- Palis, P. A. (2019). Best practices for public universities building maintenance. In

Faculty of Built Environment and Surveying: Universiti Teknologi Malaysia.

- Parida, A., & Kumar, U. (2009). Maintenance productivity and performance measurement. In *Handbook of maintenance management and engineering* (pp. 17-41): Springer.
- Rahman, M. A. A., Akasah, Z. A., Abdullah, M. S., Musa, M. K., & Sekitar, U. T. H. O. M. (2012). *Issues and problems affecting the implementation and effectiveness of heritage buildings maintenance*. Paper presented at the The International Conferences on Civil and Environmental Engineering Sustainability.
- Ramly, A. (2002). *Prinsip dan praktis pengurusan penyenggaraan bangunan: Pustaka Ilmi*.
- Rosa, C., Silva, F., & Ferreira, L. P. (2017). Improving the quality and productivity of steel wire-rope assembly lines for the automotive industry. *Procedia Manufacturing, 11*, 1035-1042.
- Salim, N. A. A., Salleh, N. M., & Zahari, N. F. (2016). *Design failure affecting maintenance management on public higher education institution in Malaysia*. Paper presented at the MATEC Web of Conferences.
- Sarbini, N. N., Ibrahim, I. S., Abidin, N. I., Yahaya, F. M., & Azizan, N. Z. N. (2021). Review on maintenance issues toward building maintenance management best practices. *Journal of Building Engineering, 44*, 102985.
- Shafeek, H. (2018). The Role of Staff Skills in Lean Maintenance. *Journal of Computational and Theoretical Nanoscience, 15*(4), 1332-1339.
- Silva, A. S., Medeiros, C. F., & Vieira, R. K. (2017). Cleaner Production and PDCA cycle: Practical application for reducing the Cans Loss Index in a beverage company. *Journal of Cleaner Production, 150*, 324-338.
- Szuba, T. (2003). *Planning guide for maintaining school facilities: DIANE Publishing*.
- Yacob, S. (2005). *Maintenance management system through strategic planning for public school in Malaysia*. Universiti Teknologi Malaysia,
- Yong, C. Y., & Sulieman, M. Z. (2015). ASSESSMENT OF BUILDING MAINTENANCE MANAGEMENT PRACTICE AND OCCUPANT SATISFACTION OF SCHOOL BUILDINGS IN PERAK, MALAYSIA. *Jurnal Teknologi, 75*(5). doi:10.11113/jt.v75.4995

Zawawi, E. M. A., Kamaruzzaman, S. N., Ali, A. S., & Sulaiman, R. (2010). Assessment of building maintenance management in Malaysia: Resolving using a solution diagram. *Journal of Retail & Leisure Property*, 9(4), 349-356.