Assessment on The Maintenance Service Delivery Characteristics (MSDCs): Case Study of The Public Schools in Perak, Malaysia

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Assessment on The Maintenance Service Delivery Characteristics (MSDCs): Case Study of The Public Schools in Perak, Malaysia

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Abstract

This paper presents the results of a questionnaire survey conducted on the selected public schools at Perak in Malaysia. Thus, it involves the school's teachers as the appointed respondents to deal with non-technical issues about the Level of maintenance performance concerning service delivery. Questionnaires are distributed to the five primaries and four secondary schools, respectively. The questionnaire instrument was used for collecting primary data. Data were analysed using the Statistical Package of Social Science (SPSS 27.0) to generate Factor Analysis (FA). As a result, there are fourteen identified Maintenance Service Delivery Characteristics (MSDCs): Timeliness, Beyond the call of duty, Records and documents, Monitoring and inspection, Manpower management, Work order completion, maintenance-related accidents, Flexibility, Service Quality, Knowledge Sharing, Contractors' skill, Administration, Standard operating procedure and Level of a nuisance. The results generated from the survey are proposed to be considered in the school maintenance service delivery as a part of initiatives to improve the efficiency of school maintenance performance. The significant impact of the study findings will benefit the school building users by providing a conducive school environment (CSE).

Keywords: Maintenance Service Delivery Characteristics (MSDCs), Conducive School Environment (CSE), Maintenance Performance (MP)

Introduction

School plays a vital role in contributing to socio-economic development. This paper forwards the idea of the ambivalent evidence about maintenance service delivery characteristics (MSDCs) from the end-user perspective in school. The awareness of the significance of MSDCs is escalating, and schools require an environment that supports the teaching and learning process (Hammond & Harvey, 2018). Singh (2014) further clarifies that where education in schools is effective, the environment must be favourable to learning, offering students space

and time to interact during the learning and teaching. It is clearly defined that a conducive school environment affects the teaching and learning process. In recent years, most scholars related to schools' facilities and maintenance study have agreed that the outlook of the school environment would strengthen the teaching and learning process and higher academic achievement. This study attempts to identify MSDCs from the perspective of school end-user.

The development of schools' curriculum and physical buildings are considered the backbone of a nation's growth. Particularly in a developing nation such as Malaysia. Thus, school maintenance is crucial for achieving a conducive learning environment by ensuring that all maintenance activities at the school can meet the user's needs (Amough, 2019). As a leading developing country, Malaysia has allocated more than 20% of the national budget to education management and development. In 2022, the government allocated RM52.6 billion for education, eventually placing the Ministry of Education (MOE) among the highest recipient from the Ministry of Finance (MOF). Therefore, the objective of this study is to:

- Identify the Maintenance Service Delivery Characteristics (MSDCs)
- Analyze the MSDCs and achieving conducive school envrironment (CSE).

Literature Review
Maintenance Performance (MP) will support the maintenance management practice of ensuring that every service satisfies the customer's needs. According to Samat et al. (2011), MP is the state or the condition of the action or the process in conducting maintenance function, measured from time to time. However, Seneviratne (2016), MP is a multidisciplinary process of measuring and justifying the value created by maintenance investment and taking care of the organisation's stockholder's requirements viewed strategically from the overall business perspective. In this study, the school MP solely focuses on the MSDCs.

Maintenance service delivery substantially impacts maintenance services to meet building users' needs and improve organisational performance through good maintenance practices (Jin & Chua, 2018). According to Dictionary (2019a), The term "service delivery" refers to the process of providing clients with services connected to their workplace. In contrast, Tummers et al (2015) define service delivery as frontline personnel's interpersonal efforts when engaging with customers to manage, accommodate, or minimise external and internal demands and disputes they face regularly. Therefore, service delivery has been identified as a critical component of maintenance services in maintenance management to meet the needs of building users and increase organisational performance (Sala et al., 2021; Fang et al., 2018).

It is crucial when the maintenance of school buildings involves many types of school buildings and facilities and relates to student achievement. Therefore, the maintenance organisation and school stakeholders must organise the school maintenance service delivery. Furthermore, the efficiency of school maintenance services will improve school maintenance performance and provide a pleasant learning environment. Details on MSDCs will be discussed in the following paragraphs. The identified characteristics are; Contractors' skill, Level of nuisance, Timeliness, Beyond the call of duty, Records and documents, Monitoring and inspection, Manpower management, Work order completion, Maintenance-related accidents, Flexibility, Service Quality, Administration, Standard operating procedure and Knowledge sharing. In this regard, MSDCs are defined as the ability of the maintenance services to provide school buildings and facilities to support the teaching and learning process and achieve a conducive school environment. The details of the MSDCs can be seen in Table 1.

Table 1
Maintenance Service Delivery Characteristics (MSDCs)

Contractors' skill	• In a study conducted by Ampofo (2020); Martins et al (2018), the skill and competency of maintenance workers are far more critical due to the complexity of the design and function of buildings and facilities in the school. The skill and competency of the workers benefit the third parties, and it will increase the satisfaction of the building users with the services provided. Thus, the skills and competency of Maintenance workers (MW) attached to the school are highly required since maintenance works are considered technical works.
Level of nuisance	• The widely practised corrective maintenance in schools will expose the school building users to noise pollution, poor ventilation, temporary structure for maintenance, maintenance equipment, and safety issues. The above is further concurred by Karunasena et al (2018); Shiue et al (2019), where corrective maintenance activities cause inconvenience to occupants, such as cleanliness and sanitation factors that affect occupant satisfaction. It is clearly described that MSDCs concerning the level of nuisance are significant in school maintenance services.
Timeliness	• According to recent study, when dealing with end-user priority, timeliness and promptness are among the characteristics that arise (Amrina et al., 2020; Mahfodh & Obeidat, 2020; Nurprihatin et al., 2019). Since the school must follow specific academic requirements, such as teaching and learning, exam schedules, and curriculum activities, timeliness is critical in school maintenance management. As a result, MW must prioritise timeliness to create a conducive school environment.
Beyond the call of duty	• In the workplace, going above and beyond the call of duty is critical to ensuring that each task assigned meets the consumers' expectations while also fulfilling the organisation's goals. The following can be accomplished with the organisation's help and ongoing involvement with the maintenance workers, which will foster a positive attitude that encourages them to go above and beyond the call of duty and complete the tasks to their best ability (Wilkins et al., 2018; Zhao et al., 2018). In this respect, school maintenance providers must go above and beyond the call of duty when performing maintenance operations since teachers with a non-technical background greatly rely on the maintenance team's efforts and support to manage maintenance activities in the school toward a conducive school environment.
Records and documents	• Maintenance at school entails documentation and records to observe and verify all flaws on maintenance reports for future maintenance purposes. Maintenance operations, in particular, must be based on existing maintenance records and services (Iberahim et al., 2016; Schoolmaster & Piazza, 2020). In this respect, the maintenance records and documents are the foundation for maintenance services. This practice benefits the maintenance workers and the users of the

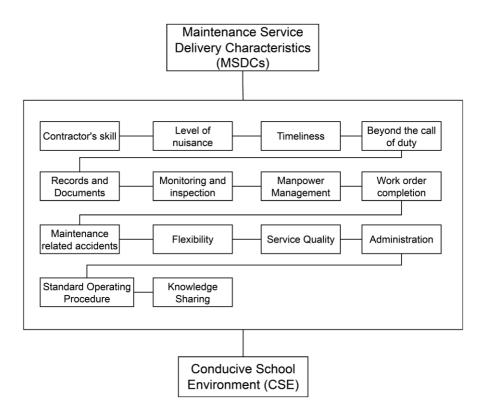|	school buildings, as recurring flaws will be reduced and achieve a conducive school learning environment.
Monitoring and inspection	• The frequency of monitoring and inspection for every maintenance management should be arranged accordingly. It ensures that all designated maintenance workers carry out their responsibilities following the tasks and timelines indicated (Nguyen et al., 2019; Nurprihatin et al., 2019). Regular monitoring and inspection are also essential to verify that all maintenance activities cause the least disruption and conducive school environment.
Manpower management	• The efficiency of the maintenance operations will be achieved when it is well planned and adequately supported, with resources such as manpower, material, equipment, information, and techniques (Chidi et al., 2017; Choudhari & Gajjar, 2018; Shou et al., 2021). Therefore, manpower management and planning are crucial for service organisations and vital components of effective maintenance management at school
Work order completion	• Maintenance practices' issuance and work order completion (WO) is closely related to MP. In normal conditions, WO may take a few minutes to several months if it is delayed for various reasons, such as ordering replacement parts. The two most typically calculated time factors are WO start and completion time (Brundage et al., 2018; Navinchandran et al., 2021). The date and time elements are used to specify the timeframe of a maintenance work order that practices at school.
Maintenance-related accidents	• Identifying security and safety issues begins with hazard detection and risk assessment and progresses to risk prioritisation. Early detection of hazards reduces risk and allows for workplace safety measures, leading to fewer near-misses and accidents (Abdul Rahim et al., 2019; Hasanzadeh et al., 2019; Laal et al., 2019). Maintenance-related accidents are crucial in determining safety performance indicators in a safe working environment. It means that any maintenance services that can reduce the number of maintenance-related accidents would improve their safety performance indicators and provide a conducive school environment.
Flexibility	• The teaching and learning process at school has to follow a strict schedule or timetable, and therefore, any maintenance operation requires working flexibility to accommodate the learning process. In that sense, workers have to move around the working environment and choose their maintenance operation area for a particular work activity at school. Flexibility dimensions contribute to the efficiency and effectiveness of potential work management (Haynes et al., 2019; Pytel-Kopczn'ska, 2021). In a nutshell, workers must be flexible in terms of where they work and be able to relocate to the most appropriate area based on their work activities at school.

Service Quality	• Parasuraman et al (1988) defined service quality as the discrepancy between what customers think about a company's services and what they expect from companies who provide such services. Service quality is one of customer satisfaction's most essential aspects (Nguyen et al., 2018). It indicates that if expectations exceed performance, perceived quality is lower than satisfactory, resulting in customer dissatisfaction and vice versa. The teachers without a technical background will rely solely on the service quality rendered by the maintenance service organisation.
Administration	• Good governance practices in an organisation play an important role in ensuring that all planning can be carried out correctly (Khan & Khan, 2018). The administration is critical in maintenance activities to ensure service delivery that meets the needs of building users. The maintenance process, which consists of work requests, orders and completion, must be well implemented (Mong et al., 2018). It proves that the efficient administration approach is required in maintenance services at the school towards a conducive school environment.
Standard operating procedure (SOP)	• A proper standard operating procedure (SOP) is required to establish an efficient and effective implementation of maintenance works, as SOP must be the most effective and efficient method for work implementation processes (Pratama et al., 2020; Mor & Bhardwaj, 2019). SOP is the most effective approach to delivering effective maintenance services to the building occupants. Using good SOPs with sequences for each maintenance procedure will speed up the process, eliminate double handling, reduce waste and obviously achieve a conducive school environment.
Knowledge Sharing	• An organisation with a more developed knowledge management ability will boost creativity and perform better. Therefore the practice of knowledge sharing between the staff can be transpired to the end-user (Mahfodh & Obeidat, 2020; Ni et al., 2018). It has been discovered that knowledge sharing among team members is crucial to team creativity and learning. Knowledge sharing promotes teams' idea creation and absorptive ability, boosting team creativity and delivering the best maintenance services at school

Methodology

This research uses a deductive approach employing theoretical testing, in which the conceptual framework is developed to suit the study's objectives. It emphasizes a survey strategy using a questionnaire to collect the primary data. The study focuses on the primary and secondary schools in Perak. The selected schools were fully funded by the government and under the Ministry of Education (MOE). The respondents covered academic staff, non-academic staff, parent-teacher associations and stakeholders. SPSS 27.0 software was utilized to assess the findings from the survey.

Proposed Research Framework

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                    ┌──────────────────────┐
                    │ Maintenance Service  │
                    │ Delivery Characteristics │
                    │      (MSDCs)         │
                    └──────────────────────┘
                               │
     ┌──────────────┬──────────────┬──────────────┬──────────────┐
     │ Contractor's │   Level of   │  Timeliness  │ Beyond the call │
     │    skill     │   nuisance   │              │   of duty    │
     └──────────────┴──────────────┴──────────────┴──────────────┘

     │ Records and  │ Monitoring and │  Manpower    │ Work order   │
     │  Documents   │  inspection   │  Management  │ completion   │

     │ Maintenance  │  Flexibility  │Service Quality│Administration│
     │related accidents│           │              │              │

     │Standard Operating│ Knowledge │
     │   Procedure   │  Sharing    │
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                    ┌──────────────────────┐
                    │  Conducive School    │
                    │  Environment (CSE)   │
                    └──────────────────────┘
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Data Analysis

The analysis included 63 questionnaires from Academic staff, Non-Academic staff, Parent-Teacher associations and Stake Holder. The results of the descriptive analysis for the respondents' category are in Table 2.

Table 2

Respondents' Category

No	Description	Total	Percentage (%)
1	Academic staff	41	65.07%
2	Non-Academic staff	9	14.28%
3	Parent-Teacher Association	6	9.52%
4	Stake holder	8	12.69%
	Total	63	100%

Table 2 presents a summary of respondents' categories concerning the school. The description of the demographic information has no direct impact on the data analysis of this study. Therefore, it is imperative to show the reliability and validity of the respondents selected in the sample to perform this empirical study. However, the results have concluded that the Academic staff with the highest response rate of 41 respondents (65.07%). The Non-Academic staff with nine respondents (14.28%), the Stakeholder had eight respondents (12.69%), and Parent-Teacher Association had six respondents (9.52%).

Type of Schools
The respondents' based type of schools is crucial as supporting evidence on the significance of maintenance service delivery at these schools. The data will improve the accuracy of the feedback received in answering the distributed survey questions. The descriptive analysis has indicated that many respondents who answered the questionnaire attached to the secondary schools stood at 43 respondents (68.25%), and the primary school comprised 20 respondents (31.75%). The overall analysis results of the type of schools are in Table 3.

Table 3
Respondents' based on type of schools

No	Description	Total	Percentage (%)
1	Primary schools	20	31.75%
2	Secondary schools	43	68.25%
	Total	63	100%

Data Reliability: Cronbach's Alpha
Table 4
Value of Cronbach's Alpha

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardised Items	N of Items
.967	.969	14

The analysis results in Table 4 show that all fourteen MSDCs have recorded a high-reliability level exceeding a threshold value of 0.70. This analysis indicates that the study data is highly reliable and perceived as satisfactory by every respondent. Thus, all data surpass the acceptable reliability and further analysis in the next section for factor analysis.

Factor Analysis
Exploratory factor analysis (EFA) summarises data, particularly a large set of variables listed in the questionnaire, to a smaller set of factors. Hence, a critical decision for those undertaking an exploratory factor analysis is determining how many factors to choose. Additionally, the factor analysis process is in the following order:

a. Preliminary Analysis
Sampling adequacy can be measured using the Kaiser-Meyer-OIkin (KMO) test to determine whether the variables in the sample are adequate to correlate and suitable for factor analysis. The KMO index measured is 0.932, indicating good data since the KMO measure should be greater than 0.50.
    The subsequent analysis examines the diagonal elements of the anti-image correlation matrix. The values should all be above the bare minimum of 0.5 (preferably higher). For these data, all values are well above 0.5, indicating a positive sign. These findings verify the factorability from every standpoint of the Exploratory Factor Analysis (EFA).

b. Factors Extraction
The next stage of the analysis process is factors extraction. The communality of 1.000 means that all variances in the model are explained. While the 'Extraction' column shows that the

variable has much in common with the other variables taken as a group when the communality is higher than 0.50. In this study, 63 samples have been used to meet the mentioned categories. The excluded items are SER2 (0.376) and SER4 (0.243). These two items indicate communality lower than 0.50, therefore excluded from the analysis as mentioned in Table 5.

Table 5
Communalities

Communalities

	Initial	Extraction
SER1	1.000	.705
SER2	1.000	**.376**
SER3	1.000	.823
SER4	1.000	**.243**
SER5	1.000	.800
SER6	1.000	.899
SER7	1.000	.860
SER8	1.000	.839
SER9	1.000	.655
SER10	1.000	.688
SER11	1.000	.805
SER12	1.000	.808
SER13	1.000	.882
SER14	1.000	.763

Extraction Method: Principal Component Analysis.

Factor Rotation

Table 5 indicates that two factors were removed from factor loading due to not meeting the threshold value of communalities in Table 5. Thus, the remaining analysed factors were left with 12, while two were rejected (SER2 and SER4). The following is the Rotated Component Matrix.

Table 6
Rotated Component Matrix

No			Component
		Component Matrix[a]	
1	SER6	(Monitoring and inspection)	.948
2	SER13	(Standard operating procedure)	.939
3	SER7	(Manpower management)	.927
4	SER8	(Work order completion)	.916
5	SER3	(Timeliness)	.907
6	SER12	(Administration)	.899
7	SER11	(Service Quality)	.897
8	SER5	(Records and documents)	.894
9	SER14	(Knowledge sharing)	.873
10	SER1	(Contractors' skill)	.840
11	SER10	(Flexibility)	.829
12	SER9	(Maintenance-related accidents)	.809
		Extraction Method: Principal Component Analysis.	

In Table 6, a total of 12 factors were later analysed, whereby two factors known as SER2 and SER4 were eventually removed due to failure in meeting the requirement of indicators for the process of preliminary analysis until factor rotation in factor analysis. Based on the Rotated Component Matrix analysis, SER6 (Monitoring and Inspection) is the highest rank with 0.948, while SER9 (Maintenance-related accidents) ranks the lowest with 0.809.

Conclusion

This study explored the MSDCs for a primary and secondary school in Perak in, Malaysia. The Rotated Component Matrix has made up 12 MSDCs that surpassed the value of more than 0.60. The sequence of MSDCs is as follows; Monitoring and inspection (SER6), Standard operating procedure (SER13), Manpower management (SER7), Work order completion (SER8), Timeliness (SER3), Administration (SER12), Service Quality (SER11), Records and documents (SER5), Knowledge sharing (SER14), Contractors' skill (SER1), Flexibility (SER10), Maintenance-related accidents (SER9). This study has contributed to exploring the MSDCs on school maintenance from the perspective of Academic staff, Non-Academic staff, Parent-teacher associations and Stakeholders. The practitioner needs to highlight the MSDCs practised in school maintenance since the building users are the ones who experience the service rendered. The study concluded that MSDCs are significant to achieving a CSE.

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