A Survey of Minimarket Maintenance Management System in Jakarta

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Abstract

The management of facility maintenance has become increasingly crucial in the retail sector. By attempting to boost production, enhance equipment efficiency overall, and simplify effective and efficient maintenance, this research can help to extend worldwide competition. This paper's analysis of the maintenance practices at several convenience stores to provide more information on the retail store's maintenance practices. The data is obtained from a survey at several convenience stores in Jakarta. Afterwards, the questions were created based on the main variables of maintenance management characteristics in the literature review. The first section of this paper, which is based on the literature, examines the traits of preventive maintenance. The second section is the outcome of research on preventive maintenance in the retail sector. A final list of six preventive maintenance characteristics was added in the questionnaire. The characteristics were rated by store management. Based on the store manager's reaction on a five-point Likert scale, the criteria for preventative maintenance were evaluated. All attributes get an average rating of approximately 4 or higher (out of 5).

Keywords
Convenience Stores, Maintenance Management Characteristics, Preventive Maintenance, Retail Sector and Survey.

1. Introduction
Variability in shopping activity is a part of consumer behaviour analysis, e.g., in terms of shopping location and volume, etc. Therefore, individuals with lower social-economy levels chose a closer supermarket compared to an individual with a higher social-economic level(L S Putranto 2020). In order to meet daily demands, people often go shopping to fulfill their needs. People in rural regions frequently select minimarkets that are close to their residences or places of activity (O K Golovnin2021). The reasons are to save time and money on commuting to the other point (Bekti et al. 2018). In addition, when a region's population grows, the number of minimarkets also increases (Yang, et al. 2019). According to data from Euromonitor International, the total number of minimarkets in Indonesia increased by 39% between 2015 and 2020. In 2020, there will be 36,146 outlets, up from 26,102(Pahlevi 2021). In the typical Jakarta minimarket, consumers can buy groceries, snacks, and medications. Mini markets also offer fast food, free restrooms, ATMs, and other amenities. These additional facilities are prepared to meet public needs. Therefore, minimarkets must understand that preventive/maintenance management needs to be implemented to ensure their facilities are long-lasting.

Maintenance is a combination of administrative, managerial actions, and technical procedures used to maintain something or restore it to its normal state for its function (Nurcahyo et al. 2018). Preventive maintenance is used to analyze and/or minimize the occurrence of component/equipment damage (Erliza et al. 2022). By doing this preventive, usefulness may be improved and the risk of machine damage can be reduced. One of the main keys in maintenance management is how to manage people, especially staff. Organizations need to train their employees in developing their knowledge and abilities which are very important in determining the conditions and problems in every piece of equipment that is operated (Ciconkov and Samoil 2016). Maintenance group is responsible for the development, implementation, and periodic evaluation of an effective asset maintenance plan(Nurcahyo n.d. 2018). Trained staff can support the organization's workflow to run well. Furthermore, in minimarkets, maintenance is not only focused on supporting equipment (e.g. electronics), but also on the condition of the building which has been taken into account as an important asset. Therefore, when a breakdown occurs, repairs and maintenance are added to

profit or loss (Erliza et al. 2022). Production scheduling and preventive maintenance go hand in hand because properly timed preventive maintenance will reduce the risk of equipment downtime that might affect production. Both subjects have also attracted a lot of research and manufacturing industry attention (Nurcahyo et al. 2016).

Koronaki et al. (2012) and Francis et al. (2017) have found that refrigeration systems in several European regions have leakage problems. The source of the problem occurs in pipe or connection failures, causing leaks in the compressor and fluid lines. The refrigeration systems in supermarkets, which make up the majority of the energy-consuming systems and account for around 43% of the structure's overall electricity consumption, are among the most energy-intensive commercial building types (EnergyStar 2008). Thousands of pounds of refrigerant charge can be found in the average retailer (ICF Consulting 2005). Assawamartbunlue and Brandemuehl (2006) estimated that the annual leakage rate is between 15% and 20%, and to 25% by ICF Consulting (2005). Refrigerants had been given a lot of focus in recent studies on supermarket systems. The situation of refrigerant leakage in refrigeration systems in numerous European nations, including leakage rates and the degree of compliance with existing laws, was evaluated by Koronaki et al. (2012). According to Koronaki et al. (2012) analysis of 81 systems, there are a few significant elements that contribute to the refrigerant leakage issue, including poor service and maintenance and technician skill deficiencies. Francis et al. (2017) reported that the most frequent causes of refrigerant leaks are pipe or joint failure and leaking seals/glands/cores in compressor racks and liquid lines using 1464 leakage maintenance records in the UK to analyze the causes and locations of the leakage in stores. In Klemick et al. (2015), representatives from 44 supermarket corporations in the United States provided information on the deployment of sophisticated supermarket technologies, such as variable capacity compressors, high-efficiency fan motors, floating head pressure controls, and demand defrost.

Although many kinds of studies have been done to observe and comprehend the practice of maintenance characteristics in numerous industries, there is still a lack of literature that specifically explains the maintenance features in the retail sector. Thus, the purpose of this study was to determine and analyze the most important maintenance characteristics in the minimarket.

1.1 Objectives
The following objectives are defined as:
1. To analyze maintenance systems at several minimarkets in Jakarta,
2. To provide an insight of activities maintenance practice in the retail store,
3. To understand the maintenance characteristics in the retail industry.

2. Literature Review
2.1. Maintenance
Maintenance is defined as the set of activities, technical, administrative, and managerial, performed during the life cycle of an item, workplace, work equipment, or means of transport, to preserve the value of an asset (Al-Turki 2014). The value includes its reli- ability, availability, productivity and market value. Activities include planning, coordination, financing, and operations. It involves multidisciplinary activities involving people, machines, equipment, spare parts and information. For these reasons, it is difficult to identify the exact number of workers involved in maintenance activities.

2.2. Preventive Maintenance
Maintenance can be performed in two major types: corrective or preventive. Corrective maintenance, similar to repair work, is undertaken after a breakdown when obvious failure has been located. Preventive maintenance (PM) is intended to reduce the probability of failure or degradation of functioning of an item and is carried out at predetermined intervals, predeter- mined PM, or according to a prescribed condition, Condition Based Maintenance (CBM) (Al-Turki 2014).

Scheduled Preventive Maintenance (PM) is a scheduled or fixed time maintenance service to detect and prevent potential failures and extend the life of equipment. It includes activities such as cleaning, lubricating, adjustment, and replacement of minor parts. It is used for reducing unexpected failure of critical.

2.3. Characteristics of Preventive Maintenance

Characteristics in maintenance management must be considered as shown in Table 1 because they tend to affect the overall maintenance performance. Effective maintenance management always strives to implement these characteristics (Au Yong 2014). From some literature, we identified five characteristics of maintenance management used in this study.

According to Idrus et al. (2009), maintenance labour is one of the important factors in preventive maintenance, since the maintenance work is implemented in a fixed time interval. Maintenance management requires a process to allocate and coordinate the resources which include labours in order to further improve the maintenance performance in terms of reliability of the systems. To be skilled maintenance personnel, labour should have an appropriate degree of knowledge and skills. Cheong Peng Au-Yong (2014) Because maintenance work is done at set intervals, a skilled worker is one of the key components in preventive maintenance. The staff must possess the necessary knowledge and abilities. The replacement job should not be the only thing maintenance technicians do. Instead, they must learn how to spot the deterioration of parts or components. Amount of maintenance workers' salaries When maintenance staff are employed, specific credentials and experience are needed Shirley Jin Lin Chua (2018).

According to Swanson (2001) preventive maintenance requires several categories of spare parts which include exchange parts, lubricants, and other maintenance materials such as rags, cleaning solvents, etc. Therefore, the availability of spare parts for replacement is necessary in order to ensure a consistent operation system. This is supported by Parida and Kumar (2006), who stated that the availability of spare parts is highly significant in preventive maintenance as it can affect the maintenance performance. (Cheong Peng Au-Yong 2014) Maintaining a system so that it can once again carry out its original purpose is the major reason a corporation keeps a supply of spare parts on hand. Demand for each spare part, brought on by corrective and preventive maintenance, dictates how many are kept on hand. In order to reduce failure costs and downtime, maintenance depends on the availability of spare parts. The analysis of necessary spare parts, the effectiveness of spare part reordering, spare part inventory levels, and spare part storage are all aspects of managing spare parts and materials. When a part or component in a system reaches the end of its lifespan, the appropriate replacement will be required. (Shirley Jin Lin Chua 2018) Spare parts, lubricants, and other maintenance supplies like cloth, cleaning agents, etc. are all necessary for preventive maintenance. Therefore, to guarantee the consistency of the operating system, spare parts must be widely available for replacement. Because it might affect maintenance effectiveness, spare component availability is crucial for preventive maintenance. The budget set aside for the purchase of replacement components, the way in which supplies of replacement parts and materials are stored, and the assurance of the replacement parts and materials' quality are all factors that must be considered (Adriaan Van Horenbeek 2013).

According to Moya (2014), maintenance policy is a set of administrative, technical, and managerial actions to apply during the life cycle of a machine, used to guide maintenance management decision making towards retaining certain operation conditions of a machine or dedicated to restoring the machine to said conditions

According to Bendaya et al. (2009), monitoring is an activity that is intended to measure the physical state of an item at predetermined intervals. It is typically carried out under various operating conditions. The characteristics of an item are evaluated during various stages of its life cycle.

According to Mulyadi (1999), the financial aspect is a cost-based maintenance by evaluating maintenance factors, such as repair, replacement, spare parts, equipment, and labor costs.

According to Al-Turki et al. (2014), treatment time interval is a preventive maintenance program that is carried out at fixed intervals to minimize the risk of future failures. It involves creating and optimizing components and systems to achieve minimal maintenance. Cheong Peng Au-Yong (2014) This has to do with maintenance planning, which requires a long-term plan to execute maintenance procedures at predefined intervals. This guarantees that the system will continue to carry out its intended function. Major and minor maintenance tasks, respectively, are generally needed for various types of maintenance downtime. Smaller tasks will require less maintenance work, which will be completed in a shorter amount of time. This work may include standard procedures like cleaning, lubrication, oil changes, realignment, and tiny adjustments. On the other side, extensive maintenance activities may require more time to complete. This might also include system replacement, inspection, and restoration. To avoid wasting money, maintenance downtime needs to be carefully managed. Ernnie Illyani Basri (2016) When a failure occurs before the designated service period, additional costs could be incurred. Additionally, system quality in relation to health,

safety, and the environment, as well as failure and downtime. One consideration in making decisions to enhance maintenance performance is maintenance downtime. The factors considered include the additional budget allocated for routine maintenance (outsourcing contractor), the frequency of routine maintenance (replacement), and the importance of the system and components (daily, weekly, monthly, yearly, etc.) Shirley Jin Lin Chua (2018).

3. Methods
The concept of maintenance characteristics has attracted the authors to explore its implementation in the minimarket. The following is the methodology of this research:
1. Literature review
    This step is taken to understand the research topic, definition of maintenance characteristics and application in the minimarket.
2. Survey questionnaire
    A survey will be conducted at several minimarkets in Jakarta. The questionnaire consists of 10 questions, obtained from breakdown of maintenance characteristics. The survey uses a Likert scale to give a rating for each criterion. Holgado et al. (2016) uses the Likert scale in their research of e-maintenance in service provision. Hence, the authors use a 5-point Likert scale to measure the maintenance characteristics. The definition of each scale is explained in Table 1.

Table 1. Likert Scale Descriptions

Scale	Descriptions
1	Very Unimportant
2	Unimportant
3	Neutral
4	Important
5	Very Important

3. Data Collection
Table 2 presents Questionnaire of characteristics preventive maintenance and Table 3 presents Respondents' questionnaire assessment.

Table 2. Questionnaire of characteristics preventive maintenance

Number	List of Questionnaire
1	There are an adequate number of maintenance staff.
2	Employees in charge of maintenance are of reliable quality.
3	The quality components are good.
4	The use of components in accordance with the SOP.
5	The availability of components is adequate.
6	Minimarkets have a maintenance policy that is in accordance with actual operational conditions.
7	The maintenance reports are made timely and accurate.

8	Computerization and digitalization are used to store maintenance-related data.
9	The maintenance costs are according to company budget standards.
10	The labor wages are according to company budget standards.

Table 3. Respondents'questionnaire assessment

Respondent	Question									
	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
1	5	5	5	5	5	5	5	5	5	5
2	5	4	5	5	5	5	4	4	5	4
3	4	5	5	5	5	4	3	4	4	3
4	3	4	4	5	4	3	4	3	4	4
5	5	5	5	5	4	4	5	4	4	5
6	4	4	5	4	5	4	5	3	4	5
7	5	5	4	5	3	4	4	5	4	5
8	5	5	5	5	5	4	3	5	4	5
9	4	4	5	5	5	4	5	5	4	4
10	4	4	4	4	4	4	4	4	4	4
11	4	4	4	4	4	4	4	4	4	4
12	5	5	5	5	5	5	5	5	5	5
13	4	5	4	4	3	3	2	5	5	4
14	4	3	3	4	4	4	2	5	3	4
15	4	5	4	5	5	5	5	5	5	5
16	5	4	5	5	5	3	5	5	4	5
17	4	5	4	5	4	5	5	5	5	5
18	3	3	3	2	4	4	3	3	3	4
19	4	4	3	5	3	5	4	5	5	5
20	3	4	3	4	3	4	4	5	5	5
21	4	4	3	4	3	5	4	5	5	5
22	3	5	3	4	4	4	5	2	4	5
23	5	5	5	5	5	4	5	5	5	4
24	5	4	4	4	2	3	3	5	5	3
25	4	4	5	5	3	3	4	4	4	5
26	4	4	4	4	4	3	3	2	5	5
27	5	5	5	5	3	3	3	3	4	3
28	4	5	5	2	2	4	4	4	5	4
29	4	4	4	5	3	4	5	5	4	5
30	3	4	4	4	4	4	5	5	5	4

31	3	3	4	5	5	5	5	5	5	5
32	2	5	5	5	4	3	5	4	5	4
33	3	4	4	4	4	3	3	4	5	4

5. Results and Discussion

5.1. Numerical Results

Only one characteristic, Maintenance Policy, has an average value below 4, which is 3.97, as shown in Table 4. All characteristics have average ratings of 4 or higher (out of 5). The Financial Aspect received the highest average score (4.44), indicating that respondents clearly agree that Indonesian minimarkets have performed preventive maintenance on the effects of the current PM model on finances, society, the environment, and budgets. The primary goal of maintenance is to achieve agreed factory performance at a cost. bare minimum upkeep the characteristic of the Maintenance Policy received the lowest average score, 3.97, indicating that respondents concur that minimarkets in Indonesia ensure that the Preventive Maintenance policies implemented are in accordance with the PM model by taking actual operating conditions into consideration.

Table 4.Characteristics of preventive maintenance

Number	Characteristics	Mean Rating
1	Maintenance Labour	4.18
2	Spare Parts and Materials	4.22
3	Maintenance Policy	3.97
4	Monitoring and Inspection	4.197
5	Financial Aspect	4.44
6	Treatment Time Interval	4.09

5.2. Graphical Results

The purpose of the graphical result is to determine how well the branch of stores in Jakarta rated the component statements on average. According to Figure 1's component characteristics average rating, the two component statements with the lowest average ratings are Q5 and Q6, which describe the performance characteristic of preventive maintenance (mean rating: 3,97) and the impact of preventive maintenance on a maintenance policy that is in accordance with actual operational conditions (mean rating is 3,97).Maintenance activities with the highest rating are The use of components in accordance with the SOP(average rating is 4.45) and the company conducts maintenance costs are according to company budget standards(average rating is 4.53).
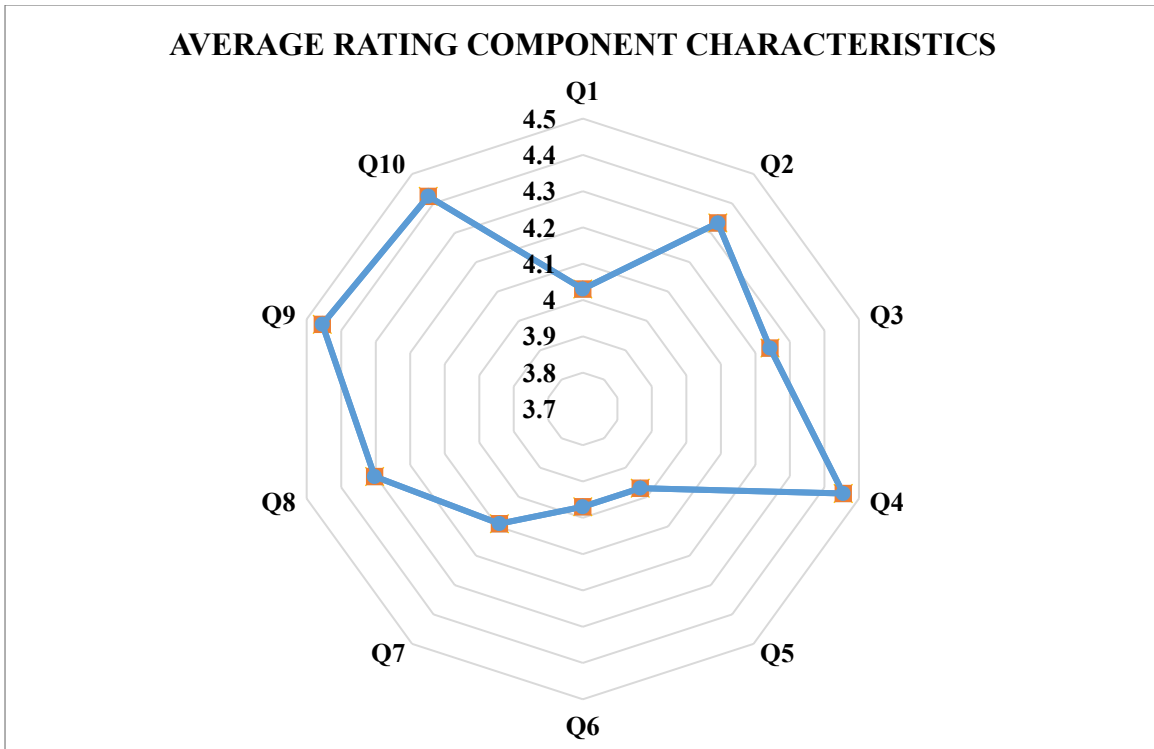
Figure 1. Average rating component characteristics

Correlations

	Maintenance Labour	Spare Parts and Materials	Maintenance Policy	Monitoring and Inspection	Financial Aspect
Spare Parts and Materials	0.414				
Maintenance Policy	0.121	0.151			
Monitoring and Inspection	0.190	0.388	0.528		
Financial Aspect	0.121	0.114	0.441	0.520	
Treatment Time Interval	0.080	0.434	0.412	0.766	0.493

Figure 2. Correlation between preventive maintenance characteristics

The Pearson-correlation test was used with Minitab software to investigate the association between preventative maintenance parameters. The results of the correlation investigation are shown in Figure 3. According to Crammer (1998)a correlation value between 0.4 and 0.6 is considered moderate, and a higher number (greater than 0.6) is considered to show a strong association.

Based on the figure above, there is only one strong correlation between PM characteristics. That is Treatment Time Interval& Monitoring and Inspection. This means that PM Treatment Time strategy impacts directly to PM Monitoring and Inspection. This correlation could appear because one of the performance measurements in PM is related to inspection aspect.This new finding is our main contribution. In the future, other researchers could find another correlation among the other characteristics.

6. Conclusion

This paper's research of maintenance management at several minimarket branches in Indonesia aims to provide insight on how activity maintenance is carried out in a shopping environment. Six Preventive Maintenance Characteristics were used to examine the survey of 33 store managers. The average value for only one attribute, Maintenance Policy, is 3.97, as shown in Table 4. The majority of factors receive average scores of 4 or higher (out of 5). The Financial Aspect obtained the highest overall average rating (4.44), showing that respondents generally agreed that Indonesian minimarkets have taken preventive measures to reduce the adverse implications of the existing PM model on finance, society, the environment, and budgets. To ensure factory performance at a cost-effective level is maintenance's major objective. The characteristic of the Maintenance Policy that requires the least maintenance, bare minimum upkeep received the lowest average score, 3.97, indicating that respondents agree that minimarkets in Indonesia ensure that the Preventive Maintenance policies implemented are consistent with the PM model by taking actual operating conditions into consideration.

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