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Analysis of Tenants Complaints Using Text Mining

Noorezatty Mohd Yusop, Nurul Nisa' Khairol Azmi, Nuralina Azlan

Faculty of Computer and Mathematical Sciences Universiti Teknologi MARA Cawangan Negeri Sembilan Kampus Seremban 70300 Seremban, Negeri Sembilan, Malaysia

Corresponding Author Email: noorezatty@uitm.edu.my

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Abstract

Tenant complaints are critical for property management companies, and they must be resolved immediately to maintain tenant satisfaction levels. However, keeping a close watch on long and unstructured complaints on any textual records is quite challenging. Hence, this paper aimed to visualise frequent issues raised in the complaints and classify complaints using text mining approaches. Analysis was done on three-month complaint records from a property management company in Shah Alam, Malaysia. The result showed that *light* is the most frequent word in tenant complaints, followed by *water.* The high frequency of the two words indicated that recurring issues raised by the tenant are regarding lighting and water problems associated with leaking pipes. In addition, complaints can be classified into four groups: light, sink, door and toilet problems. This study uses a well-established text mining technique to analyse and evaluate the voice of tenants. The information acquired through text mining analysis highlighted current issues that require the property management's attention.

Keywords: Complaint, Tenant, Text Mining

Introduction

The continuous growth of high-rise residential properties in urban areas indicates a need for an effective property management system to provide sustainable high-rise residential property development. A management body's role in managing a residential property is critical to ensure that tenants' complaints are quickly resolved and controlled efficiently. A complaint can be defined as a negative expression of dissatisfied customers or consumers about products, services, and the organisation's action (Ngai et al., 2007). The tenant complaints are valuable information for property management companies in managing landlord properties effectively. However, late response to the complaints may lead to dissatisfaction and affect the number of vacant (Musa & Musa, 2018).

Tenants nowadays are more aware of their rights to get the management's best services. The tenant has the right to allege complaint to the management depending on what is written in the agreement. The complaints can be sent via electronic systems or manually to the customer service office. They also tend to write the complaints through social media, which they assume will get fast and more effective responses (Mat et. al, 2018). However, failing to identify the common problems faced by the tenants may slow down the proper action that should be taken by responsible body. As a result, the reputation of the management may be affected. Therefore, the vast number of complaints should be analysed to highlight recurring problems in rented properties.

Text mining Application on Customer Review and Complaints

Text mining, also known as text analytics, is an artificial intelligence technique that uses natural language processing (NLP) to convert unstructured data into structured data. The method is popular in computer science, information science, mathematics, and management (Humphreys and Wang, 2018; Kumar et al., 2021). In text mining analysis, the data were processed in a form that can be structured and summarised (Miner et. al, 2012). Once the text is summarised, further analysis can be conducted, such as data visualisation and word classification.

Recent advances in text mining have made it possible to analyse unstructured text data such as suggestions, complaints, and customer feedback. Many studies have sought to employ text mining insights to determine customer's needs and help to improve services or product development (Joung et al., 2018). Recent analysis using text mining on customer reviews with the airline services revealed that the main issue that can cause customers' dissatisfaction was delay, however, customers were satisfied with the staff service. In addition, the method highlighted the significant issues in flights were about the seat, service and meal (Kwon et al., 2021). In hotel services, Hu et al (2019) studied how consumer complaints vary across different hotel grades by analysing 27,864 hotel reviews in New York City. According to the findings, customer complaints at high-end hotels are mostly about service concerns, whereas customers at low-end hotels are dissatisfied with facility-related issues.

As online evaluations and comments from customers have a lot of influence on their purchasing decision, thus, text mining techniques can be used to comprehend consumers' in-depth ideas (Ban & Kim, 2019). In a study, Nath et al. (2020) analysed online reviews of one popular brand of laptop using sentiment analysis and proposed a method for grouping customer perception. The key product qualities were used to group similar reviews. The findings aid the manufacturer in determining the level of customer satisfaction associated with distinct groups. Meanwhile, in the automotive sector, Kim and Chun (2019) examine consumer reviews of three different competitive automobile brands and analyse the advantages and disadvantages of each vehicle using text mining methods. Text analysis has distinguished customer's perception against the brand's strengths and weaknesses. In conclusion, text mining analysis helps quantify the textual record into meaningful information. Thus, the method was employed to solve the objective of this paper:

1. to visualise the most frequent issue in the complaint.
2. to classify words into types of complaints through an interactive diagram.

Materials and Method

Source of Data

This study analysed complaint record obtained from a property management company in Shah Alam, Malaysia. The company manages landlord properties such as advertising, rent collection, and job maintenance. Tenants normally report a complaint through a complaint system and notification will be sent to the management for further action. In this study, complaints for three consecutive months in 2021 was obtained in Microsoft Excel format. For each complaint, information such as home unit, room unit, tenant detail, date, time, complaint, and location were recorded. Initially, the record was littered with misspellings and some words were concatenated together but since the problem was relatively small, Microsoft Excel tools can effectively spot mistakes and suggest solutions.

Text Mining Analysis

Text mining is the process of extracting information from a collection of data in the form of a document using a specialised analytic tool. Knowledge discovery can be accomplished by evaluating several texts in stages. Text mining aims to extract usable information from data sources by discovering and exploring relevant patterns (Espinoza et al., 2015). The steps of data mining start with pre-processing the data. Redundancies, inconsistencies, distinct terminology are all removed from the text (Sheela & Bharathi, 2018). This procedure helps users prepare their documents for analysis by removing numerals, punctuation, common terms, and capitalisation. There are several text mining techniques in the text mining process. This includes supervised text categorisation, pattern matching, and support vector machine techniques. In this paper, R programming packages were employed to produce the following:

Bar chart

A bar chart depicts data as rectangular bars whose length is proportionate to the variable's value. The function barplot () in R is used to make bar charts. In a bar chart, R can create both vertical and horizontal bars. In addition, each of the bars in a bar chart can be coloured differently.

Word Cloud

Word Cloud is an effective alternative for visually interpreting text and is beneficial in quickly gaining insight into the most prominent words in a particular text. The size and colour of the words represent the word importance. This type of visualisation can highlight the most common terms and present the data in a way that everyone can understand.

Clustering and Dendrogram

Clustering is the most common type of unsupervised learning, which is a type of machine learning method that uses unlabelled data to make inferences. Agglomerative and divisive are the two types of hierarchical clustering. Individuals are grouped together in agglomerative clustering, whereas divisive clustering splits them into smaller groups. However, these two methods have one thing in common: they allow the researcher to discover the appropriate number of clusters to assist in exploring a given data set. In hierarchical clustering, objects are categorised into a hierarchy similar to a tree-like diagram called a dendrogram.

Results and Discussion

This section reveals the results and analysis of the study. Results are visualised in tables, bar charts, word clouds and dendrogram.

Words Summary and Frequent Word

As shown in Figure 1, the actual complaint record consists of unstructured sentences. The pre-processing stage in text mining had removed the records' white space, number, punctuation, common terms, and capitalisation.

1	"The front door mirror fell ... stuck near window grill ..."
2	"The rubber of the fridge is already loose and the cold gas c...
3	"Two living room lights are broken
4	broken pipe head
5	Broken water pipe
6	can't use the toilet pump because the pump buoy is broken
7	clogged sink
8	Clogged sink

Figure 1: Complaint's data

Next, the data were analysed to identify the frequency of words. The following statistics in Table 1 indicated that 135 different words were being used throughout the records. The highest mention is for 24 times, and the lowest only once. On average, each word in the records was mentioned about 2.326 times.

Table 1: Statistics of words in complaints data

Statistics	Value
Minimum	1
Maximum	24
Mean	2.326
Number of words = 135	

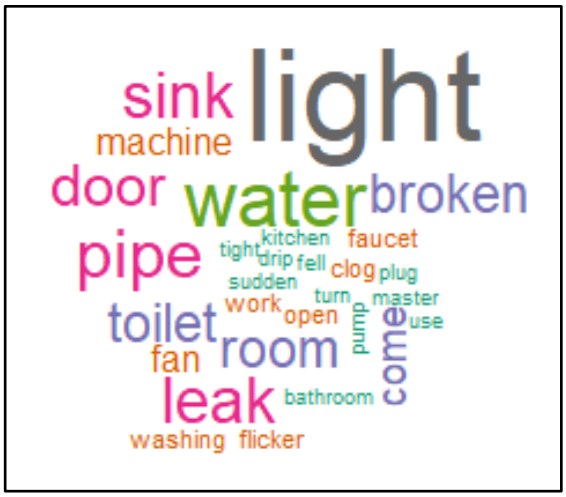

Figure 2: Wordcloud of most frequent words in complaints

Figure 2 shows the word cloud of the most frequent words in the complaint record. The word with the biggest size shows the most frequent word in the complaints. The word “light” appears most frequent in the complaint record. It is followed by second and third level size words such as “water”, “door”, “leak”, “pipe”, “sink”. This indicates that most maintenance jobs are assigned for lightings, door and piping/plumbing problems. The word “water” appears as second level size but somehow related with most word in third level size. This figure is supported by Figure 3 indicating the actual frequency for each word. The word “light” was mentioned 24 times. It is followed by the second and third level size words which appear at least 10 times. Meanwhile, other words were mentioned less than 10 times.

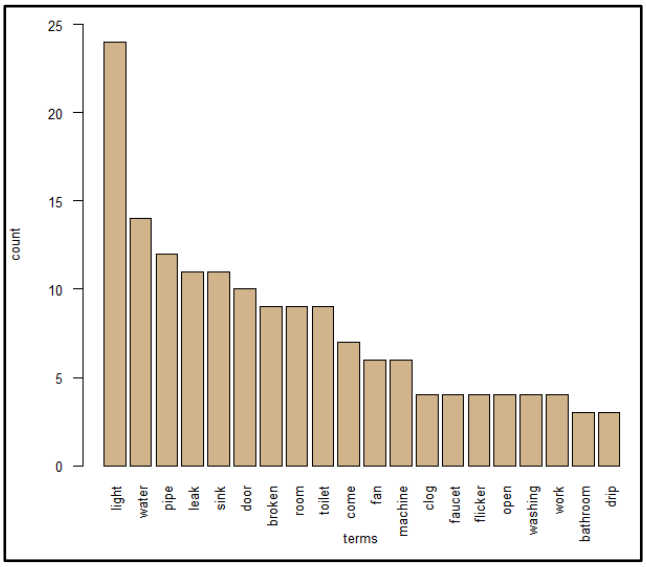

Figure 3: Frequent terms in customer complaints

Classification of Complaints

Dendrogram of the nine words based on the cluster analysis is depicted in Figure 4. On the basis of dendrogram, all nine words can be grouped into four main clusters. The first cluster shows close association between “leak” and “pipe” to a higher degree, “toilet”. The second cluster shows close association between “broken” and “room”. This group is further associated with “door” to a lesser degree. The third group shows the close association between “sink” and “water”. However, the last group shows “light” is different to the other words to a higher degree

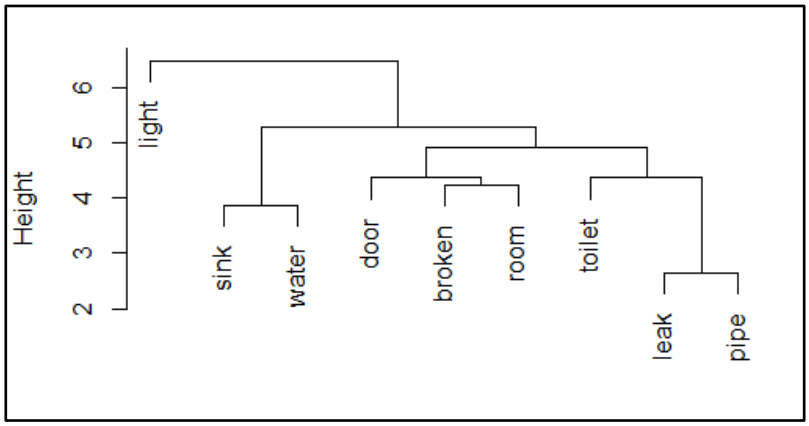

Figure 4: Clusters of word

Meanwhile, the bar chart displayed in Figure 5 shows the frequencies between two words. The pair of words (bigram) can be used to relate the single word that appears in dendrogram. For example, for the cluster containing words (toilet, leak pipe), tenants' complaints were about "leaking pipe" or "leaking toilet". Furthermore, the maintenance problems identified from the diagram are regarding washing machine, room lightings, leaking pipes, door and curtain problems, and clogged sink. Thus, frequent issues such as washing machine, room light, and leaking pipe require attention from the property management.

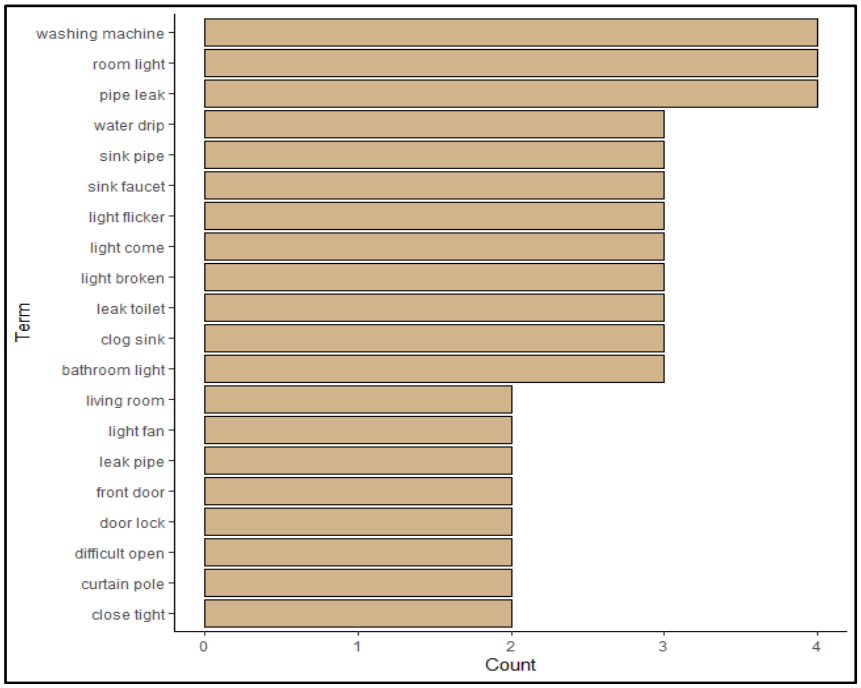

Figure 5: Frequent terms – bigram

Based on the findings, tenants mentioned that the most frequent issues in their residential are lighting problems, followed by leaking pipes and door problem specifically the doorknob. As the issue regarding the light problem has not been mentioned as crucial in the prior study, the property management should investigate this matter. The quality of bulb or lamp used in residential buildings needs to be monitored and replaced periodically. Prior research also stated that leaking pipes, failure of the water supply system, cracking in external walls,

moisture to concrete walls, and broken doorknobs are among the most prevalent issues discovered in inexpensive housing in Klang Valley (Abdul Rahman et al., 2014; Hashim et al., 2012). It is further supported by Azian et al. (2020) who found that, one of the complaints received by high-rise property management is regarding plumbing issues. Therefore, a regular inspection of the pipes system and doorknob problems in the dwelling unit is required to simplify the maintenance process.

Conclusion

The text mining techniques were employed to answer two objectives of this paper. In the first objective to visualise the most frequent issue in the complaint, the word cloud and bar chart summarise the recurring words in the records. Results indicated that higher frequency words are related to lighting and water problems. Meanwhile, the second objective to classify words into types of complaints through an interactive diagram employed dendrogram to show different clusters of complaint. The clusters represented four categories of complaints in residential units. The complaints analysis utilising text mining technique helped identify and highlight areas for improvements such as lighting problems, water leakage, pipes, washing machine and door-related problems. In conclusion, property management should take preventative measures to regulate the link between corporate costs and customer happiness.

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