



An Investigation of Toilet Cleanliness Assessment and People Monitoring at Rest and Service Area (R&R) X and Y

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Abstract: Facility management services are essential for maintaining the effective functioning and safety of buildings. Soft facility management services aim to enhance the work environment by improving efficiency and safety. Poor toilet hygiene due to inadequate care poses a threat to human health and safety. The objectives are to measure the effect of public toilet cleanliness based on the number of people and to analyse the relationship between the level of toilet cleanliness and the number of people. Observation methods were employed to monitor the number of people and evaluate toilet cleanliness from 9:00 a.m. to 17:30 p.m. at R&R X and Y. Linear regression analysis were conducted to determine R^2 values for each location and using a one-way ANOVA. The R^2 values represent the relationship between the star rating and the number of people. The result shows the R^2 values for men's and women's toilets at R&R X on weekdays and weekends are $R^2 = 0.7643$, $R^2 = 0.7784$, $R^2 = 0.2479$, and $R^2 = 0.2245$. For men's and women's toilets at R&R Y on weekdays and weekends, $R^2 = 0.1733$, $R^2 = 0.2583$, $R^2 = 0.5591$, and $R^2 = 0.6939$. In conclusion, it was found that the R^2 values on the men's toilets at R&R X and the women's toilets at R&R Y had a strong and moderate relationship to the number of people and star rating. Meanwhile, women's toilets at R&R X and men's toilets at R&R Y have a weak relationship between the number of people and the star rating. It important to maintain the cleanliness, user comfort and safety, as well as the overall satisfaction of use, to maintain 5-star rating to ensure that users who use public toilets feel comfortable.

Keywords: Soft facility management; public toilet cleanliness; monitoring and observation; star rating; user satisfaction, registration, audit effectiveness

1. Introduction

Facility management services are essential for maintaining the effective functioning and safety of buildings (Stephens, 2021). Soft facility management services focus on improving the working environment by enhancing efficiency, safety, and cleanliness. The cleanliness of public toilets is particularly important as it directly impacts user health and satisfaction (Emanuel, 2022). Maintaining cleanliness in public toilets is essential for user comfort and well-being. Adequate waste management practices and ensuring security measures are in place also contribute to a safe and pleasant environment for users (Stephens, 2021). However, during peak hours, public toilets may face challenges in maintaining cleanliness and meeting user demands.

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A public toilet star rating is a method used to give a toilet quality rating that focuses on five main areas which are design, cleanliness, effectiveness, maintenance, and user satisfaction. According to the Water and Energy Consumer Association, Malaysia is one of a country with a low-level rank of public toilet cleanliness (Abdullah, 2016). Based on 2013 statistics, 61 percent of the 10,257 public toilets across the country are in poor condition. Only 350, or 3.4 percent, achieved a five-star rating, while 1,086, or 10 percent, were in very bad condition to get the minimum one-star rating. Based on Thye (2019), there are various issues related to toilet hygiene including not flushing the toilet after use, squatting over the toilet bowl, tossing tissues, cigarette butts, and sanitary napkins into the bowl, dripping water on the floor, wasting tissue paper, soiling the toilet floor, and not disposing of trash in the provided dustbin (Abdullah, 2016).

Lack of maintenance management, ineffective cleaning schedule, lack of cultural attitudes and behavior, vandalism and misuse, and lack of hygiene awareness among Malaysians are the causes of dirty and poorly functioning public toilets in this country (Noh, Zaidan, Shamsudin, Sazili, & Abd Lateh, 2019). The frequency of toilet use, apart from the attitude of people who lack civic awareness, has burdened toilet management. Hence, this greatly impacts public toilet users in this country because it will be a yardstick for their level of comfort and safety (Ahmad Taha & Syahrul Mat, 2021). In this context, the toilet needs to be improved by improving the routine cleaning schedule to ensure public toilets in our country are always clean. This study highlights the importance of soft facility management services, particularly in maintaining the cleanliness of public toilets. This study aims to analyse the level of toilet cleanliness based on the number of people and explore the relationship between cleanliness and people monitoring at R&R X and R&R Y. Therefore, effective cleaning schedules and practices can be developed to ensure a clean and hygienic environment. These findings contribute to the overall improvement of facility management services and promote user satisfaction in public toilets.

2. Term and Definition of Public Toilet

A public toilet is a facility as opposed to a private, mostly domestic toilet room, which may be a separate water closet or part of a bathroom (Envis Centre on Hygiene, 2021). Based on the Asean Public Toilet Standard (2016), a public toilet is defined as a communal urine and faeces room or booth that includes at least a bowl with or without a seat (seating or crouching) and is connected to a waste pipe and flushing equipment.

2.1 The Condition of Public Toilets in Malaysia

Generally, public toilets in Malaysia have a low level of toilet hygiene (Abdullah, 2016). The management system is weak because no toilet cleaning service is performed, which will cause health and safety problems for users. In addition, most people are indifferent, irresponsible, lack civic awareness, and look down on the culture of public toilet hygiene. This is one of the reasons why public toilets in our country are dirty. While public toilets are a very important place for every individual (Arshad, 2017). Table 1 below shows examples of public toilets in Malaysia.

Table 1 - Examples of Public Toilets Problems or Issues in Malaysia

Author and Year	Location	Public Toilet	Problems or Issues
Abangnara, 2015	Perak	R&R Sungai Perak	Women’s toilet is filthy due to faeces. It is understood that there is no water, which makes using the toilet more difficult.
Mohd Khalid, 2023	Kuala Lumpur	Dataran Merdeka	The ceiling roof of the men’s public toilet is damaged; hand washing soap is not refilled, and some water pipes are not working.
Noh <i>et al.</i> , 2019	Bagan Ajam, Butterworth	Rest and Service Area (R&R) station	Found that the urinals were damaged and not repaired by the management or the responsible party.
Noh <i>et al.</i> , 2019	Johor Bahru, Johor	Medan Selera Public Transport Terminal Larkin Sentral	The condition of the public toilets there is very disgusting. On the third floor of the premises, the pungent smell will make anyone feel nauseous.
Noh <i>et al.</i> , 2019	Hulu Selangor, Selangor	Kuala Kubu Bharu and Bukit Sentosa bus station	Every day when washing the toilet, it is necessary to dispose of personal items such as sanitary napkins, underwear, and tissues left in the restroom.

2.2 Soft Services

Soft services are services that are directly used by people. Soft services are services and facilities that are changeable and contribute to making the premises a better environment, more secure, comfortable, and safe for its occupants to work in, a pleasant working environment, or more efficient (Bellrock, 2021). Soft facility management examples include landscaping, cleaning services, security, waste management, toilet and washing facilities and others.

Three examples of soft facility management services were selected, which are cleaning services, waste management, and toilets and washing facilities. These services were chosen to monitor and observe the cleanliness of selected public toilets in Malaysia. The observations focused on toiletries such as tissues and soap after use by users, as well as the perception of expected solid waste in the bins. The study aimed to closely examine the relationship between the use of public toilets and the mentioned facility management activities.

2.2.1 Cleaning Services

Cleaning services are regular and recurring activities performed daily, weekly, or monthly as part of the operation and maintenance services provided by Facility Management. It involves the removal of unwanted objects such as dirt, dust, germs, and pollutants from surfaces or environments using soap or detergent and water. While it may or may not eliminate germs, cleaning reduces their presence, making the environment more sanitary and safer (Treiber, 2020). Cleaning services can be provided by specialized companies for various establishments, including shops, offices, public restrooms, and residential properties (Sahil & Rushabh, 2018). These services encompass tasks like dusting, floor cleaning, window cleaning, spot cleaning, wall cleaning, and planned maintenance, all aimed at always ensuring clean and habitable premises.

2.2.2 Waste Management

Waste in the toilet context comprises human excreta, including urine and feces, with or without water, and can be managed using methods like dry toilets that don't require water for collection. Waste management involves various services, such as collection, transportation, disposal, and monitoring, with a focus on proper recycling to minimize the environmental impact of waste production (Stephens, 2021). Waste management is often associated with materials produced by human activities, and these practices are usually undertaken to reduce their impact on health, the environment, or aesthetics. Waste management deals with all materials as a class, whether solid, liquid, gas, and tries to reduce the negative impact on the environment by using various methods (Standard, (2016).

2.2.3 Toilet and Washing Facilities

Toilet facilities are crucial in public places, with separate facilities required for men's and women's restrooms by regulations (Sani, 2017). These facilities are designed for people with exceptional needs and serve as permanent or mobile structures for collecting and containing faeces and urine. Proper sanitation facilities, including toilets and latrines, play a vital role in promoting health by enabling proper waste disposal and reducing health risks. Adequate supplies in toilets and washing facilities, such as clean water, soap, tissues or hand dryers, and trash bins, are essential for personal hygiene. Women's restrooms should include provisions for sanitary dressing disposal. Proper installation, including lockable doors, lighting, ventilation, and sufficiently large sinks, is necessary. Toilets must be clean, hygienic, and easy to maintain, with cleaning duties tailored to the frequency of use, especially in high-traffic areas (Sani, 2017).

2.3 Monitoring

Monitoring is the systematic collection and analysis of data and information to track the progress of activities regularly, whether daily, weekly, monthly, quarterly, or yearly (Meshoulam, 2019). It involves observing and tracking activities and progress. Monitoring is an ongoing or continuous process of collecting and analysing of data to track progress toward certain goals and objectives. It continuously monitors the performance evolution over time. The goal of monitoring is to provide periodic, timely feedback on the implementation of programs or projects, identify areas for improvement, and ensure the achievement of expected objectives (Patrick, Kopolo, & Stanfill, 2023).

Real-time monitoring allows for the continuous observation and assessment of the selected public toilet condition as people use it. The monitoring involves evaluating the cleanliness of the toilets by observing toiletries such as tissues and soap after use, as well as assessing the presence of expected solid waste in the dustbin. The researcher will use checklists, star ratings, and guidelines for continuous data collection and analysis. Monitoring is essential for counting, tracking, and gathering data, such as the improved schedule of soft facility management services based on the number of people: counting the public entering the public toilet, tracking the sanitary conditions of toilets and toiletries, and collecting data on how many people enter public toilets.

2.4 Observation

Observation is a participatory study technique used to observe and describe a subject's behavior. It involves collecting important information and data by immersing the researcher in the location where respondents are and taking notes or recording. This method may involve observing, listening, reading, touching, and documenting the behavior and characteristics of phenomena (Bhasin, 2023). It is commonly used in the social sciences and is often complemented by interviews and record research. Observational research allows the investigator to watch and scientifically observe the

subjects or research situation to determine the status of a phenomenon without asking direct questions (Kumar, 2022). See Figure 1 for an illustrative depiction of the observational method.

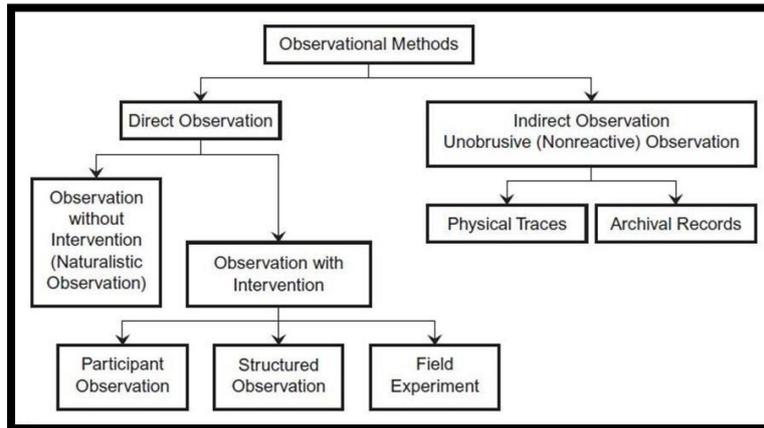


Fig. 1 - Observation methods

This study uses direct observation. Direct observation involves observing interactions, processes, or behaviors as they occur. Involves the researcher having a direct view and recording what happens without attempting to control or manipulate the situation. It is a method for collecting evaluative information where the subject is observed in their usual environment without any changes. This type of observation is used when the researcher observes interactions, processes, or behaviors as they occur (Jhangiani, Chiang, Cuttler, & Leighton, 2019). This selection was made to directly monitor the number of people entering the public toilet, observe the condition of the toilet after use, and record the observations. The goal is to assess the cleanliness of public toilets, observe toiletries like tissue and soap after use, and observe the presence of expected solid waste in the trash can.

2.5 Previous Study Use Monitoring and Observation Method

Table 3 shows summarize previous studies that employed the monitoring and observation method for evaluating toilet cleanliness. The results indicate that all researchers found a significant and positive effect of monitoring and observing toilet cleanliness on user satisfaction. This method helps public toilets assess user satisfaction with the quality of clean, orderly, and usable toilet hygiene services, leading to improved service and maintenance in the future.

Table 3 - The previous study use monitoring and observation methods for the instrument

Author and Year	Country	Title of Journal	Type of Building	Type of Study	Day/Week/Month	Time
(Alfalah, Shahrestani, & Shao, 2022)	England	Identifying Occupancy Patterns and Profiles in Higher Education Institution Buildings with High Occupancy Density - A Case Study	Library Building	Case Study Building (Observation)	12 months at 5-minute intervals (Weekdays and Weekends)	24 hours (4:00 am – 4:00 am)
(Ramli, Hassan, & Hainin, 2017)	Malaysia	Parking Demand Analysis of Rest and Service Area Along Expressway in Southern Region, Johor	R&R Building (Parking)	Empirical study (Observation)	Two days for each site with a time interval 15-minute (Weekdays and Weekends)	10 hours (9:00 am – 6:00 pm)

(Zakaria, <i>et al.</i> , 2017)	Philippines	Evaluation of a Smart Toilet in an Emergency Camp	Abuca Bunk house Camp (Toilet)	Experimental Prototype (Monitoring and Observed)	49 consecutive days (Weekdays and Weekends)	24 hours (Day time 6:00am – 6:00 pm) (Nighttime 6:00 pm – 6:00 am)
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3. Research Methodology

The methodological study details procedures and workflow for analyzing the relationship between toilet cleanliness levels and the number of people. This study emphasizes the significance of people count and star rating to gauge cleanliness. This chapter outlines the research method to explain the study and employs a flow chart in the methodology for smooth implementation and planned execution. Completion of the study's flow chart is essential for achieving set objectives. Figure 2 illustrates the research framework.

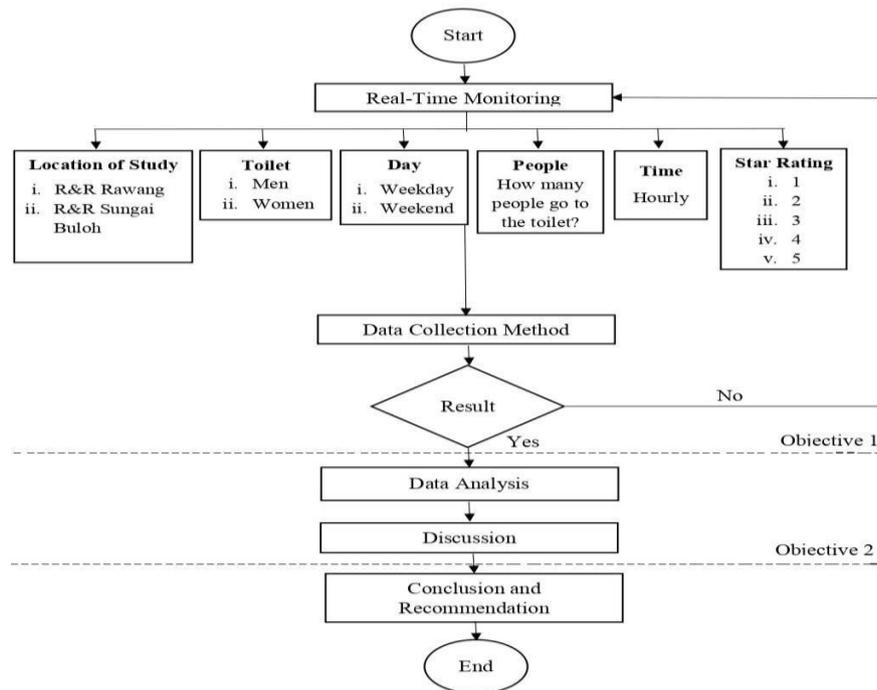


Fig. 2 - Research methodology flowchart

3.1 Materials and Methods

This study was conducted in two R&R buildings, which are R&R X and R&R Y in Selangor. This study spanned four days: March 16, 18, 19, and 2, 2023. Each selected location underwent the study twice – once on a weekday and once on the weekend. This investigation was carried out from 9 a.m. to 17:30 p.m., with the researcher spending about 9 hours on the research (Ramli, Hassan, & Hainin, 2017). This observation investigation was used to evaluate the cleanliness level of public toilets, with a data collection period of 1 hour at 15-minute intervals. In addition, both types of toilet facilities, including men's and women's toilets, will be utilised in this study on weekdays and weekends. Monitoring measures were utilised on that day to count the number of people entering the toilet using a digital tally counter. The research approach was used to study the relationship between the numbers of people and to evaluate the star rating based on the level of toilet cleanliness. In this study, the researcher has used the existing assessment of the level of cleanliness of public toilets that have been made by the Municipal Council by using the audit form checklist and star rating of cleanliness of public toilets (Samuel, 2019) to produce a star rating that will be obtained for each of the two R&R locations by achieved through observational methods. This study utilised linear regression analysis and used a one-way ANOVA to assess the cleanliness level based on the number of people (a dependent variable) and determine the star rating (an independent variable). Regression analysis helps predict the value of the relationship between the number of people and star rating.

3.2 Star Rating

According to the home ministry and local government, this guide discusses numerous pertinent factors that determine different tiers or grades for public toilets based on service levels. A minimum of 3 stars signifies a reasonably clean, safe, sanitary, and odor-free toilet. Four- and five-star restrooms offer more advanced services. It is a public toilet star-grading effort that focuses on five primary areas: design, cleanliness, maintenance, efficiency, and user satisfaction. Meanwhile, to describe the condition of a toilet, the cleanliness of a toilet is one of the factors influencing users' use of the toilet. From observation, public toilets in Malaysia are mostly not well maintained (Kamal, 2012). In this case study aims to classify public toilet cleanliness in terms of service of getting one, two, three, four, or five stars after use. Additionally, the audit form and public toilet cleanliness star rating checklist play a role by assessing the sufficiency of toilet supplies like tissue and soap in the men's and women's toilets after use and evaluating the condition of the dustbin, determining if it's full or still usable.

Based on the audit form and public toilet cleanliness star rating checklist, percentage scoring values are used for each public toilet cleanliness evaluation, such as environmental conditions (water supply, ventilation, and lighting), structural maintenance and cleanliness (floor, toilet, or urinal bowl), ceiling, walls, sink, door, faucet), hygiene facilities (liquid soap container, toilet tissue container, trash can), toilet cleaning activities (cleaning schedule, place to store things), and additional needs (perfumer, mirror, coat hanger, decoration). After the marks are calculated and totaled, stars rating will be awarded based on the total marks obtained. There are five stars to zero stars (notices are issued and advisory services are available). To get five stars, the total score must be 91 and above, and zero stars with a low total score of 50 and below.

4. Results

4.1 Men' and Women' Toilet at R&R X

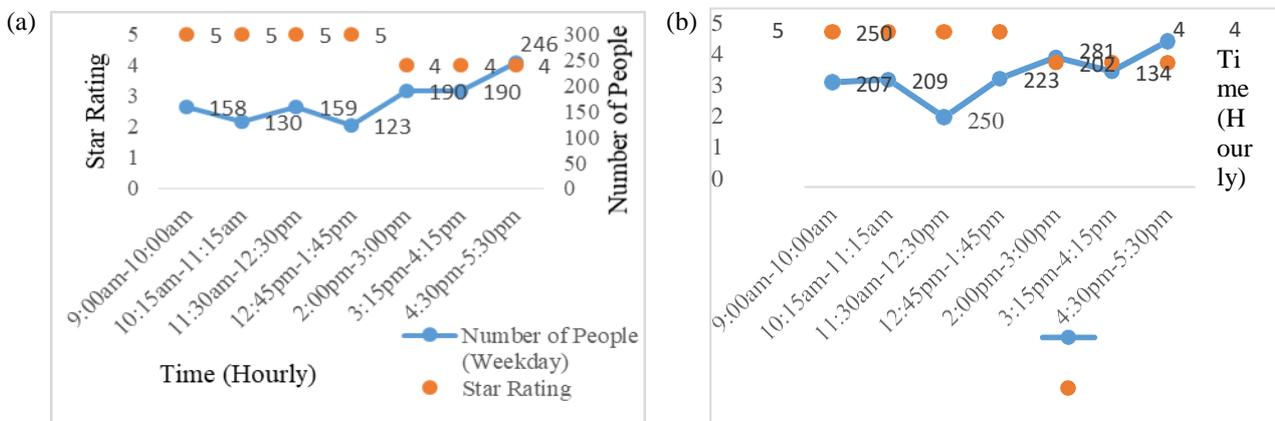


Fig. 3 - (a) Men's toilet at R&R X on weekday; (b) men's toilet at R&R X on weekend

Based on Figure 3, the relationship between the number of people (a dependent variable) and the star rating (an independent variable) in the men's toilet at R&R X on weekdays and weekends. The star rating decreases from 5 stars to 4 stars on both weekdays and weekends. From 9.00 a.m. to 1.45 p.m., the star rating remains at 5 stars, likely due to a lower number of people using the toilets during that time and adequate cleaning services (Ooi & Tan, 2021). However, from 2.00 p.m. to 5.30 p.m., the star rating drops to 4 stars, attributed to the increased addition of people and insufficient cleaning and maintenance schedules (Samuel, 2019). The number of users during peak hours has been observed to exceed the operating capability of the cleaning employees to appropriately manage the toilet facilities. Additionally, a lack of manpower contributes to the deterioration of cleaning standards. As a result, it is crucial for manpower services to play an important role in maintaining toilet cleanliness, which includes tasks such as floor mopping, removing trash, restocking soap and tissues, and other related duties (Kamaruzzaman, Egbu, & Zawawi, 2011). The statistics plainly show that weekdays have a lower total number of people compared to weekends. The graph shows that the highest number of people using the toilets on a weekday is 245, while on the weekend, it is 281. Conversely, the lowest number of users on a weekday is 123, while on the weekend, it is 134. Specifically, the overall total for men's toilets recorded 1,196 entries on weekdays and 1,506 entries on weekends. As a result, it is apparent that weekends have higher use of toilet facilities compared to weekdays. These phenomena can be attributed to increased leisure activities, travel, family outings, relaxed schedules, social events, and gatherings.

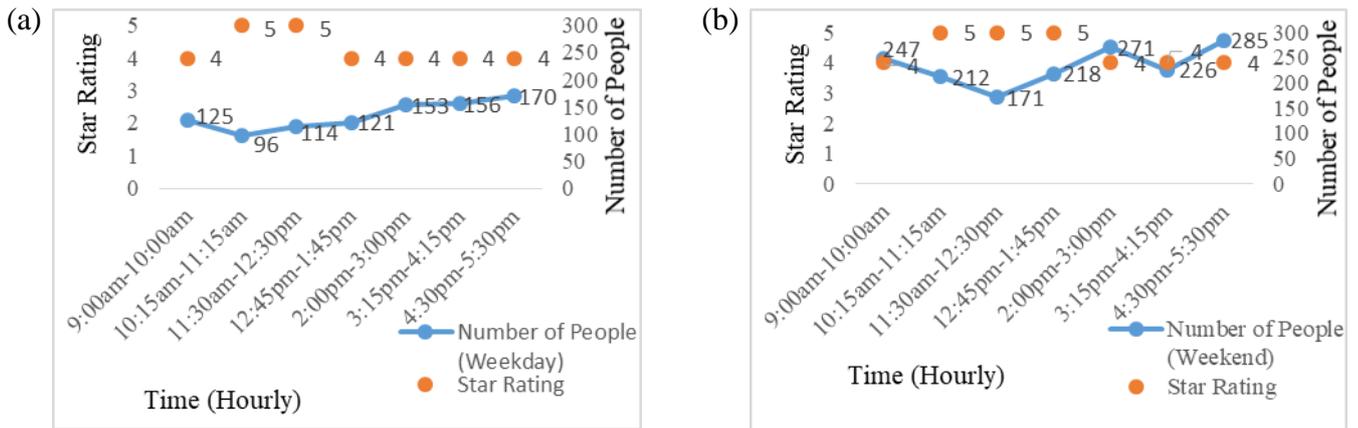


Fig. 4 - (a) Women's toilet at R&R X on weekday; (b) women's toilet at R&R X on weekend

Based on Figure 4, this shows the relationship between the number of people (a dependent variable) and the star rating (an independent variable) in the women's toilet at R&R X on weekdays and weekends. In the early morning, both weekdays and weekends show a 4-star rating. As a result, there is a subsequent rise in the rating to reach 5 stars, which is followed by a decrease back to 4 stars. From 9.00 a.m. to 10.00 a.m., the observed star rating was 4 stars. This may be due to the higher number of people using the public toilet during that time and a lack of sufficient manpower for cleaning services. However, from 10.15 a.m. to 12.30 p.m. on weekdays and 10.15 a.m. to 1.45 p.m. on weekends, the star rating increases from 4 stars to 5 stars. This occurrence can potentially be attributed to a decrease in toilet usage during those specific periods, coupled with the availability of sufficient cleaning services (Ooi & Tan, 2021). On the other hand, from 12.45 p.m. to 5.30 p.m. on weekdays and 2 p.m. to 5.30 p.m. on weekends, the star rating decreases again from 5 stars to 4 stars. This decrease was attributed to an increase in the number of people using toilets during those hours, insufficient cleaning and maintenance schedules, congestion during peak hours, and insufficient cleaning services provided by employees (Ooi & Tan, 2021). The data clearly indicates that weekdays have a lower total number of people compared to weekends. According to the graph, the highest number of people recorded in the women's public toilet on a weekday is 170, while the lowest is 96. On the weekend, the highest number of people using the public toilet is 285, with the lowest being 171. Specifically, the overall total for women's toilets recorded 935 entries on weekdays and 1,630 entries on weekends. These numbers demonstrate that weekends experience higher usage of the women's public toilets compared to weekdays, which can be attributed to increased leisure activities, travel, family outings, relaxed schedules, events, and gatherings.

4.2 Men' and Women' Toilet at R&R Y

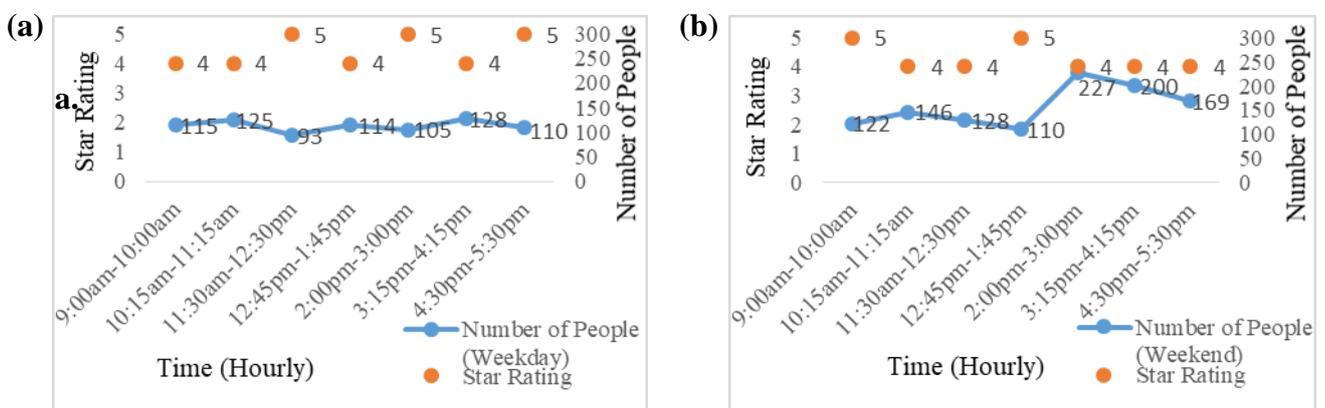


Fig. 5 – (a) Men's toilet at R&R Y on weekday; (b) Men's toilet at R&R Y on weekend

Based on Figure 5, the relationship between the number of people (a dependent variable) and the star rating (an independent variable) in the men's toilet at R&R Y on weekdays and weekends shows an inconsistent star rating pattern. The star rating fluctuates over different time periods. On weekdays, from 9.00 a.m. to 11.15 a.m., the star rating is observed to be 4 stars. However, on weekends, from 9.00 a.m. to 10.00 a.m., the star rating is observed to be 5 stars. From 11.30 a.m. to 12.30 p.m. on weekdays, the star rating increases from 4 stars to 5 stars, likely due to the lower number of people using the toilets and the presence of cleaning services (Ooi & Tan, 2021). Conversely, from 10.15

a.m. to 12.30 p.m. on weekends, the star rating drops from 5 stars to 4 stars. This decrease is attributed to increased usage, a lack of cleaning and maintenance schedules, overcrowding during peak hours, and inadequate cleaning services (Samuel, 2019). From 12.45 p.m. to 5.30 p.m. on weekdays, there is an initial increase from 4 stars to 5 stars, followed by a drop back to 4 stars. These variations may be due to changing usage patterns, overcrowding, insufficient cleaning and maintenance schedules, and a lack of effective cleaning services. The data clearly indicates that weekdays have a lower total number of people compared to weekends. The highest number of people recorded in the men’s public toilet on weekdays is 128 and the lowest is 93. On weekends, the highest number is 227, while the lowest is 110. Overall, the men’s toilet at R&R Y recorded 790 entries on weekdays and 1,102 entries on weekends. This indicates that weekends experience higher usage of the men’s public toilets, which can be attributed to increased leisure activities, travel, family outings, relaxed schedules, events, and gatherings.

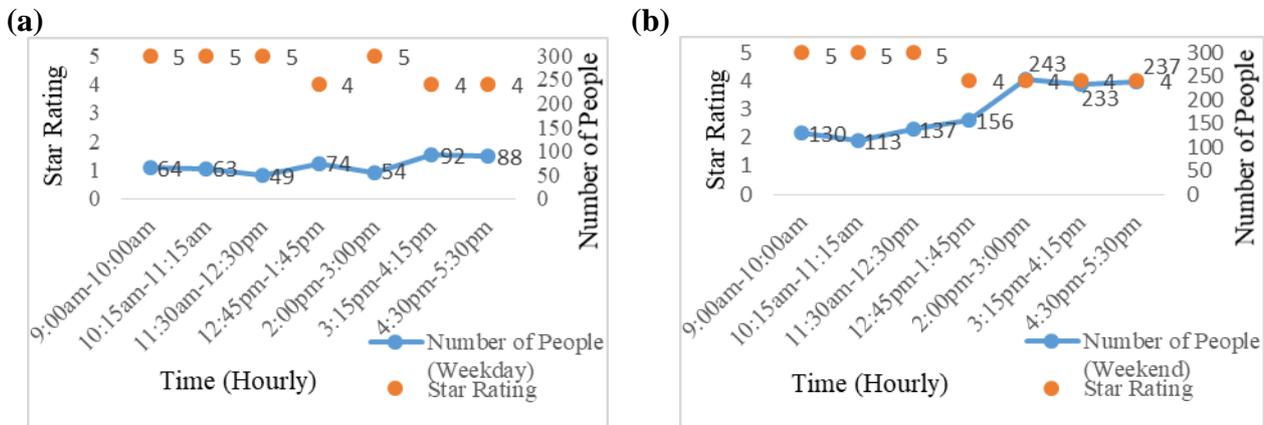


Fig. 6 - (a) Women’s toilet at R&R Y on weekday; (b) women’s toilet at R&R Y on weekend

Based on Figure 6, the relationship between the number of people (a dependent variable) and the star rating (an independent variable) in the women's toilet at R&R Y on weekdays and weekends shows inconsistent star rating conditions. The star rating fluctuates over different time periods. On weekdays, the star rating exhibits fluctuations, indicating an inconsistent star rating pattern. However, on weekends, there is a drop from 5 stars to 4 stars. From 9.00 a.m. to 12.30 p.m. on both weekdays and weekends, the star rating reaches 5 stars. This can be attributed to the lower numbers of people using public toilets during that time as well as the availability of cleaning services (Ooi & Tan, 2021). From 12.45 p.m. to 1.45 p.m. on weekdays, the star rating drops from 5 stars to 4 stars. From 2.00 p.m. to 3.00 p.m., it rises back to 5 stars, but from 3.15 p.m. to 5.30 p.m. on weekdays, and from 2.00 p.m. to 5.30 p.m., there is a consistent drop in the star rating from 5 stars to 4 stars. These fluctuations and drops in the star rating are due to increased usage, inadequate cleaning, and maintenance schedules, overcrowding during peak hours, and insufficient cleaning services. The data clearly indicates that weekdays have a lower total number of people compared to weekends. This indicates that weekends experience higher usage of the women’s public toilet on weekdays 92, with the lowest being 49. On weekends, the highest number is 243, while the lowest is 113. Overall, the women’s toilet at R&R Y recorded 484 entries on weekdays and 1,249 entries on weekends. This implies that women's public toilets are used more frequently on weekends, a pattern that can be given to an increase in leisure activities, travel, family outings, relaxed schedules, events, and gatherings.

4.3 Linear Regression Analysis

The linear regression analysis method was used to identify variables that helped in this study. Therefore, there is a relationship between the number of people and the star rating at public toilets R&R X and R&R Y. While for the period of peak toilet demand at each site was selected to try the analysis. Among the elements used are the number of people, star rating, day, and toilet type. In the case of the regression model of the number of people and the star rating, the number of people will change according to the time taken for each hour, with a 15-minute interval analysis performed. Therefore, the result of this analysis is to investigate the relationship between the number of people and the star rating and understand how changes in the number of people can affect the star rating.

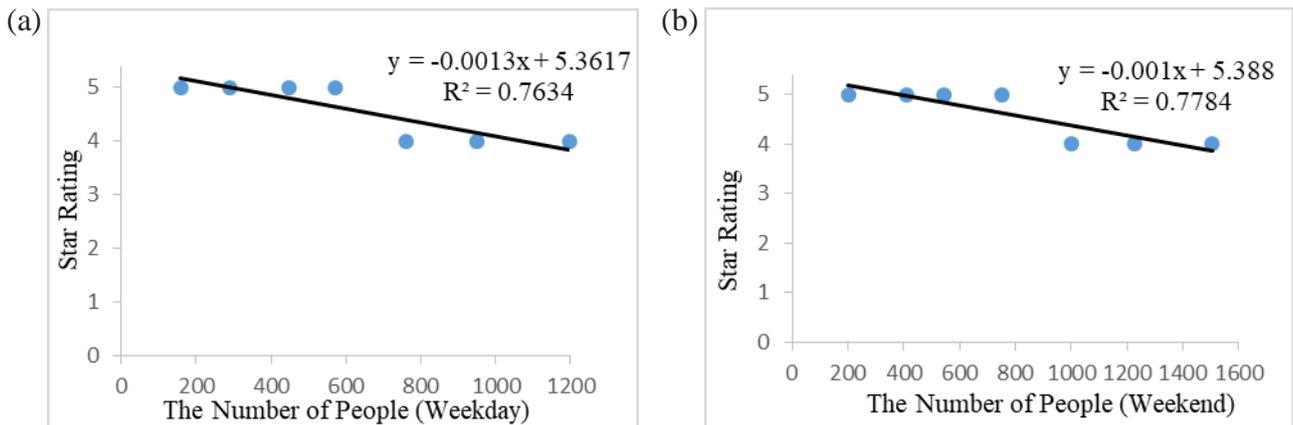


Fig. 7 - Comparison the number of people on weekday between star rating of men’s toilets at R&R X; (b) comparison the number of people on weekend between star rating of men’s toilets at R&R X

Figure 7 show a comparison of the number of people with a star rating in the men's toilet at R&R X. The linear regression analysis of the number of people and star rating in the men's toilet at R&R X is for both days, weekday, and weekend. By analysing the linear regression between the number of people and the star rating in the men's toilet at R&R X for weekdays shows a strong positive relationship $R^2 = 0.7634$ was found with the equation $y = -0.0013x + 5.3617$ in Figure (a). While the linear regression between the number of people and the star rating in the men's toilet at R&R X for weekends shows a strong positive relationship, $R^2 = 0.7784$ is found with the equation $y = -0.001x + 5.388$, as shown in Figure (b).

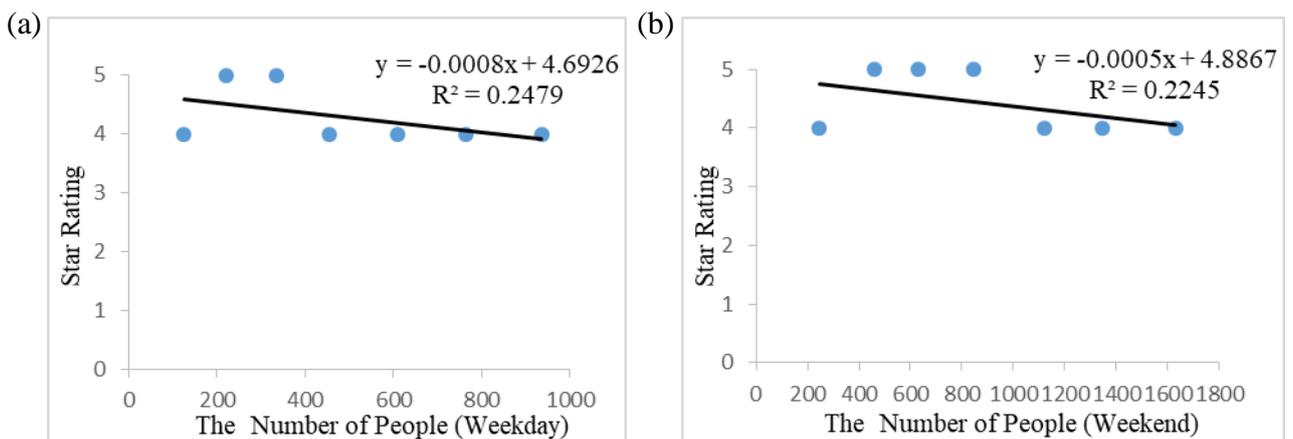


Fig. 8 - (a) Comparison of the number of people on weekdays between star rating of women’s toilets at R&R X; (b) comparison of the number of people on weekends between star rating of women’s toilets at R&R X

Figure 8 show a comparison of the number of people with a star rating in the women's toilet at R&R X. The linear regression analysis of the number of people and star rating at the women's toilet at R&R X is for both days, weekday, and weekend. By analysing the linear regression between the number of people and the star rating at the women's toilet at R&R X for weekdays, a weak relationship $R^2 = 0.2479$ was found with the equation $y = -0.0008x + 4.6926$ in Figure (a). While the linear regression between the number of people and the star rating at the women's toilet at R&R X for weekends found a weak relationship, $R^2 = 0.2245$ with the equation $y = -0.0005x + 4.8867$, as shown in Figure (b).

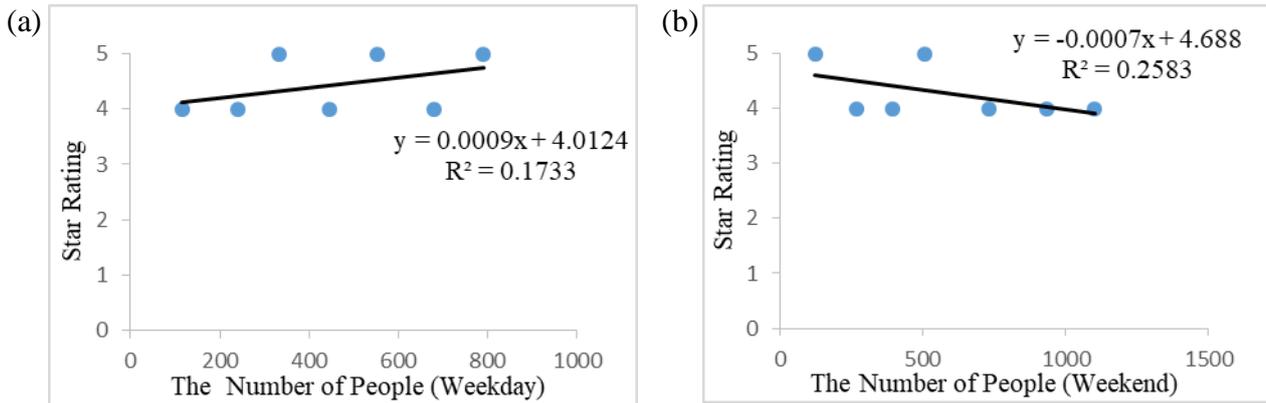


Fig. 9 - (a) Comparison of number of people on weekday between star rating of men’s toilets at R&R Y; (b) comparison of number of people on weekend between star rating of men’s toilets at R&R Y

Figure 9 show a comparison of the number of people with a star rating in the men's toilet at R&R Y. The linear regression analysis of the number of people and star rating in the men's toilet at R&R Y is for both days, weekday, and weekend. By analysing the linear regression between the number of people and the star rating in the men's toilet at R&R Y for weekdays, a weak relationship $R^2 = 0.1733$ was found with the equation $y = 0.0009x + 4.0124$ in Figure (a). During the linear regression between the number of people and the star rating in the men's toilet at R&R Y for weekends, a weak relationship $R^2 = 0.2583$ was found with the equation $y = -0.0007x + 4.688$, as shown in Figure (b).

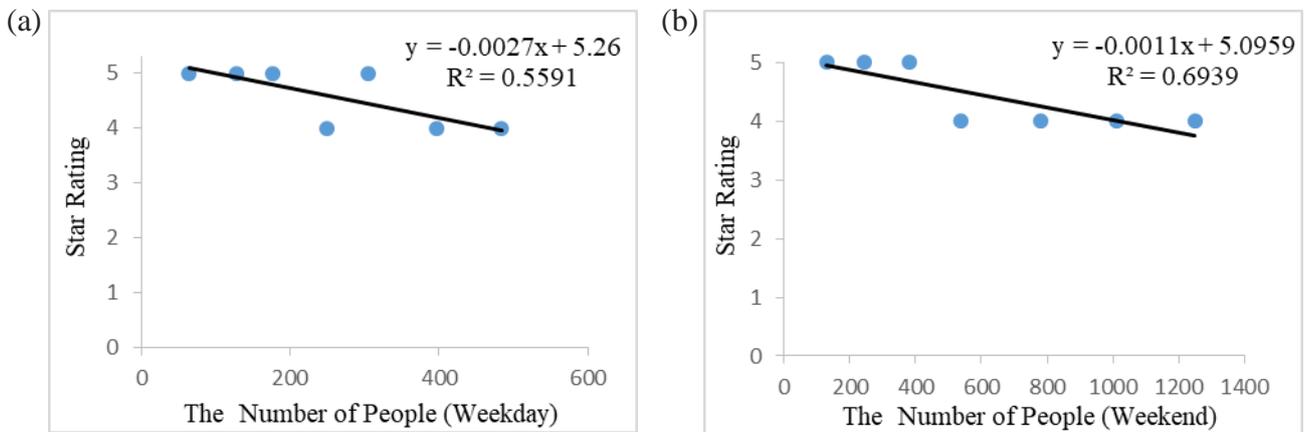


Fig. 10 - (a) Comparison of number of people on weekday between star rating of women’s toilets at R&R Y; (b) comparison of number of people on weekend between star rating of women’s toilets at R&R Y

Figure 10 show a comparison of the number of people with a star rating in the women's toilet at R&R Y. The linear regression analysis of the number of people and star rating in the women's toilet at R&R Y is for both days, weekday, and weekend. By analysing the linear regression between the number of people and the star rating in the women's toilet at R&R Y for weekdays, a moderate or moderate-strong relationship $R^2 = 0.5591$ was found with the equation $y = -0.0027x + 5.26$ in Figure (a). During the linear regression between the number of people and the star rating in the women's toilet at R&R Y for weekends, a moderate or moderate-strong relationship $R^2 = 0.6939$ was found with the equation $y = -0.0011x + 5.0959$, as shown in Figure (b).

Based on figures shown above, a graph of the relationship between the number of people and the star rating is shown. Analytical data shows that the increase in people per hour will cause a decrease or inconsistency in the star rating of public toilets at R&R X and R&R Y. This inconsistency, or the decrease from a 5- star rating to a 4- star rating, is due to the lack of scheduled cleaning and maintenance services for public toilets. Furthermore, a high number of visitors during peak hours results in an excessive number of visitors for the cleaners to manage successfully. As a result, if the floor seems dirty, unpleasant odors persist, the trash can become full, or there is a lack of tissues and soap, immediate action is suggested. Ignoring these concerns might lead to user discomfort and dissatisfaction. Therefore, it

is crucial for cleaners to play an important part in maintaining the cleanliness of the toilets, which includes tasks like floor sweeping, removing waste, and providing an appropriate supply of soap and tissues (Abdullah, Said, Din, & Razak, 2016) As a result, maintaining a 5-star rating via continuously clean facilities is crucial since it immediately improves user satisfaction and produces cleaner and more pleasant environment for customers.

Based on Table 4 shows that the R² value between 1.0-0.7 is interpreted as a strong relationship. This value has a significant impact on the star rating. Whereas an R² value of less than 0.4 is a weak relationship and has no significance that can affect the star rating value.

Table 4 - Summary of Y and R² values based on the comparison graph

	Weekday	Weekend	Relation
Men’s Toilet at R&R X	y = -0.0013x + 5.3617 R ² = 0.7634	y = -0.001x + 5.388 R ² = 0.7784	1.0> R ² >0.7 = A strong relationship
Women’s Toilet at R&R X	y = -0.0008x + 4.6926 R ² = 0.2479	y = -0.0005x + 4.8867 R ² = 0.2245	R ² <0.4 = A weak relationship
Men’s Toilet at R&R Y	y = 0.0009x + 4.0124 R ² = 0.1733	y = -0.0007x + 4.688 R ² = 0.2583	R ² <0.4 = A weak relationship
Women’s Toilet at R&R Y	y = -0.0027x + 5.26 R ² = 0.5591	y = -0.0011x + 5.0959 R ² = 0.6939	0.6> R ² >0.5 = A moderate relationship

4.4 Discussions

The cleanliness of public toilets is very important to users. Analysis of data for both R&R toilet locations shows for one day performed the star gets 4-star rating, there is a decrease in the star rating occurs indicating a decline due to inadequate cleaning. Maintaining clean, hygienic public toilets is crucial, supported by previous study conducted by Kirithika, Kumar, and Kumar (2020) emphasizing toilet usage and hygiene. To enhance cleanliness, management should optimize cleaning schedules, waste services, and maintenance based on foot traffic, ensuring regular cleaning and waste management to meet user demand. This ensures a satisfying, comfortable restroom experience.

The analysis concluded that an increase in the number of people negatively impacts the star rating due to heightened dirt accumulation. Toiletries like tissue and soap also contribute to this decline. Moreover, user behavior plays a significant role. Instances such as not flushing, squatting on a toilet bowl, improper disposal of items like tissue, cigarette butts, and sanitary pads, water splashing, tissue wastage, and overall untidiness contribute to lower star ratings. Responsible and considerate user behavior is crucial to maintain cleanliness. Previous studies on user behavior and satisfaction in urban park toilets support this.

To maintain a 5-star rating, effective toilet management is important. Previous studies emphasize consistent cleanliness through regular upkeep and cleaning (Huda, Abdul Rahman, & Nadhirah, 2022). The analysis indicates a certain period gets 4-star rating for R&R toilets, highlighting the need for maintaining a 5-star standard. This rating reflects overall toilet cleanliness, user comfort, safety, and user satisfaction. To achieve 5-star rating, management should enhance cleaning schedules, especially during peak usage times, ensuring trash removal, floor mopping, and restocking of essentials like tissue and soap. A meticulous cleaning and maintenance schedule ensures a clean and well-maintained toilet. Failure to uphold the 5-star rating leads to user discomfort and unclean conditions, like dirty floors, odors, unclean fixtures, or insufficient supplies of soap and tissue. Maintaining the 5-star rating is crucial for a clean and comfortable user experience.

User satisfaction is crucial for public toilet usage. Prior research emphasizes cleanliness and hygiene as key factors influencing user satisfaction (Ahmad Taha & Syahrul Mat, 2021). Well-maintained, adequately cleaned facilities contribute to positive user experiences, while neglected ones lead to discomfort and dissatisfaction for user. Unclean, infrequently cleaned toilets can deter users, creating negative experiences and potential avoidance. Therefore, management must ensure clean toilets is essential for enhancing user satisfaction and overall experience.

5. Conclusion

In conclusion, this study aims to investigate the relationship between toilet cleanliness and the number of people at R&R X and Y. This study analysed the relationship between the level of toilet cleanliness and the number of people measured based on the auditing form and star rating of the cleanliness of public toilets. R² values at each R&R X and R&R Y were obtained using linear regression analysis and a one-way ANOVA. The R² value shows the relationship between the star rating and the number of people. The results show that the R² values for men’s and women’s toilets at

R&R X on weekdays and weekends are $R^2 = 0.7643$, $R^2 = 0.7784$, $R^2 = 0.2479$, and $R^2 = 0.2245$. For men's and women's toilets at R&R Y on weekdays and weekends, $R^2 = 0.1733$, $R^2 = 0.2583$, $R^2 = 0.5591$, and $R^2 = 0.6939$. At the end of the study, it was found that the value of R^2 on the men's toilet at R&R X and the women's toilet at R&R Y had a strong relationship $R^2 = 0.7643$ and $R^2 = 0.7784$ and a moderate relationship between $R^2 = 0.5591$ and $R^2 = 0.6939$ to the number of people and star rating. Meanwhile, women's toilets at R&R X and men's toilets at R&R Y have a weak relationship between ($R^2 = 0.2479$ and $R^2 = 0.2245$) and ($R^2 = 0.1733$ and $R^2 = 0.2583$) the number of people and star rating. It is important to maintain cleanliness, user comfort, and safety, as well as the overall satisfaction of use, to maintain 5-star rating to ensure that users who use public toilets feel comfortable.

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