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Mask-Can: An Alternative for Better Waste Management.

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Abstract

Plastic pollution is a global issue that threatens both land and coastal environments as well as human livelihoods. As the World Health Organization (WHO) has discovered Covid-19 in China in December 2019, numerous measures have been taken in order to combat the transmission of the virus worldwide which includes the use of face masks. According to the local newspaper, the improper disposal of face masks in Malaysia has contributed to a growing concern that it could pose environmental and health impact. Hence, it needs innovative solutions that can be tailored to the local environment. This innovation is designed in order to minimize littering issues with regard to disposing face masks along with outreach programmed that would greatly reduce litter issues at the transportation hub. By innovating a reverse vending machine may reduce the microplastic pollution specifically at the public transportation hub and improve the quality of the environment at once. Malaysian government policy encourages people to use public transportation frequently as an initiative to reduce traffic congestion, air pollution and environmental concerns. Studies have shown customer satisfaction when using Light Rail Transit (LRT) and the consumer was not satisfied with the cleanliness at the stations. With the invention of Mask-can, it can help the rail company to encounter the issue by maintaining and upgrading their service to attain higher levels of satisfaction. Mask-can is derived from the combination words of "face mask", meaning a protective mask covering the nose and mouth and "can" is a waste container to dispose of waste items. Mask-can is a proper mask disposal reverse vending machine for the public to properly dispose of their used face mask in Malaysia. In exchange, the user will get a selection of rewards of tourism products from our collaborated partners. Additionally, it will be placed at a location which is used daily and accessible by the transportation users such as LRT Station hence, the maximum utilization of the innovation will be ensured.

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Key-word: Reverse Vending Machine, face mask, public transportation hub, littering

1.0 Introduction

Plastic pollution is a global issue that threatens both land and coastal environments as well as human livelihoods. As the World Health Organization (WHO) has discovered Covid-19 in China in December 2019, numerous measures have been taken in order to combat the transmission of the virus worldwide which includes the use of face masks (Xu and Li, 2020). While disposable face masks are specifically designed to protect medical professionals, who have the expertise to use and dispose of them to avoid workplace hazards, untrained professionals and the general public also used face masks during the SARS outbreak in 2003 and currently COVID-19 since 2019. The use of face masks by professionals and the general public has led to significant environmental concerns, such as solid waste and microplastic contamination in marine ecosystems. Additionally, researchers and scientists have encouraged the mass use of face masks in the case of a COVID-19 pandemic until the mode of transmission of Covid-19 is completely identified (Aragaw, 2020). According to the local newspaper, The Star, the improper disposal of face masks in Malaysia has contributed to a growing concern that it could pose environmental and health impact. Hence, it needs innovative solutions that can be tailored to the local environment. This innovation is designed in order to minimize littering issues with regard to disposing face masks along with outreach programmes that would greatly reduce litter issues at the transportation hub. By innovating a reverse vending machine may reduce the microplastic pollution specifically at the transportation hub and improve the quality of the environment at once.

2.0 Problem Statement

In line with what has mentioned, Ismail et al., (2012) posit that Malaysian government policy encourages people to use public transportation frequently as an initiative to reduce traffic congestion, air pollution, and environmental concerns; however, there is a lot of trash at the LRT station area including face mask (Anable, 2005; Hwe et al., 2006; Ng et al., 2008). Ng et al., (2008) have researched customer satisfaction when using Light Rail Transit (LRT). Ng et al., (2008) conducted two studies, satisfactions of service dimensions at the station and inside the train. The results showed that consumers were unsatisfied with the cleanliness at stations (22.89), but were satisfied by the cleanliness inside the train (22.89). The value shown is the mean of each dimension. When the value is below 25, it is classified as dissatisfied consumers. Based on the results, the management of Light Rail Transit (LRT) needs to take actions that can improve their service quality so that the management can improve their services by maintaining and upgrading their service to attain higher satisfaction levels. There is plenty of evidence of an increase in the green initiative for transportation (Adilah et al., 2019; Ismail et al., 2012). With the invention of Mask-can, it can help the rail company to encounter the issue.

3.0 Project Objectives

The main objective is further supported by immediate objectives as follows:

- RO1 : To help reduce the amount of plastic pollution.
- RO2 : To reduce littering issues that are a constant problem to Malaysia's transportation hub.
- RO3 : To encourage the public to properly dispose of their face mask.

4.0 Product Description

Mask-can derived from the combination words of "face mask," meaning a protective mask covering the nose and mouth, and "can," a waste container to dispose of waste items. Recently, wearing a face mask is considered a necessity due to the global pandemic, and the issue of improperly disposing of a mask has resulted in various environmental issues. We have also conducted a short survey on people who use LRT regularly as a mode of transportation to commute to a number of destinations. As a result, we have found out that there is evidence of LRT stations' uncleanness, and some people are still not fully aware of the proper way to dispose of their face mask. Mask-can is therefore developed to meet the needs of the absence of proper waste management.



Figure 1 : Mask-can vending machine

Mask-can is a reverse vending machine for the public to properly dispose of their used face mask. The users will have to insert their personal details such as name and phone number before proceeding to dispose of their face mask in the machine. In exchange, they are able to select their reward which includes tourism products from our collaborated partners. As the world is currently affected by the global pandemic COVID-19, many businesses and industries are affected as well, including the tourism industry. Therefore, we see this as an excellent opportunity to support the tourism industry by collaborating with them to slowly reduce the industry from a greater impact. The selection of rewards will include discount vouchers on tourism attractions and transportation such as zoo, museums, Hop-On Hop-Off (HOHO) bus, and many more.

Reverse vending machine (RVM) is an efficient and motivated waste material collection process. The design of the reverse vending machine itself is compact and will not take up too much of a space. This is due to some stations not having huge space. Undoubtedly, size does play a vital role in placing the machine, therefore, there will be no issues if we decided to place it at any possible future locations.



Figure 2 : The front of Mask-can

Mask-can will be placed at a major transportation hub, such as LRT Stations, to make it easily accessible to the public. In fact, LRT Station is a common route the public utilize daily to get to their workplace, school, and other destinations. Thus, it is an appropriate location to place the machine. However, the main objective of this innovation is to encourage the public to dispose of their face masks properly. The full utilization of this reverse recycling vending machine can help reduce the amount of littering and environmental issues that are a constant problem to most of Malaysia's transportation hubs.

Additionally, the problem of improper waste management of face masks has increased and results in various adverse environmental impacts. Therefore, Mask-can is an excellent way of minimizing these issues, especially concerning disposing of face masks. Mask-can is also a guide for the public to dispose of their face mask while minimizing plastic pollution. It also raises public awareness of the importance of proper waste management and environmental protection.

5.0 Methodology

According to Teijlingen & Hundley (2002), a pilot study's basic definition is mini versions of a full-scale study and referred to as 'feasibility' studies and the specific pre-testing of specific research tools such as a questionnaire or interview schedule. Furthermore, Sekaran and Bougie (2016) also stated that measurement reliability shows the stability and consistency of measurement, and the most popular test is the Cronbach alpha coefficient (α). Teijlingen and Hundley (2002) further explain that the purpose of a pilot study could also be a pre-testing or to try out a specific research instrument. The result of the pilot test could give an advance warning about where the main research project might fail, whether the methods or tools proposed are inappropriate or too complex.

The sample size for this study is determined by the general rule of thumb of no less than 50 participants. However, some researchers argue that if the circumstances permit, a researcher would have a better power to identify a small effect size with approximately 30 participants per variable (Voorhis & Morgan, 2007). Therefore, 30 respondents have been selected for this study and they were asked to complete a pilot test to ensure accuracy of the words and expressions. The respondents for this study are the users who use the LRT service to commute to the workplace and other destinations regularly. The respondents were required to answer a few questions regarding the awareness of adequately disposing of face masks.

As for the method used in this study, quantitative methods were used in this study. The questionnaire is divided into two sections, (a) Demographic Statistics and (b) Items Statistics. For section A, it used a multiple choices method, and section B, Likert scale method. The outcome of this study is to see whether there is a lack of awareness of disposing face masks in Malaysia.

6.0 Results

The data collected for the pilot test have reached 100% response rate. The respondents were individuals who had been to LRT station in Malaysia. A total of 33 questionnaires have been answered through the google form.

Reliability Statistics

Cronbach's Alpha	N of Items
.749	5

	Cronbach's Alpha
I use single use face mask on a regular basis	.746
I am dissatisfied with the cleanliness of the LRT Station	.678
I regularly see used face masks being thrown/left on the ground at the LRT Station	.700
Public dustbin is a proper place to discard used face mask	.718
I properly dispose my used face masks in accordance with WHO to avoid contamination	.673

Table 1 : Reliability Test for the Pilot Study

According to Ursachi, Horodnic and Zait (2015), research that has been done needs to be reliable and valid as it needs to give the same results measurement of the same phenomenon. He added reliability test is the instrument used to produce consistent results on similar subjects under the same phenomenon. Cronbach Alpha model is used to measure the validity of this study. According to Hulin, Netemeyer, and Cudeck (2001), the Cronbach Alpha rule is α 0.6 - 0.7 is an acceptable level of reliability, while 0.8 or greater is a top-notch level. Based on the above table, the Cronbach Alpha is between 0.67 to 0.74; hence, it shows that the instruments used in this study are acceptable.

Demographic Statistics

Item	Details	Frequency	Percentage%
Age	Below 18	1	3.0
	18 - 22	6	18.2
	23 - 29	18	54.5
	Above 30	8	24.2
Gender	Male	17	51.5
	Female	16	48.5
Profession	Student	8	24.2
	Self-employed	7	21.2
	Government	5	15.2
	Private	13	39.4

Table 2 : Demographics Statistics

Based on the data above, there are three categories: demographics, age, gender, and profession. Groupage between 23-29 contributed the most of the respondents with a percentage of 54.4%, followed by the above 30 groups with 24.2%. Male respondents are slightly more than female. Male respondents contributed 51.5%, while female respondents are 48.5%. Among all of the 33 respondents, most of them work in the private sector 39.4%, while in Government sectors, 15.2%, Self-employed 21.2%, and students 24.2%.

		Item Statistics				
		I use single use face mask on a regular basis	I am dissatisfied with the cleanliness of the LRT Station	I regularly see used face masks being thrown/left on the ground at the LRT Station	Public dustbin is a proper place to discard used face mask	I properly dispose my used face masks in accordance with WHO to avoid contamination
N	Valid	33	33	33	33	33
	Missing	0	0	0	0	0
Mean		4.36	4.27	4.27	4.30	4.12
Std. Deviation		1.025	.911	.839	.883	1.269
Sum		144	141	141	142	136

Table 3 : Item Statistics

1 = Strongly Disagree 2 = Disagree
 3 = Neutral
 4 = Agree
 5 = Strongly Agree

This pilot test responds to Mask-can's objectives, which aim to help reduce the amount of plastic pollution, reduce littering issues that are a constant problem to Malaysia's transportation hub, and encourage the public to dispose of their face mask properly. The table above shows the mean and standard deviations of the variables used.

The descriptive analysis determines that respondents "use a single-use face mask regularly" with the highest mean value (M = 4.36) compared to other variables. Followed by "public dustbin is a proper place to discard used face masks" with the average mean value (M = 4.30). Other variables, "I am dissatisfied with the cleanliness of the LRT Station" and "I regularly used face masks being thrown/left on the ground at the LRT Station" have the same value of mean (M = 4.27). "I properly dispose of my used face masks in accordance with WHO to avoid contamination" that has the lowest mean value (M = 4.12). It concludes that the result for the variables is high while "I properly dispose of my used face masks in accordance with WHO to avoid contamination" is moderate.

7.0 Discussion

Understanding the respondent demographics is crucial to achieving the objectives. Based on the previous results collected, the male respondents are more than female based on the data above. Male respondents contributed 51.5%, while female respondents are 48.5%. This pilot test indicates that in the age between 23-29 gained 54.5%, followed by above 30 with 8%. Among 33 respondents, 39.4% of respondents worked with the private sectors while only 5% working in the government sectors. With the above results explained, below is the explanation of the objectives of Mask-can:

RO1 : To help reduce the amount of plastic pollution.

RO2 : To reduce littering issues that are a constant problem to Malaysia's transportation hub.

RO3 : To encourage the public to properly dispose of their face mask.

It concludes that customer satisfaction with LRT services is below the expectation. Based on the results, the company of LRT should consider improving their service quality, especially on the cleanliness of the station in order to increase customer satisfaction and service quality. Total Quality Services (TQS) is an essential tool that needs to be focused on by the LRT company to improve quality services. Ng et al. (2008) suggested that the LRT company implements the TQS concept as it can integrate management system processes to meet customer needs. A previous study from Ismail et al. (2012) indicated the quality of Malaysian public transportation did not meet the traveler's expectation of the services. Similar results are shown in this study. According to Abd Rahim, Zukni, Ahmad, & Lyndon (2012), the level of green awareness in Malaysia is still low. It illustrates in the "I regularly see used face masks being thrown or left on the ground at the LRT Station" and "I properly dispose of my used face masks in accordance with WHO to avoid contamination" questions. Hence, all of the objectives are acceptable.

	Item Statistics		
	Mean	Std. Deviation	N
I use single use face mask on a regular basis	4.36	1.025	33
I am dissatisfied with the cleanliness of the LRT Station	4.27	.911	33
I regularly see used face masks being thrown/left on the ground at the LRT Station	4.27	.839	33
Public dustbin is a proper place to discard used face mask	4.30	.883	33
I properly dispose my used face masks in accordance with WHO to avoid contamination	4.12	1.269	33

Table 4 : Results of Mean and Standard Deviation of Item Statistics

8.0 Significant of the Study

Since the beginning of the outbreak, the World Health Organization (WHO) has come up with a clear picture of instructions for the public on how to properly dispose of their face mask in order to avoid further spread of the deadly virus. The organization has displayed a one-by-one step infographic on how to correctly discard the used face mask which includes the right way to remove it from the face, store it in a plastic bag, wash your hands immediately with soap after touching the face mask and discard the face mask in a closed bin to avoid contamination. Hence, this innovation will help to encourage Malaysian public to dispose of their used face masks properly and reduce the potential environmental impact which can be detrimental to the livelihood of human, animals and wildlife at once as it can possibly increase the spread of the new coronavirus.

However, we would still be questioning where all the face masks end up even after being discarded properly. There are indeed several limitations related to the place of where the used face masks are thrown after being collected from the general dustbin. There are many possibilities that it will either end up at the landfills or ocean. Hence, it is very crucial for the future researchers or government bodies to find a proper approach to resolve the concerns of where will the disposable face mask end as it can pose a potential health hazard to people who either touch it or come in contact with it. Despite the on-going concerns, further research must be executed in order to enhance this innovation, in line with the recommendation from the World Health Organization (WHO). The rules and regulations are bound to shift from time to time according to the current situation hence, it is essential to be well informed of the recent guidelines provided by the organization.

Besides, there are several future improvements that can be done in order to prolong the usage of this innovation and attract more potential users. The placing of the machine can be broadened towards other aspects other than the transportation sectors such as well-known tourist attractions, shopping malls, and other places that are frequently visited by the public. The effort in simultaneously promoting tourist destinations with the reward system will be a great contribution to both environment and industry at once. The reward system feature will be consistently updated from time to time to encourage more people to utilize this machine by collaborating with numerous other tourism organizations in the future.

9.0 Conclusion

With more than 60 million confirmed cases and more than 1.5 million deaths caused by COVID-19, this pandemic is a tipping point for the human race. Routines and social interactions have changed around the world and the new normal requires social distancing, regular hand washing either with hand sanitizer gel or with soap and water and wearing masks at all times, all for the same purpose-to avoid contamination. Additionally, WHO has revised the guidelines on the use of masks in public spaces. Since then, it has become mandatory in many cities around the world, often with penalties issued for violation of the laws. Today many people assume that the use of face masks will continue for health and hygiene purposes, even after COVID-19 is under control.

The Mask-can could be very useful for the public to use in order to dispose of their mask properly. There are indeed issues that have been circulating in regard to irresponsible dumping of face masks anywhere and everywhere. In fact, it may cause the same harm as other plastic goods, but people did not know it or feel it was minor. According to the expert, this issue can pose a health hazard to humans and threat to the environment if the used face mask is not discarded properly. Therefore, with the existence of this machine, it will be easier for the people especially who use public transportation to properly discard their used face mask.

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