




Service Requirement Analysis of Community Scrap Recycling Platform Based on Kano Model

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ABSTRACT

This study examines community scrap recycling platforms as an important tool for promoting sustainable development. Focusing on the i-City community in Malaysia, the investigation used user journey mapping, desktop research, questionnaires, and affinity diagrams to collect and then categorize residents' needs, designed and distributed Kano questionnaires, analysed and counted the attribute categories of each need, and calculated the sensitivity of each need through a Better-worse four quadrant scatter diagram. A detailed requirements analysis report was ultimately developed to provide insights into the service design of the community scrap recycling platform and to help guide future improvements and innovations to better meet user expectations and promote the sustainable development of the community scrap recycling business.

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KEYWORDS:

Kano Model
Scrap Recycling
Service Design
Needs Analysis
Sustainable Communities

CITATION:

Jialu Tang, Natrina M. P. Toyong, & Norazmi Shahlal. (2024). Service Requirement Analysis of Community Scrap Recycling Platform Based on Kano Model. *Malaysian Journal of Social Sciences and Humanities (MJSSH)*, 9(5), e002828.
<https://doi.org/10.47405/mjssh.v9i5.2828>

Contribution/Originality: The paper's primary contribution is finding that community scrap recycling platforms, specifically in the i-City community in Malaysia, significantly enhance sustainable development by effectively addressing residents' needs. This study documents an approach using user journey mapping, Kano questionnaires, and sensitivity analysis to optimize service design.

1. Introduction

As countries around the world pay increasing attention to environmental issues, people's awareness of environmental protection and sustainability is gradually rising. Driven by policy guidance and civic efforts, the concept of sustainable development is beginning to bear fruit in business, education, social innovation, and other fields. Despite some positive results, Southeast Asia has become a hotspot for plastic pollution due to rapid urbanization and the rise of the middle class. This phenomenon shows that there are still some challenges in the process of sustainable development.

Like most developing countries in Southeast Asia, Malaysia's scrap management system is not sufficient to effectively deal with the large amount of plastic scrap generated (Cheng et al., 2022). Currently, landfills and household incineration are the main means of plastic scrap disposal in the country (Yi & Jusoh, 2023). According to the survey, the amount of household scrap generated in Malaysia ranges from 0.85kg to 1.5kg per person per day due to the differences in geographical and economic conditions (Azri et al., 2023). Compared to other developing countries, domestic scrap generation in Malaysia is higher at 0.22 kg and 0.4 kg per person per day, respectively (Zabidi et al., 2022). In addition, the failure of the local scrap management infrastructure to keep pace has resulted in the mismanagement of a large amount of scrap products. This is further exacerbated by the increase in the consumption of masks, sterilized bottles, and online plastic parcels as a result of the New Crown pandemic (Siew et al., 2023). This highlights the urgent need for more effective scrap management measures in Malaysia, especially in plastic scrap disposal, to achieve a more sustainable community environment.

Scrap recycling, as a means of environmental protection and resource reuse, is gradually becoming one of the key solutions to this problem (Enu et al., 2023). Against this background, scrap recycling platforms have emerged to provide a convenient way for communities to participate in scrap recycling activities. However, to realize a successful scrap recycling platform, it is important to fully understand the needs and expectations of community residents for this service.

Therefore, we aim to provide an in-depth understanding of the future development of community scrap recycling platforms, which will provide a substantial reference for the development of smarter and user-friendly scrap management policies in the Malaysian region. This is not only crucial for the sustainable development of the community but also provides useful lessons for innovation in the field of scrap management and recycling.

2. Community scrap recycling from a service design perspective

Service design is a design activity that incorporates human-centered concepts into the planning of service touchpoints and the service process itself to enhance the user experience and quality of service, standing from the perspective of user needs and aiming to ensure that the service process is useful, usable, and well used. This concept was first proposed by Bill Hollins in 1991 in Total Design, and in the same year Michael Elhoff promoted service design at the International Design Academy in Cologne, Germany, and then some service design firms such as Line/Work and IDEO began to appear (Hummen & Sudheshwar, 2023), whose core goal is to build and improve service experience, enhance service quality through systematic planning, and improve user experience (Hu & Li, 2020).

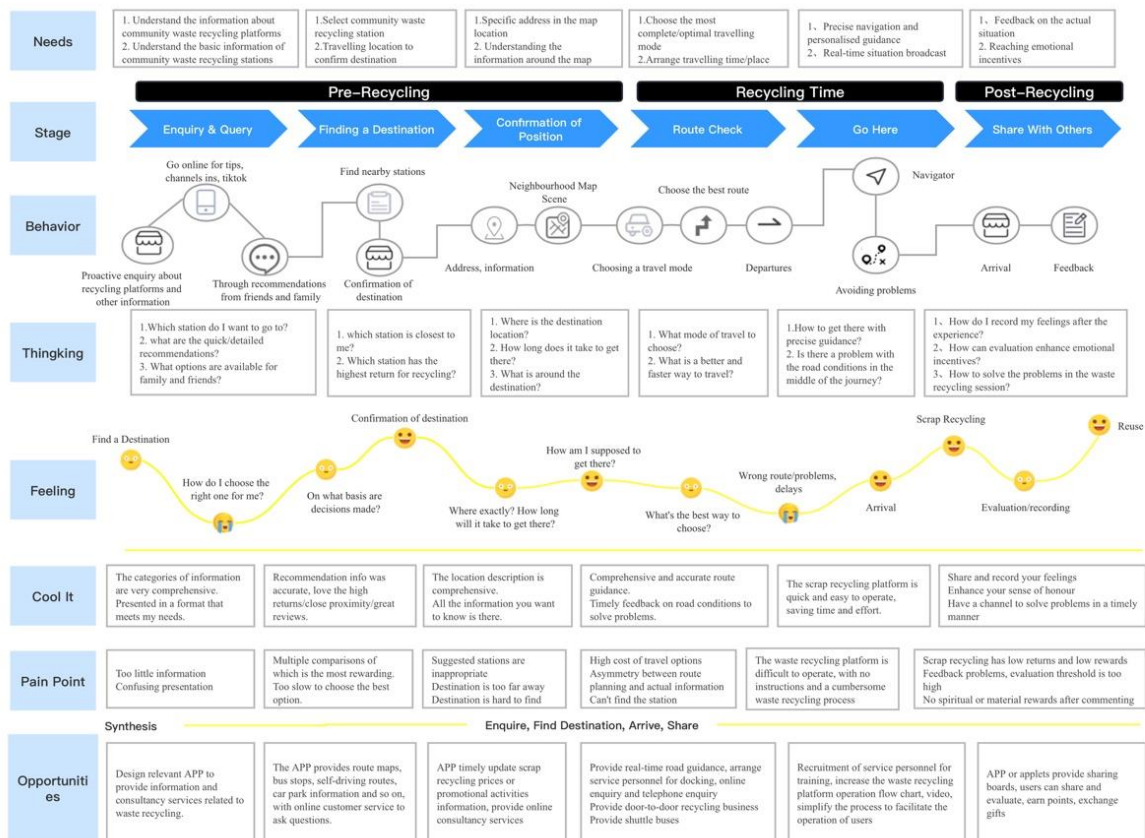
Specifically, the service design analyses and improves the recycling process from a holistic perspective systematically integrates community scrap resources and resident participation and enhances the quality of scrap recycling services and the satisfaction of residents' experience, thereby promoting sustainable scrap management and community development. For example, the study in Bekasi City, Indonesia aimed to assess the implementation of household scrap management using the Household Scrap Control Index (HWCII). The study emphasized the need for improved governance of household scrap management at the community level to achieve sustainable scrap management

(Ferdinan et al., 2022). In addition, evidence from the city of Semarang, Indonesia suggests the efficacy of community-driven material recovery facilities (CdMRF) in promoting sustainable economic incentives for scrap management (Budihardjo et al., 2022). Understanding the role of the neighborhood, community attachment, and local identity is also considered critical in influencing residents' household scrap recycling intentions, emphasizing the social and community aspects of scrap management (Pei, 2019). Together, the insights from these studies highlight the importance of integrating various factors such as community participation, behavioral norms, infrastructure planning, and sustainability assessment to design effective and sustainable community scrap recycling systems.

2.1. Community scrap recycling user journey map

The user journey map is a method of designing organizational behaviors at specific user contact points based on the deconstruction of user behaviors and separating the primary and secondary contradictions of the experience from them. Through the user journey map (Figure 1) to sort out the whole process nodes of the residents in carrying out the community scrap recycling scenario, and to analyze the residents' needs, behaviors, emotional experiences, and user psychology in carrying out the community scrap recycling scenario, and to analyze the level of visitors' needs in combination with the Kano model, to improve the process of the service system and perfect the service touchpoints.

Figure 1: Community Scrap Recycling User Journey Map



Source: Author's original

2.2. Community scrap recycling service pain points

Based on the user journey map, the service pain points of community residents in conducting community scrap recycling scenarios are derived, as shown in [Table 1](#).

Table 1: Community Scrap Recycling Service Pain Points

Pre-Recycling	Recycling Time	Post-Recycling
Difficulty in accessing recycling information	A single type of recycling	Lack of feedback channels
Lack of access to counseling	Single method of dissemination	Lack of sharing pathways
Lack of direct buses	Inadequate infrastructure	
Difficulty in planning traveling routes due to lack of traffic	Lack of rational route planning	
Lack of online customer service staff	Cumbersome platform operation	

2.2.1. Pre-Recycling

It is difficult for community residents to obtain information about scrap recycling, such as the date of recycling, the type of recycling, the form of recycling, the price of recycling, etc., and the form of presentation of the information is not satisfactory; the information on scrap recycling in the community is inaccurate so that they do not know how to choose the optimal recycling program; the information on the location of recycling sites is not clear, and the description of the location is unclear, so it is difficult to find the recycling site; for those who do not live in i-City, there is a lack of direct buses for scrap recycling, making it difficult to choose the mode of arrival; the complexity of the road conditions in the i-City community makes it difficult to plan driving routes; and there is a lack of service personnel in the community regarding scrap recycling, making it impossible to get timely counseling for any problems.

2.2.2. Recycling Time

The scrap recycling station has a single way of publicity and weak interaction, making it difficult to find the station; the scrap recycling station has a single type of recycling and is not designed for different scraps; the infrastructure of the scrap recycling station is not perfect and is not reasonably classified; the scrap recycling station lacks reasonable route planning and orientation; the operation of the scrap recycling station is cumbersome, making it difficult to recycle the scraps.

2.2.3. Post-Recycling

Lack of a feedback platform, residents do not have a way to evaluate, and problems cannot be solved promptly; lack of a way to share, making it difficult to share relevant information with others.

3. Demand analysis of community scrap recycling based on the Kano model

Community scrap recycling demand analysis based on the Kano model is an important aspect of sustainable scrap management. Understanding the factors that drive households' willingness to recycle is key to designing an effective recycling program ([Ma](#)

et al., 2023). Pei's (2019) study explored the role of neighborhood, community belonging, and local identity in residents' willingness to recycle household scrap. This study provided valuable insights into the social factors that influence recycling behavior within a community. Furthermore, the work of Jalil and Shaharuddin (2019) delved into the consumer purchasing behavior of eco-fashion clothing made from recycled materials, highlighting its importance in consumer demand for promoting sustainable disposal and purchasing behavior. Yang et al. (2020) understand the factors that drive consumer behavior toward recycled products can help shape the demand for recycled materials, including in scrap recycling. In addition, the paper by Cantillo et al. (2023) contributes to the understanding of households' willingness to recycle, with a particular focus on the moderating effect of perceived lack of amenities on households' willingness to recycle.

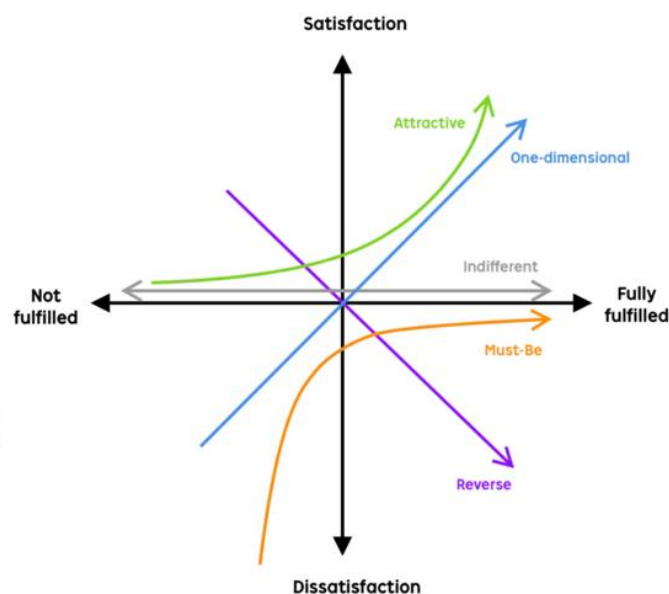
In summary, the perspectives of these scholars provide valuable insights into the demand analysis of community scrap recycling, including the impact of social factors, consumer behavior, convenience, and program sustainability. Understanding these factors in the context of the Kano model is essential for developing effective and sustainable community scrap recycling programs.

3.1. Kano model overview

The Kano model is a tool mainly used for classifying and prioritizing user requirements, proposed in 1984 by Noriaki Kano, a famous Japanese quality management guru, which is based on analyzing the impact of user requirements on user satisfaction, and demonstrates the relationship between the elements of a product or service and user satisfaction (Zhang & Dai, 2023).

The Kano model, as a methodology for service design requirements analysis, evaluates five levels of service demand attributes of users (Figure 2) (Zhou et al., 2023).

Figure 2: Kano model curve



Source: Zhou et al. (2023)

Attractive: Usually, users do not have this expectation, but once the service has this attribute it will lead to a huge increase in satisfaction, and vice versa, users will not be significantly dissatisfied.

One-dimensional: the more the service is provided, the more satisfied the user is, and vice versa.

Must-be: users take the provision of the service for granted, and when it is lacking, the impact is extremely negative;

Indifferent: the service will not affect the user experience whether it is provided or not;

Reverse: when the service has this attribute, users dislike it.

This study provides theoretical references for the design of community scrap recycling services by collecting and collating residents' needs for community scrap recycling services, researching through Kano questionnaires, and ranking the importance of each need.

3.2. User requirements collection and collation

According to the pain points and opportunity points of community scrap recycling service design analyzed by the user journey map, as well as desktop research, questionnaire research, and other ways to collect tourists' initial demand for community scrap recycling, after removing the duplicated demand items, the list of resident's demand is classified and organized through the affinity diagram method, [Table 2](#).

Table 2: List of resident needs

Type	No.	Requirement Content
Traffic Route Aspects	A1	Clear map guidance is provided in the APP
	A2	Clear locations of recycling service stations in the community
	A3	There are regular shuttle buses and public transport stops to and from the site.
	A4	
	A5	There is a car park with sufficient parking spaces near the recycling station.
		Convenient and safe walking distance within the community
Scrap Recycling Information Aspects	B1	You can get timely message notification in APP
	B2	You can check the Recycling Time and process in APP
	B3	You can easily know the way of scrap recycling classification
	B4	You can get the evaluation of scrap recycling station from other residents.
	B5	Feedback platform for evaluation and suggestion of scrap recycling station.
Services and Infrastructure Aspects	C1	Provide step-by-step flowchart for scrap recycling
	C2	Recycling station with professional scrap recycling service staff
	C3	Provide door-to-door recycling business
	C4	Clearly sorted containers at the scrap recycling station
	C5	Provide other leisure and recreational areas around the scrap recycling station
Redeeming Rewards	D1	Points redemption or reward options available
	D2	Gifts can be redeemed directly at the scrap recycling station

Aspects

3.3. Kano questionnaire design

Based on each of the residents' needs collected under each aspect, questions were set up from both positive and negative aspects, such as "What do you think about the provision of clear maps in the APP?" and "What do you think about not providing clear maps in the APP?". and "What do you think if the app does not provide a clear map?". and "What do you think if the app does not provide clear maps?". The options were very satisfied, deserved, indifferent, reluctant to accept, and very dissatisfied, to obtain the satisfaction level of the users in different situations under each demand item.

3.4. Survey and research population

Considering that the users of i-City's community scrap recycling service platform cover a wide range of groups, we paid special attention to community residents and people who visit the city mall. In addition, to have a comprehensive understanding of the satisfaction level of the community scrap recycling service, we extended the survey to different participants, including community security guards, cleaners, shopkeepers, and people who are interested in community scrap recycling. The survey thus designed aims to consider all aspects of scrap recycling services in the community in an integrated manner to ensure the comprehensiveness and reliability of the findings. We plan to use online distribution of the questionnaire to ensure the systematic and objective nature of the data. The final number of respondents will be scientifically selected based on the representativeness and participation of each group to ensure the validity of the survey.

3.5. Questionnaire collection

The Kano questionnaire was distributed online through "Questionnaire Star", 150 questionnaires were distributed, 150 questionnaires were returned, 4 invalid questionnaires were removed, and 146 valid questionnaires were obtained in the end.

3.6. Classification of needs

The Kano model analysis method is mainly researched through a standardized questionnaire, which classifies user satisfaction into 5 levels in a gradual manner. As shown in Table 3, A, O, M, I, and R are the initial letters of the 5 classes of demand attributes, and Q represents the questionable results.

Table 3: Kano Evaluation of Demand Types

		Reverse problem				
		very satisfied	deserved	indifferent	reluctant to accept	very dissatisfied
forward-looking problem	very satisfied	Q	A	A	A	O
	deserved	R	I	I	I	M
	indifferent	R	I	I	I	M
	reluctant to accept	R	I	I	I	M
	very dissatisfied	R	R	R	R	Q

The research questionnaires were distributed to a certain number of users, and by counting the results of the survey, the total number of people in each category of attributes and dubious results in the two-dimensional scale can be calculated as a percentage of the total number of people in the research, respectively, and the maximum percentage of attributes is recognized as being the final attribute definition of the service.

Due to the limitations of the traditional classification method of attribute classification using the maximum share attribute, which ignores the distribution and influence of other attributes and discards a large amount of statistical data, the results of user demand analysis are too simple and general, which is not conducive to the in-depth excavation of the potential needs of users. Therefore, the Better-Worse coefficient can be further calculated according to the index calculation formula proposed by Berger to determine the degree of satisfaction after a service is provided or the degree of influence of dissatisfaction after it is eliminated, to define the service attributes more accurately and prioritize the service demands with higher absolute coefficient scores and the calculation formulas are shown in Eq. (1) and Eq. (2):

$$\text{Better} = \frac{A+O}{A+O+M+I} \quad (1)$$

$$\text{Worse} = \frac{O+M}{A+O+M+I} * (-1) \quad (2)$$

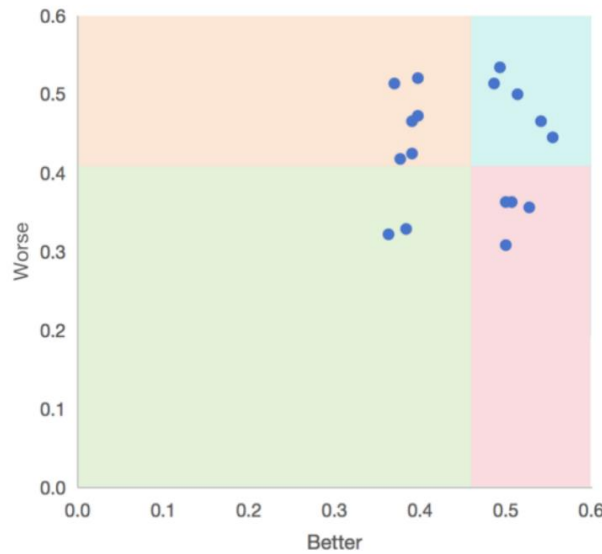
The Better and |Worse| values of each demand indicator and the statistics and classification of the types of demand for community scrap recycling services based on the calculation formula are shown in Table 4.

Table 4: Statistics and classification of types of demand for community scrap recycling services

No.	Q	A	O	M	I	R	Traditional Classification	Better	Worse	Classification
A1	1	41	16	52	37	0	M	0.390	0.466	M
A2	0	37	21	55	33	1	M	0.397	0.521	M
A3	0	53	26	42	25	0	A	0.541	0.466	O
A4	0	58	19	33	36	1	A	0.527	0.356	A
A5	1	29	26	35	56	0	I	0.377	0.418	M
B1	0	41	15	33	57	0	I	0.384	0.329	I
B2	0	29	28	34	55	1	I	0.390	0.425	M
B3	1	33	21	54	38	0	M	0.370	0.514	M
B4	0	47	24	51	24	0	M	0.486	0.514	O
B5	0	48	27	46	25	0	A	0.514	0.500	O
C1	1	55	26	39	26	0	A	0.555	0.445	O
C2	0	48	24	54	20	0	M	0.493	0.534	O
C3	0	57	17	36	36	0	A	0.507	0.363	A
C4	0	42	16	53	35	0	M	0.397	0.473	M
C5	0	40	13	34	59	0	I	0.363	0.322	I
D1	0	59	14	31	42	0	A	0.500	0.308	A
D2	0	57	16	37	36	0	A	0.500	0.363	A

The Better value, |Worse| value of each service can be calculated to determine its position in the Better-Worse coefficient coordinate graph, as shown in Figure 3, the mean absolute values of B and W are taken at the dotted line relative to the centre axis, which is calculated to be $\bar{B} = 0.452$ and $\bar{W} = 0.430$, with each of the four quadrants representing a different demand attribute. The Better-Worse coefficient co-ordinate graphs provide a more intuitive picture of the categorisation and importance of needs, and there is a difference in results between this data post-processing method and the two-dimensional attribute scales.

Figure 3: Better-worse four quadrant scatter diagram



Source: Author's original

3.7. Conclude

Prioritisation of demands is carried out because of the results of the classification of service demand attributes, following the principle of priority according to the relationship between service demands and satisfaction: Must-be attributes > Attractive attributes > One-dimensional attributes > Indifferent attributes. Between service demands with the same attributes, the combined importance and absolute value of Better-Worse coefficient are then judged, as shown in Table 5.

Table 5: Ranking the importance of service needs for different attributes

Type of requirement	Importance Ranking
Must-be needs (M)	A2 > B2 > A1 > B3 > A5 > C4
One-dimensional Needs (O)	A3 > B4 > B5 > C1 > C2
Attractive Needs (A)	C3 > A4 > D2 > D1
Indifferent Needs (I)	C5 > B1

There are 6 Must-be needs, and the priority ranking is: a clear location in the community > checking Recycling Time-related information in the APP > map guidance > recycling sorting methods > walking direct access > clear sorting containers.

One-dimensional Needs 5 items, in order of priority: shuttle bus to and from recycling centre > evaluation by others > feedback platform > community recycling flow chart > recycling service personnel.

Attractive Needs are 4 in total, with the following priority ranking: door-to-door recycling > availability of car parks > direct redemption of gifts > reward options.

There are 2 Indifferent Needs: priority ranking is: surrounding recreational facilities > app message notification.

According to the results of the Kano model analysis and the ranking of the importance of the demand, we can draw the following conclusions: for the community scrap recycling service platform, in terms of transport, residents have a greater demand for the clear location of the recycling station in the community and the provision of clear map guidance in the scrap recycling Time APP, as well as the ability to conveniently and safely reach the recycling station directly in the community. Residents are most looking forward to the provision of a regular shuttle bus to the scrap recycling station, and lastly, the provision of car parks and sufficient parking spaces, as this research mainly focuses on the residents in the i-City community, who mostly don't need to drive when they carry out scrap recycling, and therefore have the lowest demand for parking.

In terms of information on scrap recycling, residents have a greater demand for the ability to view the Recycling Time and process in the app, as well as the ability to easily learn how scrap recycling is categorized. They expect to be able to access other residents' comments on the scrap recycling station, and they also expect to be able to provide a feedback platform to comment and make suggestions on the scrap recycling station. There is a lower demand for timely message notification in the App. This is mainly because nowadays residents are more averse to the message notifications in the App, and some of them also actively block the message notifications, following the tendency to actively check the relevant information, so that the way of obtaining information has changed from passive to active.

In terms of services and infrastructure, residents were more concerned about the availability of clear sorting containers in the scrap recycling station to avoid confusion. Secondly, they have a stronger demand for the provision of step-by-step flow charts for scrap recycling and the availability of professional scrap recycling service staff. Meanwhile, the residents present a glamour demand for the service of providing door-to-door recycling business and a lower demand for the provision of other leisure and recreational activity areas in the neighborhood. This is mainly since i-City itself is a large community integrating leisure and entertainment, and there are already a lot of amusement and shopping programmers in the neighborhood, so the residents' demand for services in this area is low.

In terms of redeeming rewards, residents' demand for the possibility of directly redeeming gifts at the scrap station and having the right to choose rewards are both attractive. This shows that the community residents are very much looking forward to redeeming rewards, which also helps to stimulate the enthusiasm of residents for scrap recycling and better realize the construction of a sustainable community.

An analysis of demand for community scrap recycling platforms shows that residents have high expectations for basic services, including clear map guidance and convenient

and safe direct access to the scrap recycling station. Among the expectation-type needs, services such as the provision of fixed shuttle buses and parking spaces are of great interest, while concerns about information transparency, evaluation platforms and sorting of scrap are also more prominent. In terms of glamour-type needs, residents expressed strong interest in door-to-door recycling, leisure facilities in the neighborhood and the optionality of redeeming rewards. Message notification was less important, and residents preferred to obtain information proactively. This demand analysis provides a clear priority and improvement direction for the community scrap recycling platform, emphasizing the comprehensiveness of the service and the optimization of the user experience, which helps to promote the development and sustainable operation of the community scrap recycling business.

4. Conclusion

This study focuses on the needs of residents of the i-City community in Malaysia, using tools such as user journey maps to analyze the current service status of the community scrap recycling platform, extracting user needs, and using the Kano model to analyze the traffic route aspects and scrap recycling information aspects, services and infrastructure aspects and redeeming rewards aspects, residents' needs in these four aspects are divided into demand attributes and sorted by importance. Through data post-processing of the Better-Worse coefficient, the definition of service attributes is further optimized and prioritization.

The article aims to provide a requirement analysis method for community scrap recycling platform service design, and the findings of the study provide a reference for the construction of community scrap recycling platform services in Malaysia. In the future, based on the results of this user needs study, the cost element can be incorporated to further deepen and improve the service design of community scrap recycling platform.

Ethics Approval and Consent to Participate

All procedures involving human participants in this study were conducted in accordance with the ethical standards set by the institutional research committee.

Acknowledgement

Parts of this article are extracted from a PhD thesis submitted to the Universiti Teknologi MARA.

Funding

This study received no funding.

Conflict of Interest

The authors reported no conflicts of interest for this work and declare that there is no potential conflict of interest with respect to the research, authorship, or publication of this article.

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