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Research Article

Analysis of User-Friendly BST Permanent Shelter Using Kansei Engineering and Administrative Law

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Abstract. Urban communities in Surakarta City tend to have high mobility which has an impact on rapid growth. They need a safe, comfort and efficient transportation system. Surakarta City Transportation Agency presents Batik Solo Trans (BST) to answer these needs. However, the presence of BST is not balanced with user comfort at the BST permanent shelter. The incompatibility of shelter facilities with established standards causes users especially the disabled can't access independently. This research aims to analyze user assessments and needs using Kansei Engineering and Administrative Law methods to determine the components to create a user-friendly BST permanent shelter. Purposive sampling was used to obtain data from 130 respondents based on interviews, questionnaires and observations. The results showed that comfort and equality are mandatory standards for creating a user-friendly BST permanent shelter. There are 5 aspects that have a significant influence on these standards. Those aspects are clean shelter, clear shelter, strategic location, appropriate shelter width and appropriate of shelter's access height.

Keywords : Shelter, User-Friendly, Kansei Engineering, Administrative Law

1. Introduction

Big cities tend to have critical risks and problems, such as: air pollution and noise, difficult parking, traffic jams and high maintenance cost of infrastructure. One of the solution to overcome this critical problem is the use of the public transportation system (Moslem et al. 2020). In line with that solution, the Surakarta City provided the largest contribution to the PDRB (Pendapatan Domestik Regional Bruto) of the construction sector, in the amount of 25,94% (Kota Surakarta 2023). It means that development of infrastructure and public facilities be developed for facilitate economic access. Then the Batik Solo Trans (BST) public transportation service has been operating since 2010. Facilities are decent and comfort prioritized for BST passengers especially for passengers with special needs (Astuti, Alhakim, and Setiawan 2021). This research is a continuation of the thesis carried out by researchers regarding the permanent BST shelter considered not user friendly (Diansari, Suhardi, and Susanto 2021). There are still visible that the permanent BST shelter facilities aren't appropriate with established standards.

The percentage of BST corridors operational served has increased since 2016, in the amount of 91,67% in 2021 (Surakarta 2023). However, several studies have researched that not available of service information facilities at several shelter such as: shelter name, corridors passed, complaint number, ramp and guiding block (Putri, Waloejo, and Wicaksono 2023). Not disabled friendly of public facilities are making difficult of mobility for people with disabilities, such as: the steep ramp and narrow space for the wheelchair motion (Wulandari et al. 2022). Apart from that conditions, there is a guiding block that not integrated the sidewalk network (Pranata, Rindarjono, and Ajar 2021). The accessibility of building and environment for people with disabilities are less attention so they can't access independently (Wahyuni 2019).

This matter happened because of the BST shelter design isn't implement the applicable law. The difficulties of implementation of regulations or laws are caused by the difficult

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prediction of regulations (Wirtz, Weyerer, and Sturm 2020). Even though, regulations are already available, one of them is PM No. 10 of 2012 that concern in Minimum Service Standards of Mass Transportation Based Road (Menteri Perhubungan RI 2012). Unfortunately, it has not yet become a major concern to make user friendly BST permanent shelter.

Based on the design and facility problems of BST permanent shelter, Kansei Engineering and Administrative Law methods were applied to analyze the user needs and create user-friendly BST permanent shelter. The Kansei Engineering method is a type of technology that translates of consumer feelings to design new products (Gan et al. 2021). The basic principle is identification product and its correlation with design (López, Murillo, and González 2021). In line with administrative law, public administration policies are important to implement to become a strong country (Bauer and Becker 2020). Designers have to produce user friendly BST permanent shelter who apply human-centered design to accommodate all user needs. The innovation of this research is redesign analysis of BST permanent shelter by translating user feelings using the Kansei Engineering method and implementing related regulations about standards facilities based on Administrative Law. Then it will be known the design and facilities analysis are used for making the user-friendly BST permanent shelter.

2. Literature Review

Kansei Engineering method is oriented towards the psychological user feelings and techniques in product development (Li et al. 2019). This method is an expert system that produce a computerized database to build relationships between vocabulary (Kansei Word) and design elements (Xue, Yi, and Zhang 2020). The integration of user cognition and design features using Kansei Engineering to analyze human-computer interface of design element has been reported by Fu et al., (2020) and considering satisfaction (Hartono 2020). The result of product design that meet user preferences in designing hand drills and bicycle helmets by applying Kansei Engineering were reported by X. Li et al., (2021). Of course, the product evaluation is carried out first in the development of the product that would be produced (Zuo and Wang 2020).

The product manufacture especially related to property, must refer to legal requirements (Bibal et al. 2021) and non-discriminatory decision-making (Zuiderveen Borgesius 2020). So, it needs to involve professional personnel (Huang and Chen 2020). Ethics and law are needed to resolve the commonly occur phenomena (Samokhvalov and Strelkov 2021).

Administrative law policies needed to be strengthened so that the urban land system controlled (Chen et al. 2020) and involving stakeholders (Gerke, Minssen, and Cohen 2020). Even though ethics and law are necessary for resolve the phenomena that occur (Samokhvalov and Strelkov 2021). The administrative law aspect that's in line with his case is PM No. 10 of 2012 that concerns Minimum Service Standards of Mass Transportation Based Road. That all minimum standards for bus permanent shelter have been regulated in the regulation.

3. Methods

This research included 130 respondents. First step for collecting data used 100 respondents of BST permanent shelter users by accidental sampling method. They interviewed by researcher about the feeling or impression when using BST permanent shelter. The second step for analyzing data used 30 respondents that selected by purposive sampling. The criteria are a loyal BST permanent shelter user. This data is used for statistical calculations for the result of this research.

The primary and secondary data are used in this research. Primary data is taken from interview and observation by the researchers. Secondary data collected from literature review. Data collected from 130 respondents. Accidental and purposive sampling is used for data sampling method. The respondent criteria are the loyal passenger who have used the BST shelter at least once.

The method that used in this research is Kansei Engineering and Administrative Law. The data process using the step of Kansei Engineering combined with Administrative Law in design element variables and results step, including:

- Collect Kansei Word from interview about user assessments and needs of BST permanent shelter. This achievement indicator is to obtain Kansei Word that represent the design and facilities of user-friendly BST permanent shelter.
- Grouping words that have same meaning followed by eliminating Kansei Words.
- Semantic Differential Questionnaire for Kansei Word assessment with a scale of 1-5. This achievement indicator is to measure how important the previously collected Kansei Words.
- Determine design elements based on the researchers thinking, stakeholders and administrative law. The administrative law aspect that's in line with his case is PM No. 10 of 2012 that concerns Minimum Service Standards of Mass Transportation Based Road.
- Design variable testing (variable X against Y) continued with multiple linear regression testing for each variable Y.
- Factor analysis.

Combining Kansei Engineering with Administrative Law for this methodological approach will contribute significantly. The application of these two sciences is expected to increase the interest of BST passengers because it's comparable to the comfort and equality. The solution based on user needs.

4. Results

The result explained by the data, analysis and decisions obtained from each step of the process based on those methods. The result obtained from each step as follows:

Collect Kansei Word

Kansei words were obtained from interview about the assessment and needs of BST permanent shelter users. Table 1 shows the words that reflect various feelings or impressions when they use BST permanent shelter. There were 29 words from 100 respondents by accidental sampling method, each respondents give 4 words.

Table 1. Kansei Words

No	Kansei Word	Quantity
1	Dirty Shelter	53
2	Dirty Floor	26
3	Not Informative	14
4	Smell	4
5	Fence Available	12
6	Dark Shelter	3
7	Steep Ramp	5
8	No Bus Lane Info	31
9	Messy Cables	2
10	Strategic Location	32
11	Roof Holes	1
12	Narrow Shelter Width	2
13	Not Wheelchair Friendly	3
14	Lots of Trash	4
15	Shady	8
16	Faded Paint	2
17	Peeling Paint	1
18	Broken Seat	1
19	Bus Boarding Access Too High	42
20	Bus Alighting Access Too High	6
21	No Bus Arrival Time Info	28
22	Unique	5
23	Dirty Roof	2

24	Batik Design at The Shelter	7
25	Lots of Shelter	26
26	No Priority Seat	2
27	No Wheelchair Space	1
28	Many Trees Around Shelter	21
29	Guiding Block Available	56
Total		400

Grouping Words That Have Same Meaning

Collecting words candidate to be implemented into Kansei Word by grouping for the words that can represent the user's emotions towards the specimen. Kansei Word is collected from references, observation and literature review to the case study and elimination of unselected Kansei Word. The eighteen selected Kansei Words are shown in table 2.

Table 2. Selected Kansei Words

No	Kansei Word That Have Been Grouped	Quantity
1	Dirty Shelter (Floor, Roof, Smell, Lots of Trach)	89
2	Not Informative	42
3	No Bus Lane Info	31
4	Fence Available	12
5	Dark Shelter	3
6	Steep Ramp	5
7	Messy Cables	2
8	Strategic Location	32
9	Lots of Shelter	26
10	Roof Holes	1
11	Narrow Shelter Width (Wheelchair Can't Move)	5
12	Shady (Many Trees Around Shelter)	29
13	Facilities Damaged	4
14	Access Height For Up/Down isn't Appropriate	48
15	Unique with Batik Design at The Shelter	12
16	No Priority Seat	2
17	No Wheelchair Space	1
18	Guiding Block Available	56
Total		400

Evaluating Kansei Words Using Semantic Differential Questionnaire

Developing a Semantic Differential Questionnaire using 1-5 scale to be filled by respondents. The questionnaire was distributed to 30 selected respondents by purposive sampling, the criteria is loyal BST permanent shelter users. The form of Semantic Differential Questionnaire with selected Kansei Words can be seen in table 3. After finish this step, the data is used for statistical calculations.

Table 3. Semantic Differential Questionnaire

No	Kansei Word	Assessment Score					Kansei Word
		5	4	3	2	1	
1	Clean Shelter						Dirty Shelter
2	Clear Shelter						Dark Shelter
3	Strategic Location						Not Strategic Location
4	Appropriate Shelter Width						Narrow Shelter Width
5	Appropriate Access Height						Access Height Isn't Appropriate
6	Not Steep Ramp						Steep Ramp
7	Priority Seat Available						No Priority Seat
8	Wheelchair Space Available						No Wheelchair Space

9	Guiding Block Available	No Guiding Block

Determine Design Elements with Administrative Law (PM No. 10 of 2012 About Minimum Service Standards of Mass Transportation Based Road)

Design elements have a role to presents the product and attract for consumers or users (Mu'alim and Hidayat 2014). Determine of design elements considers the researchers thinking, stakeholders and administrative law as shown in table 4. In this case also applies administrative law based on PM No. 10 of 2012 with comfort and equality standards. Comfort standard to provide comfort, clean, beautiful and good condition that can be used by users. Equality standard to provide special treatment of accessibility, priority service and facilities for special users with disabilities, the elderly, children and pregnant woman.

Table 4. Design Elements with Administrative Law

No	Selected Kansei Word	Variable	Standard
1	Clean Shelter	X1	Comfort
2	Clear Shelter	X2	Comfort
3	Strategic Location	X3	Comfort
4	Appropriate Shelter Width	X4	Comfort
5	Appropriate Access Height	X5	Comfort
6	Not Steep Ramp	X6	Equality
7	Priority Seat Available	X7	Equality
8	Wheelchair Space Available	X8	Equality
9	Guiding Block Available	X9	Equality

Design Variable Testing

Independent variables as shown in table 4 are X1 to X9, while dependent variables are comfort (Y1) and equality (Y2).

Hypothesis:

H0: Independent variables don't have a significant effect on dependent variables

H1: Independent variables have a significant effect on dependent variables

Decision Making:

If sig ≥ 0,1 so accepted H0

If sig < 0,1 so rejected H0

Table 5. Multiple Linear Regression Test Towards Comfort Standard

Model	B	Sig.
(Constant)	3,641	,000
X1	-,082	,000
X2	,145	,466
X3	-,124	,529
X4	,294	,000
X5	-,296	,000

Table 5 shows the result of multiple linear regression test on comfort standard, there is:

$$Y1 = 3{,}641 - 0{,}082X1 + 0{,}145X2 - 0{,}124X3 + 0{,}294X4 - 0{,}296X5$$

The regression equation means that clear shelter and appropriate shelter width have a positive relationship with Y1. And constant value < 0,1 is reject H0, so independent variables

have a significant effect on dependent variables. Coefficient value with significant value 0,000 is reject H0. It means that variable clean shelter, appropriate shelter width and access height have significant effect on comfort standard.

Table 6. Multiple Linear Regression Test Towards Equality Standard

Model	B	Sig.
(Constant)	3,344	,008
X6	,246	,000
X7	,071	,683
X8	-,358	,054
X9	-,280	,125

Table 6 shows the result of multiple linear regression test on equality standard, there is:

$$Y1 = 3,344 + 0,246X6 + 0,071X7 – 0,358X8 - 0,280X9$$

The regression equation means that not steep ramp and priority seat available have a positive relationship with Y2. And constant value < 0,1 is reject H0, so independent variables have a significant effect on dependent variables. Coefficient value with significant value 0,000 is reject H0. It means that variable not steep ramp has significant effect on equality standard.

Factor Analysis

Table 7. KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		,681
Bartlett's Test of Sphericity	Approx. Chi-Square	74,994
	df	55
	Sig.	,001

KMO and Bartlett's values as shown in table 7 obtained 0,681. The KMO value was greater than 0,5 and Bartlett's test significance was less than 0,05 means that comfort and equality variable influenced for analyzing user-friendly BST permanent shelter. So, analysis process was feasible to be continued.

Table 8. Principal Component Analysis

	Initial Eigenvalues		
Component	Total	% of Variance	Cumulative %
1 (X1)	2,546	23,144	23,144
2 (X2)	1,757	15,976	39,120
3 (X3)	1,602	14,566	53,687
4 (X4)	1,262	11,471	65,158
5 (X5)	1,028	9,348	74,506
6 (X6)	,839	7,632	82,137
7 (X7)	,650	5,908	88,046
8 (X8)	,511	4,645	92,691
9 (X9)	,322	2,924	95,615
10 (Y1)	,286	2,599	98,215
11 (Y2)	,196	1,785	100,000

From table 8, it's known that for the problem analysis to make user-friendly BST permanent shelter is 5 main components. These are generated based on eigenvalues >1. Component 1 (X1) has a total diversity of 2,546; component 2 (X2) has a total diversity of 1,757; component 3 (X3) has a total diversity of 1,602; component 4 (X4) has a total diversity of 1,262; component 5 (X5) has a total diversity of 1,028. In addition, the visualization of the 5 components can be seen using the Scree Plot in figure 1.

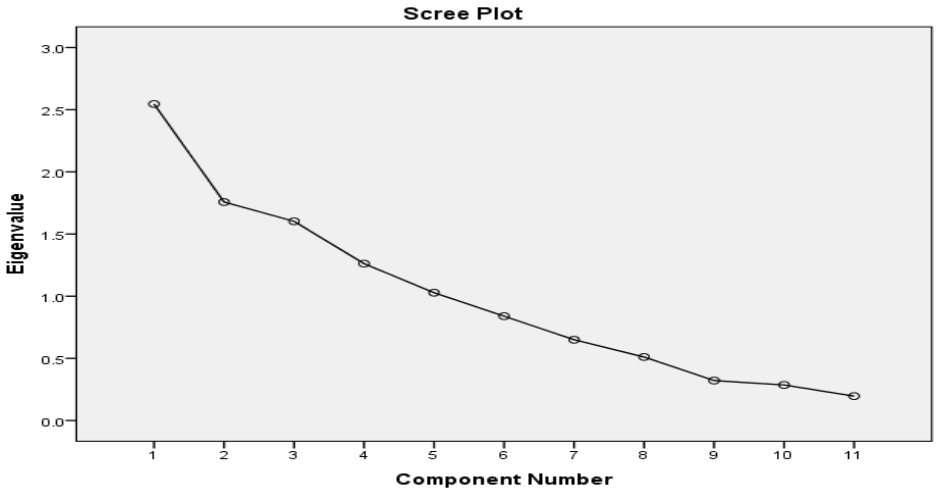

Figure 1. Scree Plot

Based on figure 1, it can be seen that graphically decline starts from point 1-11. However, the steep decline is only from point 1 and stable from point 5 to 6. It means that points 1 to 5 are all above the y=1, so 5 main components are selected for this case.

5. Conclusion

Based on the research result, the analysis of Kansei Engineering and Administrative Law to make a user-friendly BST permanent shelter are:

- Based on Kansei Words from user interview and assessment of BST permanent shelter, grouped into 18 Kansei Words. These words are used as indicators to analyze the condition of shelter according to user assessment and needs. Kansei Words are grouped into design elements using administrative law (PM No. 10 of 2012 About Minimum Service Standards of Mass Transportation Based Road), namely comfort and equality. Both standards are mandatory in user-friendly public facilities but there's no available at BST permanent shelter.

- In statistical calculations, it was found that H0 was rejected for the dependent variable Y1 (comfort). It means that clean shelter, appropriate shelter width and access height have significant effect on comfort standard. For the dependent variable Y2 (equality) also rejected H0. It means that variable not steep ramp has significant effect on equality standard. Then, the suggestions for all stakeholders in the design and maintenance of BST permanent shelter to pay attention for these things to improve the comfort and equality aspects for all users.

- The result of factor analysis stated that the KMO value was greater than 0,5 and Bartlett's test significance was less than 0,05. It means that comfort and equality variable influenced for analyzing user-friendly BST permanent shelter. And those 5 main components with eigenvalues >1 can be used as reference for creating user-friendly BST permanent shelter. Those 5 components are clean shelter, clear shelter, strategic location, appropriate shelter width, appropriate access height.

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