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Effectiveness of Revitalized UIKA 1 and UIKA 2 Bus Stops Using IoT and AI

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ABSTRACT

Public transportation is a vital component of urban mobility, and the integration of Internet of Things (IoT) and Artificial Intelligence (AI) technologies has become increasingly important for improving service efficiency, accessibility, and passenger experience. As urban development accelerates, the availability of safe, comfortable, intelligent, and efficient transportation systems is essential for communities, including students and residents around the Ibn Khaldun University (UIKA) campus. This study aims to evaluate the effectiveness of UIKA Bus Stop 1 and UIKA Bus Stop 2 on the Transpakuan Bus route after revitalization while examining the potential contribution of IoT- and AI-based technologies to public transport management. The research employed a quantitative descriptive approach using surveys, field observations, and interviews. Data were collected through questionnaires distributed to bus passengers and interviews with Transpakuan Bus managers to assess passenger satisfaction, waiting time, accessibility, and service quality. The findings indicate that the revitalization significantly improved passenger satisfaction, particularly regarding comfort, safety, and accessibility, leading to increased public transport usage around the UIKA campus and fewer complaints related to bus stop facilities. Furthermore, the study identifies that the implementation of IoT-based real-time passenger information systems and AI-driven predictive scheduling and demand analysis could further optimize bus arrival predictions, reduce waiting times, and enhance operational efficiency. Nevertheless, improvements are still required, particularly in integrating departure schedules with mobile applications, providing additional seating capacity, and adopting smart monitoring technologies. Overall, the revitalized UIKA Bus Stop 1 and UIKA Bus Stop 2 are effective in supporting public transportation operations. Future development should focus on integrating IoT sensors, AI-based decision support systems, and digital passenger information services to create a smarter, more efficient, and sustainable public transportation system.

Keywords: effectiveness, transpakuan Bus Stop, revitalization, passenger satisfaction, public transportation, IoT, AI.

INTRODUCTION

Public transportation is an important component in supporting community mobility, especially in urban areas. In the midst of increasingly rapid urban development, the availability of safe, comfortable, and efficient transportation is a primary need for the community, including for students and residents around the Ibn Khaldun University (UIKA) campus. As one of the modes of public transportation, the Transpakuan Bus has long been a means of mobility for many people in the Bogor area, including students, lecturers, and staff on the UIKA campus.

However, over time, the condition of the UIKA 1 Bus Stop and UIKA 2 Bus Stop has decreased in quality both in terms of facilities and comfort. This results in discomfort for public transportation users, which then has an impact on reducing public interest in using these facilities. Realizing the importance of improving the quality of public transportation services, the government and the Transpakuan Bus management have decided to revitalize the stops along the UIKA route, including the UIKA 1 Bus Stop and UIKA 2 Bus Stop.

The revitalization carried out is expected to increase the effectiveness of the use of stops by providing more adequate facilities and increasing accessibility and safety for users. This is in line with efforts to reduce the use of private vehicles and support environmentally friendly transportation. However, so far, there has been no comprehensive study evaluating the extent to which the revitalization is effective in achieving the desired goals.

Therefore, this study will focus on the effectiveness of the use of UIKA Bus Stop 1 and UIKA Bus Stop 2 after revitalization. This study is important to evaluate the impact of revitalization on the level of user satisfaction, the number of users, and the contribution of the stops to the transportation system in the UIKA campus environment. The results of this study are expected to be the basis for recommendations for Transpakuan Bus managers and related parties to continue to improve the quality of public transportation services in Bogor. The objectives of this study are: 1) to analyze the existing conditions of UIKA and UIKA 2 bus stops in improving comfort, safety, and accessibility for Transpakuan BTS Bus users, 2) to obtain the level of user satisfaction with the facilities available at UIKA Bus Stop 1 and UIKA Bus Stop 2.

Definition of Bus Stop

A bus stop is a transportation facility that functions as a temporary stopping place for public transportation to pick up and drop off passengers. Bus stops are designed to provide comfort and safety for passengers while waiting, and play an important role in increasing the satisfaction of public transportation users [1], [10], [11].
Bus stops are defined as places that are facilitated with elements such as seating, information boards, and weather protection for passenger comfort. Bus stops are considered as facilities that must meet certain design standards to ensure the safety and satisfaction of users while waiting for public transportation [2], [12], [13].

Bus Stop Requirements

Technical Guidelines for Engineering Public Passenger Vehicle Stops, general requirements for bus stops are:
1. Located along the public transportation/bus route
2. Located on a pedestrian (foot) path and close to pedestrian (foot) facilities
3. Directed close to activity centers or settlements
4. Equipped with signs
5. Does not interfere with the smooth flow of traffic

Bus Stop Facilities
Public Passenger Vehicle Stop Facilities (TPKTU) are divided into 2 general and additional facilities, general facilities are:
1. Bus stop identity in the form of name and/or number
2. Signs
3. Route/route information board
4. Lighting
5. Seating

And additional facilities are:
1. Public telephone
2. Trash can
3. Fence
4. Billboard/announcement [3], [14], [15], [21].

Bus Stop Revitalization

Bus stop revitalization is not just about physical improvements, but also a comprehensive effort to make public transportation safer, more comfortable, inclusive, and sustainable. It is an investment that brings long-term benefits to communities and cities, creating more effective transportation and supporting sustainable urban development [3], [16].

Factors Requiring Revitalization

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User needs are one of the main factors. They noted that understanding the comfort, safety, and ease of access needs of passengers is very important in planning the revitalization of bus stops. This aims to improve comfort and attract more users. The physical condition of the bus stop before revitalization greatly determines the scale of repairs needed. Old or damaged bus stops require more in-depth renovation than bus stops that are still in good condition. Government policies play a major role in bus stop revitalization, especially regarding public transportation facility and safety standards. Government regulations can support or hinder the revitalization process if they are not in line with transportation infrastructure planning. Application of technology in bus stop revitalization, such as the use of digital information boards or non-cash payment instruments. Technology can improve user comfort and make bus stops more efficient and environmentally friendly [4], [17].

Effectiveness

Effectiveness is defined as a measure of the extent to which a goal is achieved. According to them, effectiveness is related to how well an activity or action is able to achieve the desired target or goal, without emphasizing too much on the method or process. Effectiveness is the achievement of the target or goal of an activity or job. This effectiveness focuses on the end result and assesses whether or not a particular target is achieved. If the target is achieved, then the activity is considered effective. The author concludes that effectiveness is a measure of the success of an activity, the process of achieving the goals that have been set. Effectiveness focuses on the final results achieved [5], [18].

Factors Affecting Effectiveness

Comfort of Facilities, comfort of bus stop facilities such as seating, spacious waiting rooms, and protection from the weather (roofs or protective walls) are the main factors in increasing the effectiveness of bus stops. They found that comfortable bus stops tend to increase the satisfaction and interest of public transportation users. Security factors greatly affect the effectiveness of bus stops. CCTV, lighting, and the presence of security officers make users feel safe, especially at night. This sense of security directly affects the user's decision to use the bus stop regularly. The availability of information regarding the arrival schedule and position of the bus in real time at the bus stop is an important factor in the effectiveness of the bus stop. With accurate information, users can plan their trips better, reduce uncertainty, and increase the comfort of waiting. Accessibility of bus stops for people with disabilities is an important factor in the effectiveness of bus stops. Bus stops equipped with ramps, clear signs, and disability-friendly access allow users from various groups to access public transportation comfortably. Cleanliness and regular maintenance of the bus stop greatly affect its effectiveness. They found that well-maintained and clean bus stops are preferred by users because they create a comfortable and healthy atmosphere. Sufficient Queue Management and Waiting Area, These factors are also no less important in increasing the effectiveness of a bus stop. Queue management and a fairly large waiting area, especially during peak hours. They found that bus stops with large and organized waiting areas reduce congestion, create comfort, and increase the effectiveness of bus stop use. From several studies above, it can be concluded that the effectiveness of bus stops after revitalization is determined by a combination of comfort, security, real-time information, and accessibility factors. Strategic location, attractive design, cleanliness, and good queue management also play an important role in creating effective bus stops and are able to improve the overall public transportation user experience [5], [8], [9], [19].

Survey Using Questionnaires

A survey using questionnaires was conducted by looking at the responses of Biskita users at UIKA 1 and UIKA 2 bus stops regarding the level of service after revitalization. The questionnaire used in the implementation of this survey was, bus stop users, Kita Transpakuan Bus operators, and City Transportation and AKAP Bus users. The population used in this study is as stated at the beginning of the research background, namely the population of Bogor City in Figures 2024 according to BPS 2024 as many as 1,098,022 people [6], [7].

In determining the sample, the number of samples is determined based on purpose sampling. Data with this sample includes respondents who are motorized vehicle users, city transportation users, and city transportation operators [22], [23]. The questionnaire method was developed in taking data samples for its determination based on the Slovin formula, namely:

$$n = \frac{N....}{1+Ne^2} \quad .....(1)$$

Information: n = number of samples
N = number of population
e = error tolerance limit = e^2 = 0,01

$$n = \frac{1.098.022 souls}{(1+ 1.098.022 \times 0,01)}$$

= 100 respondents (sample)

So the number of samples taken was 100 samples consisting of users of UIKA 1 and UIKA 2 bus stops, both city transportation passengers, intercity/AKAP transportation, Bis Kita Transpakuan or those using other transportation.

Future development should focus on integrating IoT sensors, AI-based decision support systems, and digital passenger information services to create a smarter, more efficient, and sustainable public transportation system [24], [25].

RESEARCH METHODOLOGY

Place and Time

This research was conducted at the UIKA 1 and UIKA 2 Transpakuan Biskita bus stops located on Jalan Sholeh Iskandar, Kedung Badak, Bogor City. The research time was carried out for one week starting from November 1, 2024 to November 7, 2024 at 10.00-16.00 WIB. The location of the research can be seen in Figure 1 below.

Figure 1. Research Location Map (Source: Google Earth)

Figure 2. UIKA 1 and UIKA 2 Bus Stops (Source: Personal Documentation, 2024)

Tools and Materials

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1. Tools
The tools used in this study are:
1) Laptop and Smartphone: Used to create and compile, analyze data, and process survey results.
2) Stationery: needed for filling out paper questionnaires by respondents.
3) Journal: to obtain information from several researchers.
2. Materials
The materials used in this study are namely
1) Primary data is data obtained directly from the field.
Example: Questionnaire Data.
2) Secondary Data is data that has been collected and processed by other parties before this research was conducted.
Example: Data from the decision of the director general of land transportation.

Research Method

This research uses a quantitative-method, the preparation of this research requires complete data both technically and in-the field so that this research runs properly. Furthermore, the research flow diagram is displayed as shown in Figure 4 below.

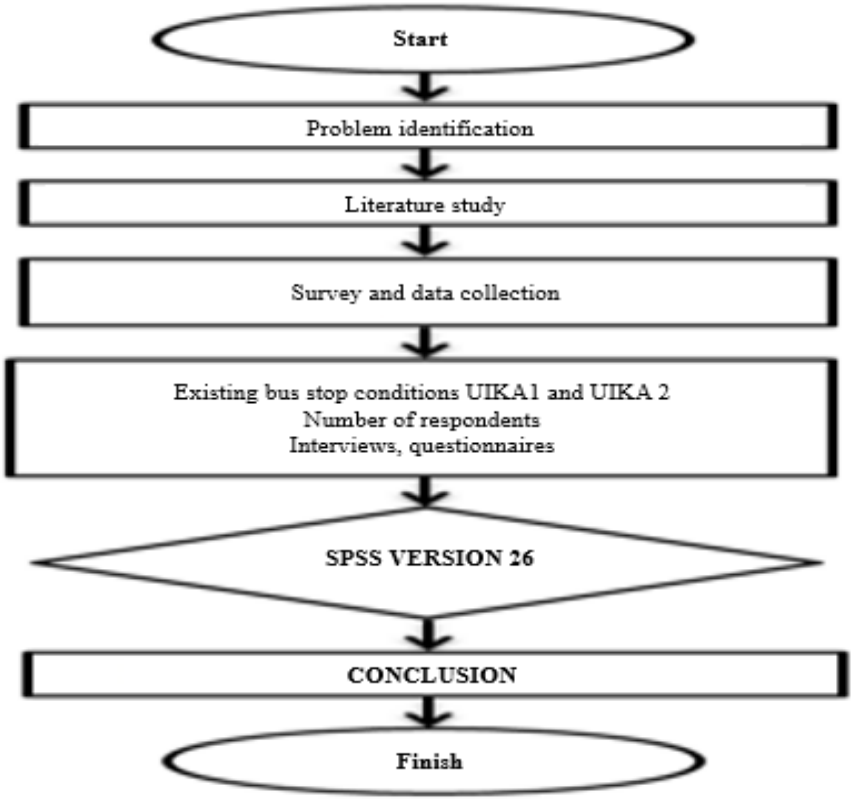

Figure 4. Research Flowchart

Respondent Validity and Reliability Test

The following is the result of the respondent validity and reliability test with a total of 100 respondents. This can be seen from the picture below.

Uji Validitas X1

Correlations

		X1.1	X1.2	X1.3	X1.4	X1.5	X1.6	X1.7	X1.8	X1.9	X1.10	X1.11	Total
X1.1	Pearson Correlation	1	-.047	.029	.035	.086	-.149	-.034	.127	-.007	.116	.053	.301**
	Sig. (2-tailed)		.644	.772	.732	.393	.139	.736	.208	.942	.252	.599	.002
	N	100	100	100	100	100	100	100	100	100	100	100	100
X1.2	Pearson Correlation	-.047	1	.192	.264**	.282**	.089	-.182	-.148	.300**	-.029	-.029	.464**
	Sig. (2-tailed)	.644		.056	.008	.005	.379	.070	.143	.002	.774	.771	.000
	N	100	100	100	100	100	100	100	100	100	100	100	100
X1.3	Pearson Correlation	.029	.192	1	.138	.220*	.017	-.049	-.188	-.054	.216*	.033	.418**
	Sig. (2-tailed)	.772	.056		.172	.028	.868	.625	.062	.596	.031	.746	.000
	N	100	100	100	100	100	100	100	100	100	100	100	100
X1.4	Pearson Correlation	.035	.264**	.138	1	.187	.177	-.094	.094	.187	-.019	.048	.606**
	Sig. (2-tailed)	.732	.008	.172		.062	.079	.353	.351	.063	.851	.638	.000
	N	100	100	100	100	100	100	100	100	100	100	100	100
X1.5	Pearson Correlation	.086	.282**	.220*	.187	1	-.108	-.280**	.050	-.169	.384**	-.044	.554**
	Sig. (2-tailed)	.393	.005	.028	.062		.283	.005	.622	.093	.000	.661	.000
	N	100	100	100	100	100	100	100	100	100	100	100	100
X1.6	Pearson Correlation	-.149	.089	.017	.177	-.108	1	-.167	-.159	.025	-.017	-.291**	.090
	Sig. (2-tailed)	.139	.379	.868	.079	.283		.097	.114	.808	.866	.003	.373
	N	100	100	100	100	100	100	100	100	100	100	100	100
X1.7	Pearson Correlation	-.034	-.182	-.049	-.094	-.280**	-.167	1	.083	-.031	-.062	.105	-.006
	Sig. (2-tailed)	.736	.070	.625	.353	.005	.097		.410	.760	.542	.297	.951
	N	100	100	100	100	100	100	100	100	100	100	100	100
X1.8	Pearson Correlation	.127	-.148	-.188	.094	.050	-.159	.083	1	-.047	-.080	.304**	.280**
	Sig. (2-tailed)	.208	.143	.062	.351	.622	.114	.410		.641	.429	.002	.005
	N	100	100	100	100	100	100	100	100	100	100	100	100
X1.9	Pearson Correlation	-.007	.300**	-.054	.187	-.169	.025	-.031	-.047	1	-.141	.243*	.300**
	Sig. (2-tailed)	.942	.002	.596	.063	.093	.808	.760	.641		.161	.015	.002
	N	100	100	100	100	100	100	100	100	100	100	100	100
X1.10	Pearson Correlation	.116	-.029	.216*	-.019	.384**	-.017	-.062	-.080	-.141	1	-.143	.339**
	Sig. (2-tailed)	.252	.774	.031	.851	.000	.866	.542	.429	.161		.156	.001
	N	100	100	100	100	100	100	100	100	100	100	100	100
X1.11	Pearson Correlation	.053	-.029	.033	.048	-.044	-.291**	.105	.304**	.243*	-.143	1	.291**
	Sig. (2-tailed)	.599	.771	.746	.638	.661	.003	.297	.002	.015	.156		.003
	N	100	100	100	100	100	100	100	100	100	100	100	100
Total	Pearson Correlation	.301**	.464**	.418**	.606**	.554**	.090	-.006	.280**	.300**	.339**	.291**	1
	Sig. (2-tailed)	.002	.000	.000	.000	.000	.373	.951	.005	.002	.001	.003	
	N	100	100	100	100	100	100	100	100	100	100	100	100

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

Figure 5. Validity test X1

Uji Validitas X2

Correlations

		X2.1	X2.2	X2.3	X2.4	X2.5	X2.6	X2.7	X2.8	X2.9	X2.10	X2.11	Total
X2.1	Pearson Correlation	1	-.028	-.240*	-.112	.085	.018	-.157	-.045	-.048	-.060	-.067	.023
	Sig. (2-tailed)		.785	.016	.269	.399	.858	.118	.656	.632	.556	.507	.819
	N	100	100	100	100	100	100	100	100	100	100	100	100
X2.2	Pearson Correlation	-.028	1	-.071	.112	-.280**	.362**	-.060	-.138	-.132	-.324**	.086	.299**
	Sig. (2-tailed)	.785		.483	.269	.005	.000	.556	.172	.189	.001	.397	.003
	N	100	100	100	100	100	100	100	100	100	100	100	100
X2.3	Pearson Correlation	-.240*	-.071	1	-.152	-.072	.011	-.094	.176	.084	-.113	.211*	.179
	Sig. (2-tailed)	.016	.483		.131	.476	.914	.351	.079	.406	.263	.035	.075
	N	100	100	100	100	100	100	100	100	100	100	100	100
X2.4	Pearson Correlation	-.112	.112	-.152	1	.007	-.038	.166	-.161	-.130	.125	-.074	.363**
	Sig. (2-tailed)	.269	.269	.131		.946	.710	.099	.109	.198	.215	.462	.000
	N	100	100	100	100	100	100	100	100	100	100	100	100
X2.5	Pearson Correlation	.085	-.280**	-.072	.007	1	-.405**	-.102	-.054	.234*	.145	.189	.204*
	Sig. (2-tailed)	.399	.005	.476	.946		.000	.312	.591	.019	.149	.060	.042
	N	100	100	100	100	100	100	100	100	100	100	100	100
X2.6	Pearson Correlation	.018	.362**	.011	-.038	-.405**	1	-.052	.060	-.097	-.218*	.007	.272**
	Sig. (2-tailed)	.858	.000	.914	.710	.000		.608	.555	.339	.029	.943	.006
	N	100	100	100	100	100	100	100	100	100	100	100	100
X2.7	Pearson Correlation	-.157	-.060	-.094	.166	-.102	-.052	1	-.039	-.091	.011	-.085	.270**
	Sig. (2-tailed)	.118	.556	.351	.099	.312	.608		.703	.367	.911	.401	.007
	N	100	100	100	100	100	100	100	100	100	100	100	100
X2.8	Pearson Correlation	-.045	-.138	.176	-.161	-.054	.060	-.039	1	-.022	-.082	.067	.268**
	Sig. (2-tailed)	.656	.172	.079	.109	.591	.555	.703		.827	.417	.510	.007
	N	100	100	100	100	100	100	100	100	100	100	100	100
X2.9	Pearson Correlation	-.048	-.132	.084	-.130	.234*	-.097	-.091	-.022	1	.200*	.066	.344**
	Sig. (2-tailed)	.632	.189	.406	.198	.019	.339	.367	.827		.046	.511	.000
	N	100	100	100	100	100	100	100	100	100	100	100	100
X2.10	Pearson Correlation	-.060	-.324**	-.113	.125	.145	-.218*	.011	-.082	.200*	1	-.147	.158
	Sig. (2-tailed)	.556	.001	.263	.215	.149	.029	.911	.417	.046		.145	.116
	N	100	100	100	100	100	100	100	100	100	100	100	100
X2.11	Pearson Correlation	-.067	.086	.211*	-.074	.189	.007	-.085	.067	.066	-.147	1	.356**
	Sig. (2-tailed)	.507	.397	.035	.462	.060	.943	.401	.510	.511	.145		.000
	N	100	100	100	100	100	100	100	100	100	100	100	100
Total	Pearson Correlation	.023	.299**	.179	.363**	.204*	.272**	.270**	.268**	.344**	.158	.356**	1
	Sig. (2-tailed)	.819	.003	.075	.000	.042	.006	.007	.007	.000	.116	.000	
	N	100	100	100	100	100	100	100	100	100	100	100	100

*. Correlation is significant at the 0.05 level (2-tailed).

Figure 6. Validity test X2

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Uji validitas Y

Correlations

		Y.1	Y.2	Y.3	Y.4	Y.5	Y.6	Y.7	Y.8	Y.9	Y.10	Y.11	Y.12	Y.13	Y.14	Y.15	Total
Y.1	Pearson Correlation	1	.324**	.132	-.192	.265**	-.142	-.301**	.211*	.052	.130	.158	.054	.052	.241*	.264**	.468**
	Sig. (2-tailed)		.001	.190	.056	.008	.158	.002	.035	.608	.197	.117	.591	.609	.016	.008	.000
	N	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Y.2	Pearson Correlation	.324**	1	.193	-.109	.313**	.043	.057	.214*	.051	-.201*	.080	.014	.132	.249*	-.111	.571**
	Sig. (2-tailed)	.001		.054	.280	.002	.673	.571	.032	.612	.045	.428	.888	.190	.012	.270	.000
	N	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Y.3	Pearson Correlation	.132	.193	1	-.238*	.302**	.030	-.142	.216*	.117	-.062	.094	.068	-.079	.245*	-.040	.407**
	Sig. (2-tailed)	.190	.054		.017	.002	.767	.158	.031	.247	.540	.350	.503	.434	.014	.689	.000
	N	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Y.4	Pearson Correlation	-.192	-.109	-.238*	1	-.290**	-.090	.231*	-.278**	-.175	-.004	-.099	-.062	.215*	-.398**	.074	-.035
	Sig. (2-tailed)	.056	.280	.017		.003	.375	.021	.005	.082	.966	.327	.539	.031	.000	.463	.728
	N	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Y.5	Pearson Correlation	.265**	.313**	.302**	-.290**	1	-.067	.133	.209*	.228*	-.202*	-.107	.218*	-.030	.279**	-.335**	.534**
	Sig. (2-tailed)	.008	.002	.002	.003		.511	.186	.037	.022	.044	.288	.029	.770	.005	.001	.000
	N	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Y.6	Pearson Correlation	-.142	.043	.030	-.090	-.067	1	-.067	-.140	.010	-.107	-.058	-.066	-.462**	-.008	-.076	-.091
	Sig. (2-tailed)	.158	.673	.767	.375	.511		.509	.164	.922	.288	.568	.515	.000	.937	.454	.370
	N	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Y.7	Pearson Correlation	-.301**	.057	-.142	.231*	.133	-.067	1	-.209*	-.050	-.178	-.259**	.285**	.274**	-.242*	-.195	.207*
	Sig. (2-tailed)	.002	.571	.158	.021	.186	.509		.037	.618	.076	.009	.004	.006	.015	.052	.039
	N	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Y.8	Pearson Correlation	.211*	.214*	.216*	-.278**	.209*	-.140	-.209*	1	.227*	.063	.146	.084	.155	.560**	-.152	.482**
	Sig. (2-tailed)	.035	.032	.031	.005	.037	.164	.037		.023	.532	.147	.408	.124	.000	.132	.000
	N	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Y.9	Pearson Correlation	.052	.051	.117	-.175	.228*	.010	-.050	.227*	1	.072	.036	.202*	.002	.248*	-.174	.296**
	Sig. (2-tailed)	.608	.612	.247	.082	.022	.922	.618	.023		.474	.722	.044	.981	.013	.083	.003
	N	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Y.10	Pearson Correlation	.130	-.201*	-.062	-.004	-.202*	-.107	-.178	.063	.072	1	.053	-.036	-.134	.154	-.046	-.011
	Sig. (2-tailed)	.197	.045	.540	.966	.044	.288	.076	.532	.474		.598	.724	.185	.125	.651	.917
	N	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Y.11	Pearson Correlation	.158	.080	.094	-.099	-.107	-.058	-.259**	.146	.036	.053	1	.046	-.093	.192	.099	.144
	Sig. (2-tailed)	.117	.428	.350	.327	.288	.568	.009	.147	.722	.598		.651	.360	.056	.325	.152
	N	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Y.12	Pearson Correlation	.054	.014	.068	-.062	.218*	-.066	.285**	.084	.202*	-.036	.046	1	.190	.035	.015	.431**
	Sig. (2-tailed)	.591	.888	.503	.539	.029	.515	.004	.408	.044	.724	.651		.059	.732	.880	.000
	N	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Y.13	Pearson Correlation	.052	.132	-.079	.215*	-.030	-.462**	.274**	.155	.002	-.134	-.093	.190	1	.029	-.002	.350**
	Sig. (2-tailed)	.609	.190	.434	.031	.770	.000	.006	.124	.981	.185	.360	.059		.773	.988	.000
	N	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Y.14	Pearson Correlation	.241*	.249*	.245*	-.398**	.279**	-.008	-.242*	.560**	.248*	.154	.192	.035	.029	1	-.218*	.536**
	Sig. (2-tailed)	.016	.012	.014	.000	.005	.937	.015	.000	.013	.125	.056	.732	.773		.030	.000
	N	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Y.15	Pearson Correlation	.264**	-.111	-.040	.074	-.335**	-.076	-.195	-.152	-.174	-.046	.099	.015	-.002	-.218*	1	-.016
	Sig. (2-tailed)	.008	.270	.689	.463	.001	.454	.052	.132	.083	.651	.325	.880	.988	.030		.876
	N	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Total	Pearson Correlation	.468**	.571**	.407**	-.035	.534**	-.091	.207*	.482**	.296**	-.011	.144	.431**	.350**	.536**	-.016	1
	Sig. (2-tailed)	.000	.000	.000	.728	.000	.370	.039	.000	.003	.917	.152	.000	.000	.000	.876	
	N	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

Figure 7. Validity test of Y

Uji Reabilitas X1

Case Processing Summary

		N	%
Cases	Valid	100	100.0
	Excluded[a]	0	.0
	Total	100	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.281	11

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
X1.1	30.1700	5.799	.074	.271
X1.2	30.2000	5.333	.258	.195
X1.3	29.6000	5.414	.182	.223
X1.4	28.8700	4.478	.321	.117
X1.5	29.6400	4.576	.199	.193
X1.6	29.6900	6.398	-.128	.344
X1.7	29.9900	6.636	-.210	.367
X1.8	28.6400	5.849	.018	.297
X1.9	30.3200	5.796	.060	.277
X1.10	30.7700	5.694	.119	.253
X1.11	30.7100	5.844	.080	.268

Figure 8. Reliability test X1

Uji Reabilitas X2

Case Processing Summary

		N	%
Cases	Valid	100	100.0
	Excluded[a]	0	.0
	Total	100	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha[a]	N of Items
-.445	11

a. The value is negative due to a negative average covariance among items. This violates reliability model assumptions. You may want to check item codings.

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
X2.1	31.6900	4.236	-.220	-.309[a]
X2.2	30.6900	3.772	-.162	-.311[a]
X2.3	31.8300	3.941	-.097	-.400[a]
X2.4	31.6200	3.511	-.055	-.462[a]
X2.5	31.9400	3.956	-.151	-.338[a]
X2.6	31.4700	3.767	-.091	-.405[a]
X2.7	31.4400	3.825	-.150	-.332[a]
X2.8	30.7900	3.804	-.126	-.364[a]
X2.9	32.5900	3.557	-.021	-.491[a]
X2.10	31.9600	4.039	-.163	-.333[a]
X2.11	31.3800	3.551	.092	-.569[a]

a. The value is negative due to a negative average covariance among items. This violates reliability model assumptions. You may want to check item codings.

Figure 9. Reliability test X2

Uji Reabilitas Y

Case Processing Summary

		N	%
Cases	Valid	100	100.0
	Excluded[a]	0	.0
	Total	100	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.239	15

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Y.1	43.0300	6.191	.298	.147
Y.2	43.0600	5.572	.356	.086
Y.3	43.1700	6.284	.203	.174
Y.4	42.8700	7.932	-.302	.393
Y.5	43.4800	5.484	.244	.122
Y.6	43.5800	7.640	-.251	.315
Y.7	43.6800	6.967	-.090	.307
Y.8	43.4500	6.169	.319	.142
Y.9	43.3600	6.859	.200	.208
Y.10	43.2800	7.375	-.146	.278
Y.11	43.3500	7.078	.038	.236
Y.12	43.4000	6.323	.265	.163
Y.13	43.8200	6.452	.134	.201
Y.14	43.3200	5.432	.231	.126
Y.15	43.3100	7.691	-.248	.350

Figure 10. Reliability test Y

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Regresi Linear

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	X2, X1[b]	.	Enter

a. Dependent Variable: Y
b. All requested variables entered.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.481[a]	.231	.215	2.38003	.231	14.580	2	97	.000

a. Predictors: (Constant), X2, X1
b. Dependent Variable: Y

Figure 11. Linear regression

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	165.177	2	82.589	14.580	.000[b]
	Residual	549.463	97	5.665		
	Total	714.640	99			

a. Dependent Variable: Y
b. Predictors: (Constant), X2, X1

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	33.137	5.629		5.887	.000
	X1	.497	.096	.466	5.174	.000
	X2	-.088	.121	-.065	-.726	.470

a. Dependent Variable: Y

Figure 12. Anova and coefficients

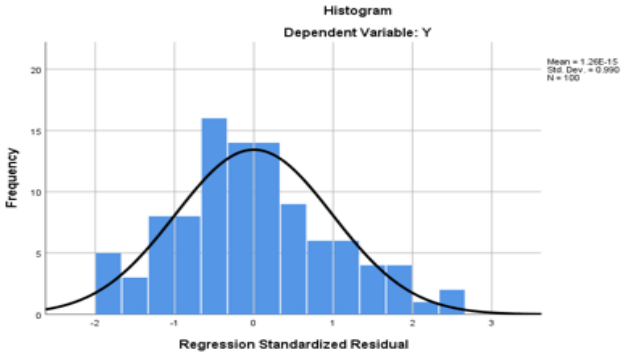

Figure 13. Histogram diagram of variable Y

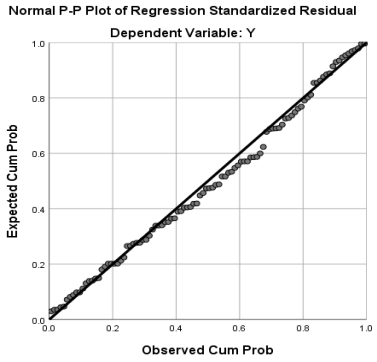

Figure 14. Normal distribution

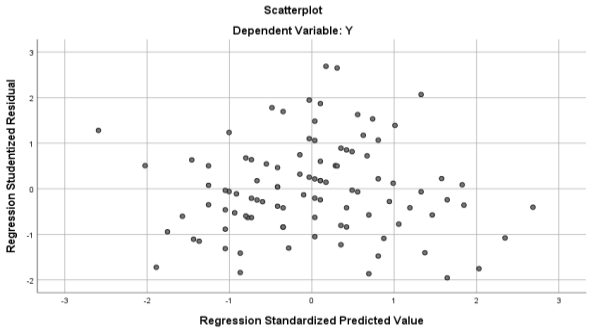

Figure 15. Scatterplot diagram

RESULTS AND DISCUSSION

The results of the study from the specified location show that the study with the following data. The number of questions described and the number of respondents displayed in this study are:

The following are questions about:

The results of the questions are in the form of perceptions of bus stop users

There are 11 (eleven) questions that can be asked to bus stop users, both those using public transportation and waiting for pick-up at the bus stop. These questions relate to satisfaction with the condition of the bus stop, the comfort and safety of the bus stop:

Here are some examples of survey questions with a Likert scale to measure passenger perceptions of bus stop comfort, bus stop accessibility, security and safety, service efficiency and general impressions of the bus stop. The Likert scale usually uses a range, such as:

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

Bus Stop Comfort

1. This bus stop has adequate facilities (e.g., seats, protective roof, lighting).
2. This bus stop is well maintained.
3. This bus stop feels safe and comfortable to use during the day or night.

Bus Stop Accessibility

4. This bus stop is easily accessible to pedestrians.
5. This bus stop is friendly to disabled users (e.g., there is a ramp or special lane).

Security and Safety

6. This bus stop is equipped with adequate security facilities (e.g., CCTV cameras, lighting).
7. I feel safe waiting at this bus stop, both during the day and at night.

Service Efficiency

8. Buses arrive at this bus stop according to the scheduled time.
9. This bus stop has enough space to accommodate the number of passengers during peak hours.

General Impression of Bus Stop Conditions

10. I am satisfied with the facilities and services provided at this bus stop.
11. I would recommend using this bus stop to others.

This question is designed to provide a comprehensive picture of the level of satisfaction, comfort and safety of bus stop users. The Likert scale makes it easy to quantify the results, while open-ended questions give respondents room to provide specific input.

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Results of Questions in the Form of Bus Stop User Trust
Next, 11 (eleven) questions were also asked in the form of bus stop user trust related to service constraints, service consistency, security and safety, credibility and general trust. These questions relate to vehicle conditions, waiting times and road accessibility:
The following are survey questions using a Likert scale to measure passenger trust in bus stop services. Just like before, the Likert scale usually has a range such as:
1 = Strongly Disagree
2 = Disagree
3 = Neutral
4 = Agree
5 = Strongly Agree

Service reliability

1. I believe this bus stop can serve passengers well throughout the day.
2. I believe buses always stop at this bus stop according to the specified schedule.
3. The facilities at this bus stop are always in a condition suitable for use.

Consistency of service

4. I believe this bus stop always provides accurate and up-to-date information about bus routes.
5. I believe the service at this bus stop is consistent over time.
6. This bus stop is always reliable, especially when I need it.

Safety and security

7. I feel safe at this bus stop because of the security facilities provided.
8. I believe this bus stop pays attention to passenger safety, both day and night.

General credibility and trustworthiness

9. I believe the management of this bus stop works professionally to meet passenger needs.
10. I feel comfortable and confident using this bus stop for my trip.
11. I believe that this bus stop service is designed with the interests of users in mind.

These questions are used to measure the overall trust dimension, including aspects of reliability, consistency, security, and credibility of the bus stop service. The survey results can help evaluate and improve user trust in the service.

Secondary Data Results

Data on the number of users of the UIKA 1 Bus Stop and UIKA 2 Bus Stop can be described based on Gender, Age Range, Type of Job, and Education Level. These results are discussed in each of the figures below.

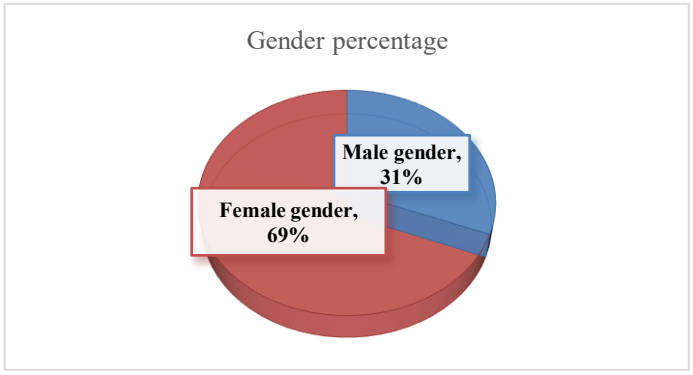

Figure 16. Percentage of gender of users of UIKA 1 and UIKA 2 bus stops Source: Data processing results, 2024

Based on gender obtained from 100 respondents using the Kita Bus Stop, namely UIKA 1 and UIKA 2, 69% were female and 31% were male.

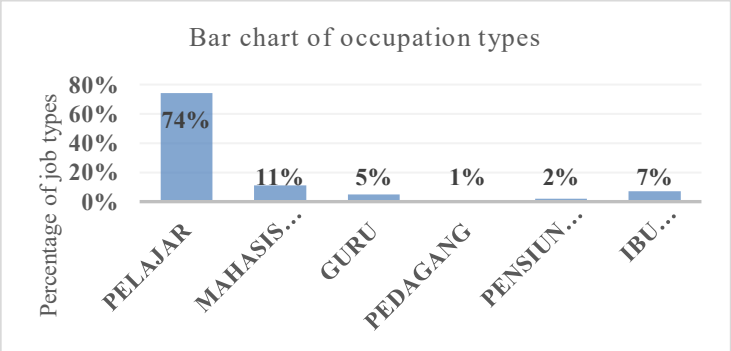

Figure 17. Percentage of types of jobs of users of UIKA 1 and UIKA 2 bus stops Source: Data processing results, 2024

Based on the types of jobs obtained from 100 respondents using the Kita Bus Stop, namely UIKA 1 and UIKA 2, the highest users were students at 74%, students at 11%, housewives at 7%, teachers at 5%, retirees at 2% and traders at 1%.

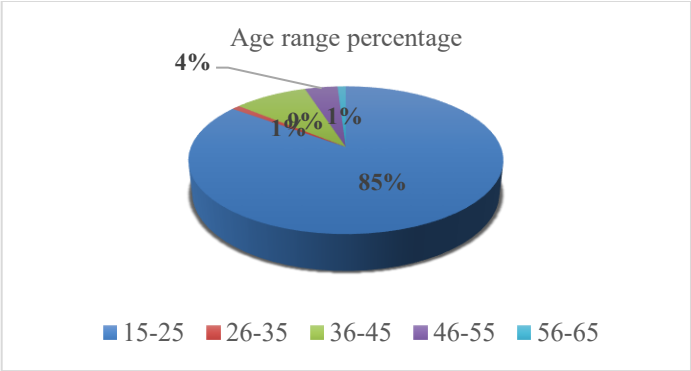

Figure 18. Percentage of age range of users of UIKA 1 and UIKA 2 bus stops Source: Data processing results, 2024

Based on the age range obtained from 100 respondents using the Kita Bus Stop, namely UIKA 1 and UIKA 2, the highest number of users is the 15-25 year age range at 85%, the 26-35 year age range at 9%, the 36-45 year age range at 4%, the 46-55 year age range at 1% and the 56-65 year age range at 1%.

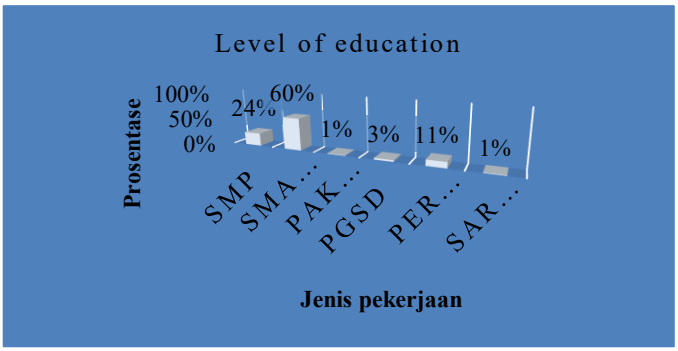

Figure 19. Percentage of education level of users of UIKA 1 and UIKA 2 bus stops Source: Data processing results, 2024

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Based on the Education Level of 100 respondents who used the Kita Bus Stop, namely UIKA 1 and UIKA 2, the highest users were high school/vocational school students at 60%, junior high school students at 24%, college students at 11%, PGSD Education Level at 3% and Bachelor's and Package C Education Level at 1% each.

Discussion of perceptions at the BTS Transpakuan bus stops at UIKA 1 and UIKA 2

The results of this data analysis were generated from a questionnaire distributed by the author to users of the BTS Transpakuan Bus Stop at the UIKA 1 and UIKA 2 stops. The number of respondents was determined as 100 respondents based on the Slovin formula with an error rate of 0.01.

Based on the comfort of the bus stop

Table 1. Discussion of perceptions about the comfort of the Bus Stop

No	Questions	Precentage	Average
1.	P1	54%	
2.	P2	53%	57%
3.	P3	65%	

From the table above, the facilities and cleanliness of the bus stops are still low compared to the comfort of using the UIKA 1 bus stop and the UIKA 2 bus stop in terms of use at night, which is 65%.

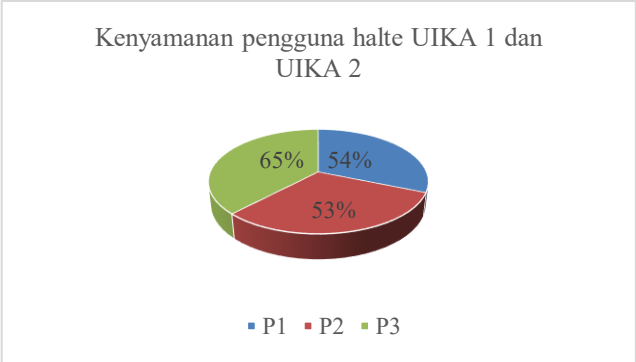

Figure 20. Percentage of comfort of users of UIKA 1 and UIKA 2 bus stops Source: Data processing results, 2024

Based on bus stop accessibility

Table 2. Discussion of perceptions about bus stop accessibility

No	Questions	Precentage	Average
1.	P4	80%	
2.	P5	64%	72%

From the table above, the bus stop location is very easy to reach with a perception level of 80% and the UIKA 1 bus stop and UIKA 2 bus stops are indeed very disability-friendly with a confidence level of 64%.

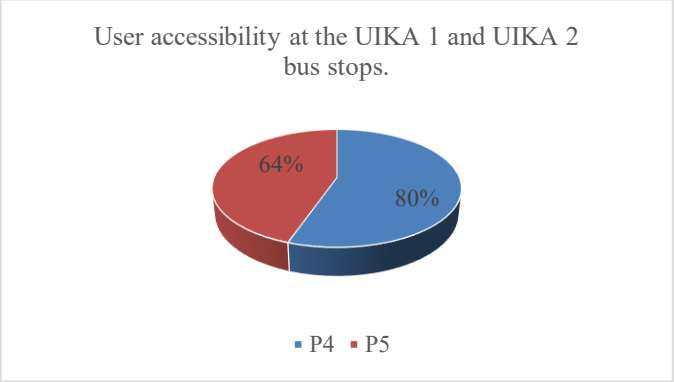

Figure 21. Percentage of accessibility of users of UIKA 1 and UIKA 2 bus stops Source: Data processing results, 2024

Based on the security and safety of bus stops

Table 3. Discussion of perceptions about the security and safety of bus stops

No	Questions	Precentage	Average
1.	P6	63%	
2.	P7	57%	60%

From the table above, the bus stop is equipped with CCTV and lighting but the user's trust in the completeness is not enough, which is 63%. While the security and comfort in waiting for the bus at the UIKA 1 and UIKA 2 bus stops are only 57%, this is still low public trust.

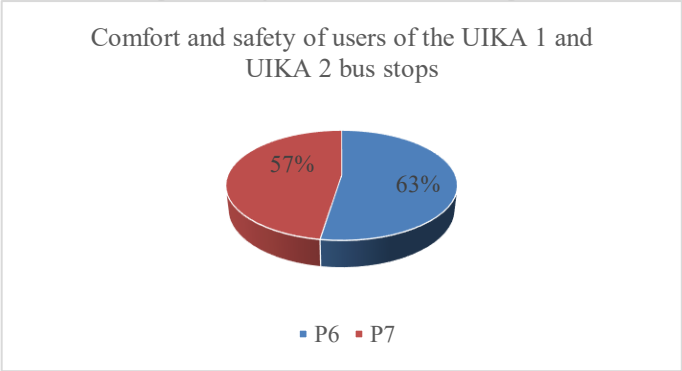

Figure 22. Percentage of comfort and safety of users of UIKA 1 and UIKA 2 bus stops. Source: Data processing results, 2024

Based on bus stop service efficiency

Table 4. Discussion of perceptions about bus stop service efficiency

No	Questions	Precentage	Average
1.	P8	84%	
2.	P9	51%	68%

From the table above, the bus arrived at the UIKA 1 and UIKA 2 bus stops on time and according to schedule, as evidenced by the user confidence level of 84%, while the bus stops did not have

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enough space to accommodate the number of waiting passengers, which was 51% both at the UIKA 1 and UIKA 2 bus stops.

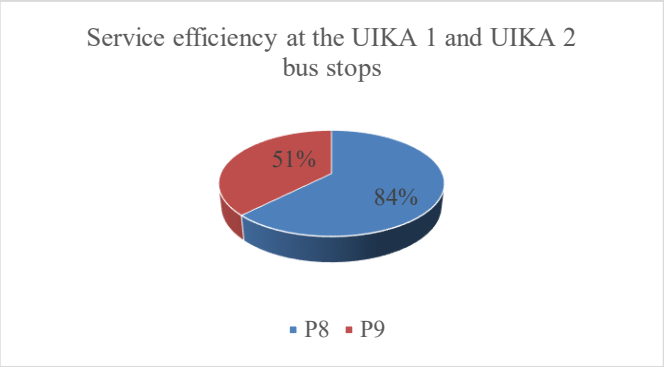

Figure 23. Percentage of efficiency of users of UIKA 1 and UIKA 2 bus stops. Source: Data processing results, 2024

Based on general impressions of bus stop conditions

Table 4. Discussion of perceptions of general impressions of bus stop conditions

No	Questions	Precentage	Average
1.	P10	42%	
2.	P11	43%	42,5%

From the table above, it can be seen that the satisfaction of user perceptions of the bus stop services provided is quite low, which is 42%, while users also recommend using bus stops both at UIKA 1 and UIKA 2, which is very low, which is 43%. This triggers that the bus stop seems very unsuitable for use as a BTS Transpakuan bus stop.

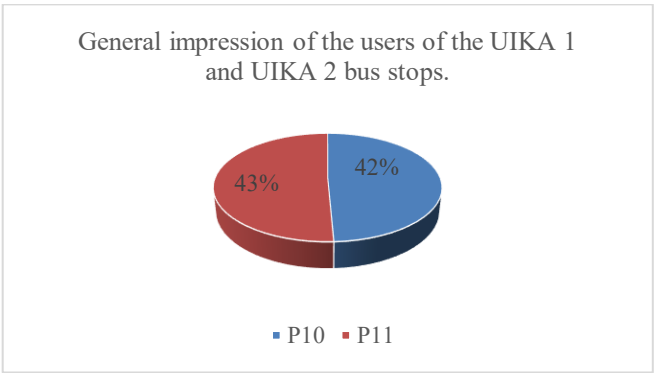

Figure 24. Percentage of general impressions of users of UIKA 1 and UIKA 2 bus stops Source: Data processing results, 2024

Discussion of trust in BTS Transpakuan bus stops at UIKA 1 and UIKA 2

The results of this data analysis were generated from a questionnaire distributed by the author to users of BTS Transpakuan Bus Stops at UIKA 1 and UIKA 2 stops. The number of respondents was determined to be 100 respondents based on the Slovin formula with an error rate of 0.01.

Based on the reliability of bus stop services

Table 5. Discussion of trust in the reliability of bus stop services

No	Questions	Precentage	Average
1.	P1	61%	
2.	P2	81%	67%
3.	P3	58%	

The trust of users of UIKA 1 and UIKA 2 bus stops is very good all the time with a trust level of 61%, while the trust level for the length of waiting and the punctuality of arriving at the bus stop has the highest trust level of 81%. Users of UIKA 1 and UIKA 2 bus stops questioned the facilities of this bus stop with a trust level of 58%, this is still low and below the average trust level of bus stop users.

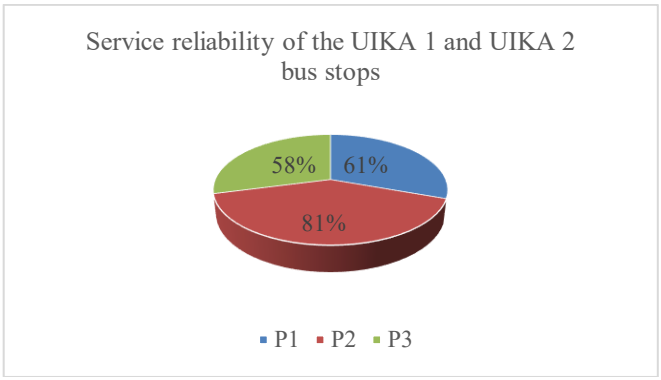

Figure 25. Percentage of reliability of bus stop services at UIKA 1 and UIKA 2. Source: Data processing results, 2024

Based on bus stop service consistency

Table 6. Discussion of trust in bus stop service consistency

No	Questions	Precentage	Average
1.	P4	62%	
2.	P5	56%	61%
3.	P6	65%	

The trust of users of UIKA 1 and UIKA 2 bus stops is only 62% towards the provision of accurate and up-to-date information about the BTS Transpakuan bus route. The consistency of bus stop services is less consistent over time and gets trust only 56%. While the reliability of the bus stop to serve users is better at 65%.

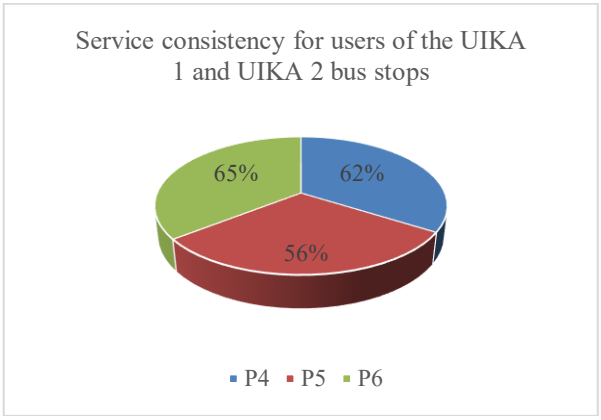

Figure 26. Percentage of service consistency of users of UIKA 1 and UIKA 2 bus stops. Source: Data processing results, 2024

Based on Security and Safety of Bus Stop Services

Table 7. Discussion of beliefs about the security and safety of bus stop services

No	Questions	Precentage	Average
1.	P7	66%	
2.	P8	79%	61%

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Users of UIKA 1 and UIKA 2 bus stops feel comfortable at the bus stops with the facilities provided by answering 66%. BTS Transpakuan bus stops pay attention to passenger safety with a trust level of 79%.

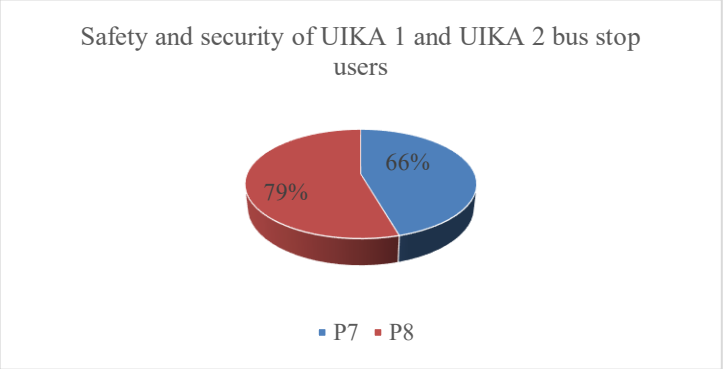

Figure 27. Percentage of security and safety of users of UIKA 1 and UIKA 2 bus stops Source: Data processing results, 2024

Based on credibility and general trust in bus stop services

Table 8. Discussion of trust in credibility and general trust in bus stop services

No	Questions	Precentage	Average
1.	P9	43%	
2.	P10	56%	55%
3.	P11	67%	

The trust of users of UIKA 1 and UIKA 2 bus stops towards the bus stop management is very low, which is 43%. The comfort of users of UIKA 1 and UIKA 2 bus stops for their trips is also still lacking, which is 56%, this has an impact on the quality of bus stop services. Meanwhile, users consider that the quality of the designed bus stops is better with a level of trust of 67%.

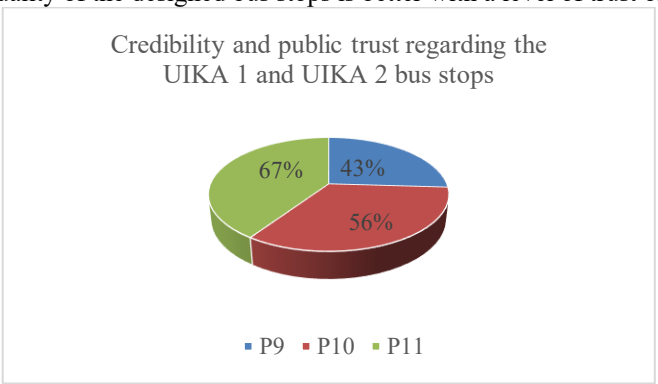

Figure 28. Percentage of credibility and general trust of users of UIKA 1 and UIKA 2 bus stops. Source: Data processing results, 2024

Based on the analysis of user satisfaction responses at UIKA 1 and UIKA 2 bus stops, it was found that user accessibility was better and easier to reach by 80%. Meanwhile, the general impression of the condition of the bus stop was very low, which was 42%, this requires more intensive handling by bus stop users so that they can be trusted by the public so that there is an increase in public trust. The level of service with the highest user trust is the security of waiting at the UIKA 1 and UIKA 2 bus stops, because it is right in front of the UIKA Bogor campus gate, which is 79%. Meanwhile, the punctuality of waiting for the bus and the arrival of the BTS Transpakuan bus was very punctual, which was 815. This proves that BTS buses are still very trusted and needed by users.

CONCLUSION

Based on the results of the analysis that has been carried out on users of the BTS Transpakuan bus stop, the following conclusions are drawn: 1) The results of the analysis of the effectiveness of the BTS Transpakuan bus stop are very effective, as evidenced by the number of users from 100 respondents dominated by women at 69% and men at 31%. The highest number of students is 74% and students at 11%, while the age range of 15-25 years is the highest at 85%, 2) The satisfaction of users of the UIKA 1 and UIKA 2 bus stops is better user accessibility and easy to reach at 80%. While the general impression of the condition of the bus stop is very low at 42%, this requires more intensive handling by bus stop users so that they can be trusted by the community so that there is an increase in community trust. Ultimately, it is necessary to evaluate whether the revitalized UIKA 1 and UIKA 2 bus stops genuinely improve public transport performance, rather than simply assessing whether users like the facilities. Future development should focus on integrating IoT sensors, AI-based decision support systems, and digital passenger information services to create a smarter, more efficient, and sustainable public transportation system.

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