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Modelling User Perception of Sustainable Public Transportation in Kodagu District

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ABSTRACT

This study aims to determine the perception of sustainable transportation in the Community using public transport in Kodagu Data was collected from the passenger of the Karnataka road transport corporation (KSRTC) . The method used was a qualitative method of distributing questionnaires to respondents. The sample used inthis data was passengers on KSRTC routes of corridors 2,3 and 4, and passengers on KSRTC Muffsil route A, D and C in the city of kodagu. The data were analyzed by using SEM (Structural Equation Modeling) via the Smart PLS 2.0 M3 software. The variables reviewed included of reliability, comfort, security, timeliness and generosity. Based on the evaluation results of the measurement model, there were 34indicators met the 40 initial indicators. The 34 indicators affect the respective variables significantly while 6 indicators did not influence their respective latent variables significantly. Latent variables, namely reliability and comfort had a significant effect on transportation sustainability, while security, generosity and timeliness did not show a significant influence on the sustainability variable of transportation. From the description of these conclusions, it is expected that there were good policy directions so that an effective and efficient public transportation system that meets the requirements for sustainable transportation will be created in the future.

Keywords: Perception, sustainable Transportation, public transportation.

1. INTRODUCTION

Transportation is an important part of national socio-economic and sustainable development that can produce positive and negative effects on the environment and quality of life depends on the level of development and indicated preferences. Modern interpretations of sustainable city development require a reduction in the use of private cars through improving the quality of public transportation services [1].

The need for transportation services is qualitative and different characteristics as a part of the time, the aim of the trip, the frequency of trips, the types of goods transported and others. The need for movement is derivative needs, the movements occur because of the process of meeting the demands. Fulfillment of needs usually must be performed every day, such as work, education, health, and sportsmen, because of that transportation facilities and infrastructure are needed in supporting the process of filling those needs [2]. Social facilities, entertainment facilities, shopping centers and offices which are places for meeting daily needs must be spread evenly in an urban area, so that the distance from housing to various locations becomes shorter. The farther we move, the higher our chances of contributing to congestion in the urban center. This also means adding transportation costs, as well as environmental problems. Current transportation is mostly based on burning fossil fuels, establishing it a source of aviation pollution, noise pollution and loss of land and open place. Even so, the movement of goods and people is very important for societal and economic development; this allows trade and provides chances for employment, training and recreation. Therefore, there is a need for sustainable mobility [3].

The social dilemma perspective views of the transportation as a result of unfavorable preferences for short-term profits by private car users at the expense of long-term losses to the community. An approach to measuring quality of life, its relation to alternative sustainable transportation, and potential implications for informing policy, are considered. Transportation can be a means of achieving social policy goals, namely by providing access to participation that can lead to equality. Good transportation system must be designed to provide sufficient services, both to the public in general and personally. These services include security, comfort, speed, accuracy, and can be relied on by its users [4]. In summation to the things mentioned above, of course, users expect satisfaction and low cost of travel. Inadequate transportation system causes mass transportation modes to be difficult to access. This can result in social

exclusion and encourage ownership of private motorized vehicles for people along the fringes of the metropolis. Since the transportation system is very important, so the transportation system must fit with a sustainable transportation system, such as environmentally friendly transportation, low cost or affordable and also efficient, thus the generated impact can be minimized, including the social impact [5].

Reliability is regularly quoted by users of public transportation as one of the most important quality services. A San Francisco study considers that the general strategy for dealing with it cannot be relied on using services and routes that are considered more reliable and using real-time information. In addition, customers disclose unreliable past experience with a reduction in estimated transit usage, namely delays and long waits at the point of transfer. These results have implications in transit planning: passengers may prefer services more often and quickly. In addition, increasing use of real-time information services will continue to influence the way people view transit services and may even intensify the unattractive service that is rare [6]. This study tries to conduct an in-depth study in order to

analyze the public's perception of sustainable transportation for users of public transportation in urban areas in kodagu. There are 5 (five) main variables used to assess the public perceptions sustainable public transport users, respectively, reliability, comfort, safety and timeliness and generosity, each variable consists of 7 indicators. This study aims to determine the user perception of sustainable public transportation in kodagu.

2. METHOD

This research includes applied research, which is a research that is expected to be able to answer certain questions so that it can provide solutions to the problems associated with this research. The study was conducted with an interview system over public transport both KSRTC and KSRTC users, using questionnaires that had been designed and prepared in advance. The data collected can be either primary or secondary data. Before the data is collected first, a questionnaire is made which is adjusted for the purpose of this study. The questionnaire made is based on variables that can provide an overview of the public perceptions of users of public transportation about sustainable transportation, so that the policies taken by transportation managers in the future will pay attention to aspects of sustainable transportation. After the questionnaire is ready, then a survey is conducted in order to obtain the necessary data.

The collected data is then grouped and then tabulated in order to facilitate the processing of the data. The processed data is then validated to see whether the data meets or not. Data that does not fulfil is not used in the analysis, while the data that satisfies is then analysed in such a way as to be followed by discussion so that conclusions and recommendations are obtained. This study took a case study in the city of Madikeri was chosen as the study location, because the Madikeri City is the gateway to the all other parts of Kodagu, also including trade cities, Industrial cities, Education cities, Services cities, and tourism cities. Apart from these reasons Madikeri City is also one population of more than 30,000 people with an area of 1,150 m Sampling is done randomly (random sampling). The data were obtained by conducting interviews based on the prepared co commissioners on the passengers (users) of public transportation, both KSRTC muffasil and KSRTC.

Data collection in the form of research samples was conducted in January 2020, which began with collecting preliminary data in the form of data on the average number of passengers both KSRTC muffasil and KSRT , this preliminary data collection was intendedto determine the size of the population considering data Secondary existing cannot clearly describe the existing population. From the preliminary survey, the number of routes operating as many as 17 routes, namely each route (A, B, C, D, E, F, G, H, I, J, S, B1, C1, E1, F1, R1 and W) and the KSRTC corridors that operate as many as 11 corridors, namely each corridor (1, 2, 3, 4, 5, 6, 7, 8, 9, 10 and 11), but this research takes samples for each route and corridors, as follows. Six routes consisting of 3 muffasil and 3 KSRTC were selected purposefully, then the sample was carried out using the stratified cluster sampling technique with Slovin formula. The selected total sample was 207 persons.

Data collected from survey results were then grouped into several categories and tabulated so that it will simplify the analysis. Secondary data obtained from various literatures that are related and can support this research, these data include; population, population growth rate, population density, economic growth, administrative map, number and length of routes for Muffasil bus stand number and length of corridors for KSRTC, length of the road and condition, the number of vehicle ownership, area, activity system, the price of transport fares generally applies.

Analysis of the data used in this study is generally divided into two, namely: Qualitative Desk Analysis. This analysis is used to describe the public's perception of sustainable transportation, then to measure public perceptions of users of public transport, a factor analysis is conducted based on the questionnaire that has been filled. The factor analysis method is used to analyse respondents' perceptions of existing service attributes. Answers provided for perception data

from respondents in the form of opinions about the importance of these variables according to respondents using a Likert scale, then processed using Structural Equation Modeling (SEM) Analysis. The steps in this research are as follows: Identification of samples is done using the calculation algorithm and bootstrapping method developed by Geisser & Stone. At this stage it is used to find out how many indicators / questions will be used and which will be dropped out by knowing the value of structural coefficients in the interval parameters of the algorithm & bootstrapping results, indicators / questions that have a coefficient <0.5 will be dropped - out. Obtaining a model based on the concepts and theories to design structural models, the design of a structural model of the relationship between latent variables is based on theformulation of the problem.

The design of the measurement model determines the type of indicator of each latent variable, whether reflective or formative. In this study the nature of the indicators of each of the latent variables used is formative. A path diagram was developed to explain the pattern of the relationship between latent variables and indicators. Path diagrams was developed into structural model equations and measurement models. The estimation of SEM modeling parameters is obtained through a three-stage iteration process using Ordinary Last Square (OLS). Perform goodness of fit evaluation. Evaluation of SEM models of the measurement model (outer model) is evaluated by looking at validity and reliability.

3. RESULTS AND DISCUSSION

Based on the results of the research obtained that the data with endogenous latent variables, namely transportation sustainability are measured through exogenous latent variables namely Reliability, Comfort, Security, Generosity and Timeliness. The five variables, each have indicators that influence it. Data obtained as in the appendix of this study, then processed using the Partial Least Square (PLS) method as an analysis tool with the help of SmartPLS 2.0 M3 software. For this case, we will examine how the influence of these five exogenous latent variables on sustainable transportation. The loading value λ and the value of ɣ are obtained by estimating using the smart PLS program. This value is done for testing the model. For testing the measurement model (outer model) is done by looking at whether the value of the loading factor indicator meets convergent validity. Validity test was conducted with the aim of knowing the accuracy and reliability of the questionnaire which means that the questionnaire can measure what should be measured. The terminations of this test adequately reflect the subject being studied. The validity test was proven by the SEM (Structural Equation Modeling)

program by seeing at the Pearson's Product Moment (PPM) correlation for each program line item with a total test score.

Proving the robustness of each index number that measures each latent variable Reliability, Security, Comfort, and Timeliness are done by paying attention to the results of psychoanalysis based on outer loadings (measurement model) or the convergent validity of each manufacture. To determine the robustness of each KSRTC and muffasil indicator, data were presented in the bellow table (Table 1). There were 6 indicators of endogenous latent variables that have a value of <1.645 and 29 indicators that have a value> 1.645. Indicators on exogenous latent variables (sustainable transportation) all have values> 1.645. Therefore, all indicators used to measure the latent variables Reliability, Comfort, Security, Generosity, Timeliness and Transportation Sustainability there are 34 statistically significant indicators and 6 nonsignificant indicators, but overall, all have convergence validity for measuring variables latent respectively. In addition to the validity of indicators, it is also necessary to pay attention to discriminant validity and construct validity. To measure discriminatory validity, the results of the analysis of the indicator lodging values for the construct or cross loadings are used. In addition to that value, discriminant validity can also be measured based on the value of correlations of the latent variables and rootAVE.

Table 1 Result for Outer Loadings (mean, STDEV, and T Statistics) public transportation (KSRTC and MUFFASIL bus)

	Original Sample (O)	**Sample Mean (M)**	**Standard Deviation (STDEV)**	**Standard Error (STERR)**	**T Statistics (|O/STERR|)**
X1.1 <- X1	**0.86**	**0.86**	**0.02**	**0.02**	**34.50**
X1.2 <- X1	**0.73**	**0.73**	**0.06**	**0.06**	**12.21**
X1.3 <- X1	**0.77**	**0.77**	**0.04**	**0.04**	**21.66**

X1.4 <- X1	**0.79**	**0.79**	**0.05**	**0.05**	**16.67**
X1.5 <- X1	**-0.26**	**-0.26**	**0.09**	**0.04**	**2.86**
X1.6 <- X1	**0.78**	**0.78**	**0.05**	**0.04**	**16.67**
X1.7 <- X1	**0.88**	**0.88**	**0.04**	**0.13**	**23.57**
X2.1 <- X2	**0.54**	**0.54**	**0.04**	**0.14**	**3.70**
X2.2 <- X2	**0.45**	**0.45**	**0.02**	**0.04**	**2.84**
X2.3 <- X2	**0.41**	**0.41**	**0.11**	**0.11**	**19.62**
X2.4 <- X2	**0.45**	**0.45**	**0.03**	**0.03**	**40.27**
X2.5 <- X2	**0.45**	**0.45**	**0.06**	**0.06**	**0.17**
X2.6 <- X2	**0.85**	**0.85**	**0.11**	**0.11**	**34.64**
X2.7 <- X2	**0.95**	**0.95**	**0.03**	**0.03**	**10.99**
X3.1 <- X3	**0.71**	**0.71**	**0.06**	**0.06**	**35.39**
X3.2 <- X3	**0.45**	**0.45**	**0.02**	**0.02**	**1.82**
X3.3 <- X3	**0.54**	**0.54**	**0.13**	**0.13**	**0.68**
X3.4 <- X3	**0.45**	**0.45**	**0.14**	**0.14**	**0.86**
X3.5 <- X3	**0.85**	**0.85**	**0.15**	**0.15**	**46.59**
X3.6 <- X3	**0.45**	**0.45**	**0.02**	**0.02**	**19.29**
X3.7 <- X3	**0.36**	**0.36**	**0.04**	**0.04**	**27.94**
X4.1 <- X4	**0.95**	**0.95**	**0.01**	**0.01**	**75.75**
X4.2 <- X4	**0.93**	**0.93**	**0.04**	**0.04**	**23.34**
X4.3 <- X4	**0.85**	**0.85**	**0.03**	**0.03**	**27.34**
X4.4 <- X4	**0.13**	**0.13**	**0.11**	**0.11**	**1.20**
X4.5 <- X4	**0.94**	**0.94**	**0.01**	**0.01**	**66.73**
X4.6 <- X4	**0.96**	**0.96**	**0.02**	**0.02**	**63.73**
X4.7 <- X4	**0.94**	**0.94**	**0.02**	**0.02**	**58.71**
X5.1 <- X5	**0.37**	**0.37**	**0.12**	**0.12**	**3.06**
X5.2 <- X5	**0.14**	**0.14**	**0.15**	**0.15**	**0.99**
X5.3 <- X5	**0.90**	**0.90**	**0.01**	**0.01**	**46.51**
X5.4 <- X5	**0.81**	**0.81**	**0.01**	**0.01**	**15.61**
X5.5 <- X5	**0.68**	**0.68**	**0.10**	**0.10**	**1.21**
X5.6 <- X5	**0.91**	**0.91**	**0.02**	**0.02**	**94.87**
X5.7 <- X5	**0.63**	**0.63**	**0.09**	**0.09**	**7.07**

Y1 <- Y	**0.92**	**0.92**	**0.02**	**0.02**	**50.17**
Y2 <- Y	**0.80**	**0.80**	**0.06**	**0.06**	**7.14**
Y3 <- Y	**0.99**	**0.99**	**0.02**	**0.02**	**58.27**
Y4 <- Y	**0.63**	**0.63**	**0.52**	**0.52**	**13.52**
Y5 <- Y	**0.65**	**0.65**	**0.25**	**0.25**	**46.57**

Cross loading is useful for assessing whether constructs have adequate discriminate Validity, namely by comparing the indicator correlation of a construct with other constructs. If the construct indicator correlation has a high value compared to the correlation of the indicator to other constructs, then the construct has high discriminant validity.

3.1. Discriminant Validity

To measure discriminatory validity, the results of the analysis of the indicator lodging values
for the construct or cross loadings are used. In addition to that value, discriminant validity can also be measured based on the value of correlations of the latent variables and root AVE. showed that construct indicator correlation has a higher value than the correlation of the indicator to other constructs. Thus, it could be concluded that the indicators of each construct give a high convergent value of validity. So even with the cross-loading value
showed good discriminant validity.

Discriminant validity can be seen in cross loading. Another way to assess discriminant validity is to compare Square Root of Average Variance Extracted (AVE) for each construct with a correlation between the construct and the other constructs in the model. The model has sufficient discriminant validity if the root AVE for each construct is greater than the correlation between constructs and other constructs. The AVE values range from 0.43 – 0.74 (Table 3). From the results of the analysis it is known that the value of R Square was 0.92, while redundancy was 0.15.

Table 2 Quality Criteria Overview ksrtc and Muffasil

	AVE	Composite Reliability	Cronbachs Alpha	Communalit
X1	0.56	0.87	0.80	0.56
X2	0.44	0.82	0.75	0.44
X3	0.46	0.81	0.76	0.46
X4	0.74	0.95	0.92	0.74
X5	0.43	0.64	0.60	0.43
Y	0.71	0.92	0.89	0.71

The values obtained in the previous tables can be clearly explained in the following table

4. The root value of AVE> 0.5, that means that all the variables in the model estimated meet the criteria of discriminant validity

Reliability test was a reliability test that aims to find out how far a measuring instrument can be relied on or trusted. Reliability related to the estimation of the extent of a measuring instrument, when viewed from the stability or internal consistency of the answer or statement if the observer is repeated. Moreover, a measuring instrument was used repeatedly and the results obtained are relatively consistent so the measuring instrument is considered reliable (reliability).

Reliability testing of all items or statements used in this study was used the Cronbach Alpha formula (Cronbach alpha coefficient), which is generally considered reliable if the Cronbach alpha value is> 0.6.

Table 3 The AVE scores and root of AVE scores for KSRTC and Muffasill

Variable	AVE	√AVE
Reliability	0.56	0.75
Convenience	0.44	0.67

Security	0.46	0.67
Price	0.74	0.86
Punctuality	0.43	0.66
Sustainable transportaton	0.71	0.84

3.2. Reliability of KSRTC and MUFFASIL

Reliability test in PLS was done by looking at the composite Reliability value of the indicator block that measures the construct. The composite Reliability result showed a satisfactory value if above 0.7 or close to 0.7. The following is the composite Reliability KSRTC and Muffasil in the following Smart PLS output. The Composite Reliability value for all constructs was greater than 0.7 or close to 0.7 which indicates that all constructs in the estimated model have high reliability and meet reliable criteria.

Table 5 Composite Reliability ksrtc and Muffasil

variable	**Composite Reliability**
Reliability	0.87
Convenience	0.82
Security	0.81
Price	0.95
Punctuality	0.64
Sustainable transportation	0.92

Test reliability was also usually reinforced with Cronbanch's Alpha where the value was said to be good if $\alpha \geq 0.5$ and was said to be sufficient if $\alpha \geq 0.3$ (Table 6). Following was the output of Cronbach's Alpha from software SmartPLS. In table 8, it can be seen that the Cronbach's Alpha value for all constructs was more than 0.5. Thus, it can be concluded that all variables have good reliability.

After describing the validity and reliability of the measuring variables of each latent variable, the structural models and measurement models are then described. Therefore, based

on the description and explanation of the model criteria, the model can be formed as follows: The measurement model was a model that builds the relationship between latent variables and their indicators. In this study, all latent variables had a relationship with indicators informative form only.

Table 4 Cronbach's Alpha KSRTC and Muffasil

Variable	**Cronbach's**
Readability	0.89
Convenience	0.845
Security	0.91
Price	0.97
Punctuality	0.86
Sustainable Transportation	0.89

The outer weight significance test was carried out as the second stage of evaluation of the measurement model with formative indicators. The value of the outer weight research can be seen in the following table. For the value of the outer weight indicators on all latent variables there were 6 indicators 1.645. This showed that 34 indicators significantly contribute to measuring their respective latent variables and the 6 indicators did not significantly contribute to measuring their respective latent variables.

Other study confirm that service quality has a direct effect on the intention to use public transport more and this effect influence both the intention to use one's own car less and the intention to use sustainable means of transportation such as car-sharing more [7]. Sustainable transportation systems must provide broader public transport services, and pay attention to comfort, security, reliability and attractiveness, so that passengers will have more choices, between better quality public transport modes, in terms of comfort, reliability and flexibility [8]. These service qualities (accessibility; reliability; safety; comfort) improve the productivities for the passenger [1]. From the description of these conclusions, it showed that these results made sense because most public transport users assume that if public transport was reliable and creates a sense of comfort for passengers, all other variables will contribute

significantly to the sustainability of transportation. From the description of these conclusions, it was expected that there were good policy directions so that an effective and efficient public transportation system that meets the requirements for sustainable transportation will be created in the future.

4. CONCLUSION

Based on the evaluation results of the measurement model, there were 34 indicators met the 40 initial indicators. The 34 indicators affect the respective variables significantly while 6 indicators did not influence their respective latent variables significantly. The latent variables namely reliability and comfort had a significant effect on transportation sustainability, while security, generosity and timeliness did not show a significant influence on the sustainability variable of transportation. From the description of these conclusions, it was expected that all stakeholder including government establish good policy directions to foster public transportation system specially to improve security, price, and punctuality for sustainable transportation in the future.

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