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**EFFECT OF INTEGRATED TICKETING ON SUSTAINABLE
MOBILITY IN THE MATATU SACCOS IN NAIROBI COUNTY,
KENYA**

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**EFFECT OF INTEGRATED TICKETING ON SUSTAINABLE MOBILITY IN THE
MATATU SACCOS IN NAIROBI COUNTY, KENYA**

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Abstract

Purpose: The purpose of this study was to establish the effect of integrated ticketing on sustainable mobility in the Matatu Saccos in Nairobi County, Kenya.

Materials and Methods: The study was guided by Positivism philosophy while descriptive research design was adopted. The target population was 177 Sacco Managers and two representatives, one from MOT and other from MVOA respectively. The whole population of 179 respondents was used in the study hence; the study employed the census approach. The questionnaire was pilot tested on 18 respondents who were selected randomly. The study applied Cronbach's alpha and the results displayed a high level of internal consistency hence infers that the research tool used in the study was reliable. The data collection instrument was a semi-structured questionnaire, which were dropped and picked later. A semi-structured interview guide was also used. Data was analysed using descriptive and SPSS Version 24.

Results: Correlation analysis indicates that there is a strong positive and significant relationship between integrated ticketing and sustainable mobility of Matatu Sacco in Nairobi County. ($\rho = 0.809$, p value <0.05). Regression analysis also showed that in general, integrated ticketing is significant in explaining the variation in sustainable mobility of Matatu Sacco's in Nairobi County, Kenya ($\beta = 1.046$, $t = 15.872$, $p < 0.05$).

Unique contribution to theory, practice and policy: The study recommends recommended that, the Ministry of Transport and the management of the Saccos should formulate substantial policies on how to handle ticketing where the government imposes control of fares. This ensures that there is functional guidance on charging the passengers, which would, in turn, improve customer satisfaction and improve company image.

Key words: *Integrated Ticketing, Sustainable Mobility, Matatu Saccos*

1.0 INTRODUCTION

Integrated ticketing is a single ticket that allows passengers to make a complete journey, making transfers within and even using different modes. Integrated ticketing is classified in several types such as special event, multi journey, weekly, group ticket or single operator tickets. The ticket is categorized depending on the type of transport to use, location travelling or type of technology used (Bak & Borkowski, 2010). According to Abate (2009) paper tickets are more expensive to maintain and also needs some intervention for them to be valid. Authority backed by operator strives to make the use of ticketing system accessible and affordable. The International Association of Public Transport (2007) striving to combine forces with other operator to ensure that they offer quality services and encourage the use of public transport by making it more attractive as compared to the car and providing chances of knowing the flow and patterns of passengers to enable them give their best.

To facilitate the use of public transport, cities aim at making the ticketing system as easy and attractive as possible. Commonly grouped under the term integrated ticketing, pricing structures and information are coherent between different public transport operators and are valid for all modes in one specific region. Integrated tickets are not necessarily smart (regarding the technology); but they safe on time, are more affordable and easily accessible (AECOM, 2011).

Several studies that exist have examined the impacts of tariff integration on public transport demand. Bak and Borkowski (2010) analyzed the impact of an integrated season ticket in Switzerland from 1971 to 1996 and concluded that the extension to an inter-operator transferable ticket in the city of Bern significantly affected the demand positively. A study by Matas (2004), conducted in the years between 1979 and 2001, had similar conclusions. In the greater Madrid region, the introduction of a travel card for the whole transport network led to demand growth rates of 7% to 15% in the long run. Felleson and Friman (2012) noted that integrated tariff systems in 69 Italian cities, carried out in the years 1991 to 2002, exerted a demand increase in the usage.

Additionally, it indeed seems that integrated ticketing schemes facilitate the combination of modes and the transfer between them. Integrated ticketing in their electronic version schemes may extended to other applications, for example as major entertainment and touristic sites, making it also more interesting for other customer groups. In line with this, most European cities try to introduce integrated ticketing schemes that personalized travel cost through consideration of the most frequent journey. Another important aspect regarding integration is to have easy access to information timetables and tariffs, irrespective of different operators being involved. Ferrecchi (2013) defines a payment system as interoperable if “it is not dependent on one organization but is open and allows as many as necessary interested parties to join.” In other words, the key benefit of integrated ticketing is that several operators are working together and combine their products on a single card, ideally throughout different operating regions. Even though integrated ticketing is a going concern in various countries in Africa, implementation status is very heterogeneous; border-crossing applications are rare (Abrate, Piacenza & Vannoni, 2009). It is important to note that integrated (multi-mode, multi-operator) fare schemes are initiatives taken or at least endorsed by transport authorities to make travel by Matatu Sacco affordable and easy.

Integrated ticketing is a way of making ticketing system more attractive and easy for the passengers (WB, 2006). In this context, Abrate (2009) conducted a study on the impact of integrated ticketing systems (ITS) in public transport in Italy. The target population was 69 Italian public transit providers. The study revealed that the impact due to the ITS introduction was on average quite small, but became more relevant when the ITS was characterized by specific factors making it more attractive for potential users, such as the availability of a single ticket option and the application of zonal pricing schemes. Buehler and Pucher (2012) argues that public transport has been more successful in Germany than in the USA. Buehler and Pucher (2012) explains that application of coordinated strategic integration that include information to the commuters, attractive fare and convenient ticketing, full multimodal and infrastructure integration has contributed to the success.

Himwana (2012) conducted a study on integrated ticketing system of public transport in Jakarta verse Varmland, Sweden on the performance of the public transports. By analyzing data from a survey of 100 passengers, the study gave a description and explanation relating characteristics, travel behaviour of passengers, and concluded that there was significant improvement in the Varmland after the introduction of integrated ticketing. The contextual gap is that the study was done in Sweden, a developed country with a different transport policy from Kenya.

Streeting and Barlow (2007) investigated on key drivers of public transport patronage growth in Australia. The study found that the introduction of full fares and advance ticketing integration, improved service coordination and a range of marketing and communications initiatives. The contextual gap is that the study was conducted in Australia, a developed country with a different transport system from Kenya. Trepanier, Chapleau and Transchant (2007) carried out a study on the use of smart card technologies to measure public transport performance in Brisbane, Australia where observation of two buses performance done for two days, revealed that the usage of the smart card, reduced travel time and fare. The conclusion was that the smart card was effective, provided a reliable service, and was user friendly, faster, easy to use, able in tracking fraud and therefore useful in a wide range of different sectors, and finally supports different fare types at the same time. The contextual gap is that the study was based in Australia, a developed country. The conceptual gap is that the study focuses on smart card technologies and public transport performance.

1.1 Statement of the Problem

Matatu Saccos dominates the main transport in Kenya and especially the urban sector accounting for over 80% of the country's total passenger transportation. The sector is a pillar in the development of the economy in the country through direct and indirect employment as well as promoting individuals who offer other services in the transport sector. The Matatu Sacco is not only preferred choice for many commuters but the only option to those commuters who do not have the luxury of owning their own vehicle since it has an elaborate transport network of routes which transverse the whole country. The significance of the Matatu Sacco sector in economic creation cannot be gainsaid. The sector is the fifth largest contributor of formal employment and the fourth largest contributor of informal sector jobs in Kenya (Republic of Kenya, 2011). In spite of the significant role played by the Matatu Sacco in Nairobi County and the Country at large, the sector is associated with several challenges. Among the challenges are lack of sustainable mobility with the following ripple effect of traffic jams and death, dangerous driving behaviour,

environment pollution, economic problems and social issues affecting the cities and the life of the city dwellers with an equal breath.

Despite the many interventions carried out by the government to streamline the Matatu Sacco to attain sustainable mobility, the situation persists. The government has established several bodies like NTSA, TLB, KeNHA, KURA, NAMATA, among others to create synergy in the sector. Other interventions such as the marking and mapping out of the red lane (lip stick lanes) on Thika and Mombasa road, and the free-car plans for two days, the situation is still grim. The implementation of the famous Michuki laws (via legal notice No. 161 of 2003) gave a form of normalcy and orderliness for a time, but its fading with time. Finally, the registration of all Matatu into Saccos or companies is bearing fruits as they have developed terms of service and codes of conducts for their owners and Sacco managers. The duo and other stakeholders have a potential of transforming. Through its operation, the Matatu Sacco have always suffered the love- hate relationship with the players and its absence in the streets of Nairobi during strikes makes the city to come to a standstill and this provokes the following questions. “Is banning the services offered by Matatu Saccos in Nairobi County the solution?” “Or having the two car free days?” “Or is strategic transport integration and sustainable mobility the only option for the Matatu Saccos?” is it the option what will give the Nairobians an end to the Matatu nightmare? Given the above-illuminated gap, the researcher was motivated to carry out this study, entitled Strategic Transport Integration and Sustainable Mobility on Matatu Saccos in Nairobi County, Kenya.

2.0 METHODOLOGY

The study was guided by Positivism philosophy while descriptive research design was adopted. The target population was 177 Sacco Managers and two representatives, one from MOT and other from MVOA respectively. The whole population of 179 respondents was used in the study hence; the study employed the census approach. The questionnaire was pilot tested on 18 respondents who were selected randomly. The study applied Cronbach's alpha and the results displayed a high level of internal consistency hence infers that the research tool used in the study was reliable. The data collection instrument was a semi-structured questionnaire, which were dropped and picked later. A semi-structured interview guide was also used. Data was analysed using descriptive and SPSS Version 24.

3.0 RESULTS

3.1 Descriptive statistical Analysis Results

3.1.1 Descriptive Statistics on Integrated Ticketing

The study examined the effect of integrated ticketing on sustainable mobility of Matatu Saccos in Nairobi County. The respondents were required to indicate the level of agreement on aspects of integrated ticketing. The components included; single ticketing, advance ticketing, discriminative ticketing, and standard fare. Means and standard deviation values were sought to aid the study in making pertinent inferences. Findings from the analysis are as tabulated in Table 1.

Table 1: Descriptive Statistics on Integrated Ticketing

	Percentage (n=135)					Mean	Std. Dev
	SD	D	N	A	SA		
Allowing customers to pay in advance enhances competitiveness	6.7	8.9	21.5	28.9	34.1	3.7	1.2
Introduction of discriminative pricing increases public image of Matatu Saccos	7.4	8.9	23.7	36.3	23.7	3.6	1.2
Single ticketing encourages the use of Matatu Sacco's in public transport and thus enhances competitiveness	5.9	8.1	21.5	35.6	28.9	3.7	1.1
Introduction of standardized fares increases customer satisfaction	4.4	3	32.6	35.6	24.4	3.7	1.0
Overall average						3.7	1.1

**SD- Strongly Disagree, D- Disagree, N-Neutral, A-Agree, SA-Strongly agree*

The study findings as showed on table 4.29 indicates that the majority agreed that integrated ticketing has effect on sustainable mobility of Matatu Saccos in Nairobi County (mean = 3.7, standard deviation = 1.1). Secondly, majority 34.1 percent strongly agreed, 28.9 percent agreed, that single ticketing encourages the use of Matatu Sacco's thus enhancing competitiveness. The response has a mean of 3.7 and a standard deviation of 1.0 which means that the respondents agreed with the statements. Thirdly, majority 36.3 percent agreed, and 23.7 percent strongly agreed that the introduction of discriminative pricing increases public image of Matatu Saccos. Finally, 35.6 percent agreed, and 24.4 percent strongly agreed that introduction of standardized fares increases customer satisfaction.

The findings agreed with Himwana (2012) study in Sweden that introduction of integrated ticketing significantly improved the efficiency of transport sector. The findings also concurred with Puhe, Edelmann, and Reichenbach (2014) who reported that e-ticking increases reputation of Matatu Sacco's and improves ridership levels. The findings further concur with a report by Commission of the European Communities, (2011) that integrated ticketing as a high priority measure that helps to increase passenger intermodal and the attractiveness of Matatu Sacco's and thus encourages travelers to use more environmentally friendly modes of transport. The implication is that to enhance the use of Matatu Sacco's, cities should aim at making the ticketing sector attractive and easy to understand for all customers.

3.1.2 Integrated Ticketing Embraced by Saccos

The study sought to determine the type of integrated ticketing that the Sacco's understudy had embraced. The research findings were as presented in Table 2.

Table 2: Integrated Ticketing embraced by Sacco

	Frequency	Percent
Single ticketing	128	94.8
Discriminative ticketing	7	5.2
Total	135	100.0

The results on table 2 indicate that majority 128(94.8%) of the Sacco's had embraced single ticketing while only 7(5.2%) had embraced discriminative ticketing. The findings were in tune

with the study by Turner and Wilson (2010) which argue that integrated ticketing schemes aim at facilitating the combination of modes and the transfer between them by making the ticketing sector as easy and attractive as possible. The findings are also in line with Ollier and Ringquist (2013), who reported that the integration of tariffs, operators, and modes is proved to have a positive impact on transport demand. Recommendation is that the Matatu Sacco embraces E-ticketing to save on time thus improving on sustainable mobility of Matatu Sacco.

According to informant KI₁,

“Transport in Nairobi County can be improved by, collective-responsibility in creating of policies, the government and Sacco should come up with an institutional framework to manage the growth of PSV industry and also promote an integrated transport sector.”

Further, informant KI₂, recommends that transport in Nairobi County can be improved by;

“Having age limits on drivers in all modes of transport, having a strict implementation of Michuki rules, having a Matatu Sacco’s in a public-private partnership to enhance service delivery in the Matatu industry.”

The findings further support Streeter and Barlow (2007) who found that the introduction of full fares and advance ticketing integration, improved service coordination and a range of marketing and communications initiatives. This implies that adoption of integrated ticketing has the potential of creating effectiveness in the transport sector and provided reliability of services.

3.2 Factor Analysis

3.2.1 Factor Analysis for Integrated Ticketing

KMO and Bartlett’s test was adopted to show the interrelationship between attributes of integrated ticketing the findings are shown in Table 3.

Table 3: KMO and Bartlett's Test for Integrated Ticketing

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.716
Bartlett's Test of Sphericity	Approx. Chi-Square	121.616
	Df	6
	Sig.	0.000

In Table 4.16 KMO coefficient of 0.716, depicted that a sample of 135 was appropriate to execute exploratory factor analysis since KMO value was greater than 0.5. Further, Bartlett’s coefficient of 121.616 and p-value of 0.000 were obtained. Hence, there was significant interrelationship between attributes of integrated ticketing, and exploratory factor analysis was appropriate in the study. Total variance explained by integrated ticketing was summarized, as shown in Table 4.

Table 4: Total Variance Explained by Integrated Ticketing

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.269	56.735	56.735	2.269	56.735	56.735
2	0.785	19.628	76.363			
3	0.492	12.304	88.667			
4	0.453	11.333	100			

A maximum of one factor was obtained, the factor had Eigenvalue, which was greater than 1, and its extraction sums of squared loadings were greater than 1. Further, the extraction sums of

squared loadings of other factors were between the range of 2.269 and 0.453. Four factors were retained for subsequent analysis since their component loading was greater than 0.7. Figure 4.9 presents the Scree Plot showing Eigenvalue and variable components.

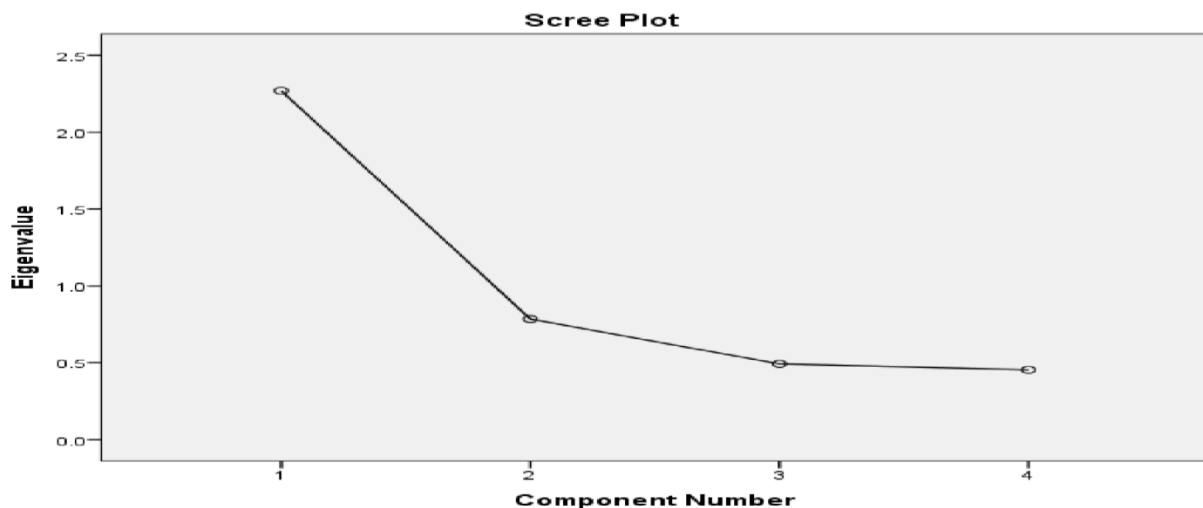


Figure 1: Scree Plot for Integrated Ticketing

The scree plot is a graph of the eigenvalues against all the factors. The graph is useful for determining how many factors to retain. According to the scree plot, 3 to 4 factors were retained because it is at the third factor that the scree plot takes an elbow shape as depicted in Figure 4.9. The component matrix in Table 4.18 shows that the factor loadings of integrated ticketing items ranged from 0.729 to 0.779.

Table 5: Extracted Components for Integrated Ticketing

	Component Loading
Allowing customers to pay in advance enhances competitiveness	0.729
Introduction of discriminative pricing increases public image Matatu Saccos	0.779
Single ticketing encourages the use of Matatu Sacco's in public transport and thus enhances competitiveness	0.733
Introduction of standardized fares increases customer satisfaction	0.771

Study findings in Table 5 revealed that all the four items met the loadings cut-off of 0.7 and were retained for analysis. The highest of 0.779 was for attribute on the introduction of discriminative pricing increases public image of Matatu Saccos, followed by 0.771 for introduction of standardized fares increases customer satisfaction, and the least was 0.729 for allowing customers to pay in advance enhances competitiveness.

3.3 Inferential Analysis of Integrated Ticketing on Sustainable mobility

3.3.1 Integrated Ticketing on Sustainable mobility

The evaluated the effect of integrated ticketing on sustainable mobility Matatu Sacco in Nairobi County, Kenya.

Table 6: Model Summary on the Effect of IT on Sustainable mobility of Matatu Saccos in Nairobi County

R	R Square	Adjusted R Square	Std. Error of the Estimate
0.809	0.654	0.652	0.659

Regression model summary results in Table 6 shows an R squared (R^2) of 0.654 which indicates 65.4 percent of the variation in sustainable mobility of Matatu Saccos in Nairobi County can be explained by integrated ticketing.

ANOVA results in Table 7 shows the model goodness of fit on the effect of integrated ticketing on sustainable mobility of Matatu Saccos in Nairobi County.

Table 7: ANOVA on the Effect of IT on Sustainable mobility of Matatu Sacco in Nairobi County

	Sum of Squares	Df	Mean Square	F	Sig.
Regression	109.312	1	109.312	251.921	0.000
Residual	57.711	133	0.434		
Total	167.022	134			

Further, the ANOVA results in Table 4.45, show that the F-statistics of the regression ($F_{(1, 133)} = 251.921$, which is statistically significant ($p < 0.05$). This implies that the coefficient integrated ticketing was not equal to zero, suggesting that the model fits the data significantly. The results in Table 8 show the regression coefficients results.

Table 8: Regression Coefficients on the Effect of IT on Sustainable mobility of Matatu Sacco in Nairobi County

	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
(Constant)	0.011	0.068		0.16	0.873
Integrated Ticketing	1.046	0.066	0.809	15.872	0.000

Table 8 shows that there exists a statistically significant positive relationship between integrated ticketing and sustainable mobility of Matatu Saccos in Nairobi County, Kenya ($\beta = 1.046$, $t = 15.872$, $p < 0.05$). An additional unit increase in integrated ticketing increase sustainable mobility of Matatu Saccos in Nairobi County by 1.046 units. Hence, the study failed to accept the null hypothesis (H_{04}) at 95% confidence interval by concluding, “Integrated ticketing has no significant effect on sustainable mobility of Matatu Saccos in Nairobi, Kenya.” These findings mirrored recommendations by Bak and Borkowski (2010) who examination recommendations by Abrate (2009) on benefits associated with use of paperless ticketing. The study argued that integrated ticketing does not only enhance management of transport companies but also promote customer satisfaction since situations of tickets pilferage will be mitigated. In addition, the study concurred with Redman et al., (2013) who recommended automated ticketing to enhance customers travel time management. The following regression model was obtained.

$$\text{Sustainable mobility} = 0.011 + 1.046 * \text{Integrated Ticketing} \dots\dots\dots (4.4)$$

4.0 SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Summary

The evaluated the effect of integrated ticketing on sustainable mobility of the Matatu Saccos in Nairobi County, Kenya. from the findings majority that is 60% agreed that introduction of discriminative pricing increases in public image of Matatu Sacco's. There was agreement among most respondents that single ticketing encourages use of Matatu Saccos and thus enhances competitiveness, and that introduction of standardized fares increases customer satisfaction. The research findings further indicate that most Sacco's had embraced single ticketing while only a few Saccos had embraced discriminative ticketing.

Correlation analysis indicated that there is a strong positive and significant relationship between integrated ticketing and sustainable mobility of Matatu Sacco in Nairobi County. ($\rho = 0.809$, p value <0.05). Regression analysis also showed that in general, integrated ticketing is significant in explaining the variation in sustainable mobility of Matatu Sacco's in Nairobi County, Kenya ($\beta = 1.046$, $t = 15.872$, $p < 0.05$).

Conclusion

The researcher concluded that on overall, integrated ticketing significantly influences the sustainable mobility in the Matatu Saccos in Nairobi County, Kenya. The researcher observed that allowing customers to pay in advance enhances competitiveness and that introduction of discriminative pricing increase public image of Matatu Saccos. The researcher also established that single ticketing encourages use of Matatu Saccos and thus enhances competitiveness. Also, introduction of standardized fares increases customer satisfaction. The following were the conclusions that single ticketing encourages use of Matatu Saccos and thus enhances competitiveness. The study concluded that introduction of standardized fares increases customer satisfaction. Thus, integrated ticketing should be emphasized at Sacco's to enhance the sustainable mobility in the Matatu Saccos.

Recommendations

From the findings, it was clear that single ticketing encourages the use of Matatu Saccos and thus enhances competitiveness and that introduction of standardized fares increases customer satisfaction. The study, therefore, recommended that, the Ministry of Transport and the management of the Saccos should formulate substantial policies on how to handle ticketing where the government impose control of fares. This ensures that there is functional guidance on charging the passengers, which would, in turn, improve customer satisfaction and improve company image.

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