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Relationship Between Informal Transport Service and Inter Urban Mobility in Developing Cities

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***Abstract*—** *An effective transportation system should be viewed as a catalyst for development and a means of bringing the whole economy together. The paper looks at the relationship between informal transport service and inter urban mobility in developing cities. The study employed survey design using questionnaire to collect sample from one hundred and seventy-seven (177) respondents from registered bus terminal in the study area, data was analyzed using inferential statistics. The regression analysis postulated for the study shows that informal transport contributes to urban mobility in terms of accessibility, affordability and reliability. The study concludes that informal transport services play a crucial role in complementing Inter-urban mobility in developing cities. However, it was recommended that, improve coordination and collaboration between informal and formal transport providers to enhance connectivity and accessibility for commuters should be encouraged*.

***Keywords*—** *Development, Informal Transport, Inter Urban Mobility, Public Transportation Management*.

I. INTRODUCTION

Transportation is the movement of people and things from one place to another, according to the World Bank Report (1975) (Okoko, 2006). In order to enhance mobility conditions, informal transportation is given more attention, particularly in developing cities. This is predicated on the introduction of new public transportation initiatives on how to integrate current informal service by bringing up new systems, such bus rapid transit (BRT) and cable cars, even if they have a considerable impact on urban surroundings and mobility patterns (Brand and Dávila 2011, Behrens 2014).

In many cities, these services continue to supply a sizable portion of public transportation (Salazar Ferro 2015). New informal services are occasionally prompted by the introduction of new formal systems, just as the reconfiguration of public transportation networks occasionally results in additional requirements if formal means aren't meeting all of the criteria for mobility (Arteaga 2012, Jirón 2013). The second rationale pertains to cities where informal transportation is the primary means of public transportation and is expected to remain so for the foreseeable future. In this case, the more pertinent question is how to gradually enhance the service in order to reduce some of its adverse impacts. The demand for public transportation is now greater than the supply because of the people's transportation demands are not always adequately met due to the world's fast urbanization and growing economic activity in developing nations. Many researchers (Vuchic, 2005; Sperling, 1995) who have studied the functions and negative effects of transportation in cities contend that transportation is a catalyst and agent responsible for both economic growth and decline, particularly in situations where human endeavor and financial resources are insufficient. Accordingly, an effective transportation system should be viewed as a catalyst for development and a means of bringing the whole economy together (Olorunfemi and Basorun, 2013). A well-functioning transportation system also serves to optimize the growth and advancement of cities' economies. System of public transportation offers the most effective way to move huge numbers of people, particularly in densely populated metropolitan areas. Apart from the welfare of its patrons, public transportation is essential to cities' productivity, which directly affects the economics of the countries (World Bank, 2001; Lyndon and Todd, 2006).

It is germane to also note that informal transport often fills the gaps left by formal systems, providing affordable and accessible options for transport users. However, it can generate concern for safety, traffic congestion and regulatory challenges. Understanding thus dyanmics requires examining factors such as socio – economic stutus, urban planning and government policies to create sustainable solutions for inter-urban mobility.

II. CONCEPTUAL REVIEW

2.1 Concept of Informal Transport Service and inter – urban mobility

Informal transport refers to transportation services that operate outside of formal regulatory frameworks and often without official licenses or permits. These services typically include mini buses, shared taxis, motorcycles and other modes of transportation provided by individuals or small groups. Informal transport plays a significant role in many developing cities, offering flexible, affordable, and often more accessible options for commuters, especially in areas underserved by formal transportation systems.

According to Stackey and Hire (2014), over half of the world's population resides in cities, and this percentage is predicted to rise. Urban cities cannot achieve their current level of development without a sustainable and workable transport management system, which calls for enhanced public transportation, traffic control, an intermodal transportation system, and an intelligent transportation system that will enable better mobility and transportation infrastructure. According to Herrero (2012), transportation plays a crucial

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role in sustainable development due to its influence on the environment, society, and economy, as well as its connections with other sectors.

Inter- Urban mobility is the movement of people and goods between cities or urban areas. It encompasses various modes of transportation which include informal transports. Inter-urban mobility is crucial for economic development, social interaction and access to resources and opportunities. Efficient inter-urban mobility infrastructure and services are essential for connecting cities, facilitating trade, commuting and supporting regional development. However, challenges such as traffic congestion, environmental impacts and inequalities in access to transportation services often accompany inter-urban mobility efforts, it is due to this fact that it is important to collaborate with informal transport provider in order to cumber these challenges and achieve a seamless movement from point of origin to destination.

Urban mobility is a vital part of the economic component, the lifeblood of contemporary cities, and a promoter of wise and long-term growth. Developing innovative and cooperative eco-system ideas and tactics to address city mobility through secure and safe public transportation networks is necessary for designing a 21st-century city that provides an equitable and efficient urban mobility solution. It should be acknowledged, nonetheless, that contemporary societies require a significant degree of mobility of many kinds, mostly for the purpose of adjusting to social demands in order to guarantee the safe, economical, ecologically responsible, and efficient transportation of people and products (Herrero, 2012). According to John (2019), sustainable development is essentially addressing current demands without sacrificing the capacity of future generations to address their own needs.

The bulk of urban residents in most areas rely on public transportation for their requirements; this is mostly provided by the private sector, which runs taxis, para-transit minibuses, passenger-carrying private automobiles that are paid for with fare payments (also called "kabukabu"), and motorbikes, both two- and three-wheeled models that are driven in most cities.

2.2 Theoretical Review

2.2.1 Theory of Traffic Flow

Traffic flow is defined by Wikipedia as the study of how cars, drivers, and infrastructure such as highways, signage, and traffic control devices interact. The goal is to comprehend and create an ideal road network with effective traffic flow and few issues with traffic congestion. The terms "traffic flow theory" and "free-flowing network" relate to the variables of flow, concentration, and speed in the traffic stream. These interactions, which are mostly seen on freeways or expressways, are primarily concerned with uninterrupted traffic movement. According to Lieu (1999), a road is said to be in "free" flow when there are less than 12 cars per mile. Twelve to thirty cars per mile lane is frequently used to define "stable." When the density surpasses the ideal density (more than 30 cars) and hits the maximum flow rate (or flux), Traffic becomes unsteady, and even a small-scale event might cause driving to always be stop-and-go. A traffic "breakdown" happens when the speed of cars per mile surpasses 67. According to Rijn (2014), "jam density" is the term for extremely high traffic density accompanied with a fully halted flow of traffic; this is often between 185 and 250 cars per mile per lane.

When observed across years of traffic observations, there are common spatiotemporal empirical characteristics of traffic congestion that are qualitatively the same for many roadways in various nations. In Kerner's three-phase traffic theory of traffic flow, synchronized flow and broad moving jam traffic phases are defined by some of these similar qualities of traffic congestion.

Two main categories of traffic flow may be distinguished, according to Alber (1997): uninterrupted flow, flow that is interrupted or continuous. The manner that this flow is determined by how cars interact with each other and with the road. On an interstate highway, vehicles move in a continuous flow. On the other hand, there are breaks in the flow of traffic on our interstate roads.

Traffic lights, among other external mechanisms, are used to control interrupted flow. Vehicle-to-vehicle interaction is not as important in determining traffic flow when there is an interruption in flow. On intraurban roadways, moving vehicles take part in interrupted flow.

III. METHODOLOGY

The Ogbomoso, Oyo state, was the study's site. The whole landmass of Oyo state is 28,454 km². It is an inland state with Ibadan as its capital located in southwest Nigeria. There are five local government areas in Ogbomoso: Ogo-Oluwa, Oriire, Surulere, Ogbomoso South, and Ogbomoso North. The local governments of Ogbomoso North and Ogbomoso South served as the case studies. These local government districts are made up of several rural communities. Ogbomoso is roughly situated where latitude 8°08'N and longitude 4°16'E converge. It is around 105 kilometers northeast of the state capital, Ibadan; it is also 58 kilometers northwest of Osogbo; 53 kilometers southwest of Ilorin; and 57 kilometers northeast of Oyo Town. The local government of Ogbomoso South has its headquarters Ogbomoso North local government area is headquartered at Ogbomoso, but the town of Arowomole serves as its headquarters. According to the 2006 census, Ogbomoso had a population of around 454,690 people. The population of this research is made up of various road users in Ogbomoso, Oyo state, such as office workers, traders, students, and commercial and private riders in Takie and Taxi Park in Ogbomoso North LGA. Using stratified sampling, the study's respondents will be chosen from among commercial riders, a small number of private passengers, and employers of transportation services. With a population of 316 respondents in Takie and Taxi Park in Ogbomoso North LGA.

Model Specification

$$Y = a + b_1X_1 + b2X2 + b3X3 + \ldots\ldots + bnXn$$

Where:
Y = Urban Mobility
a = Constant
bnXn= Regression coefficients
X1= Connectivity

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X2= Accessibility
X3= Reliability
X4= Conveniency
X5 = Affordability
E= error of term

IV. Results and Discussion

4.1 Relationship between informal public transport and inter urban mobility in Ogbomoso, Oyo State

From the table 4.1 below, R shows a value of 0.762, denoting a strong relationship between the relationship between informal public transport and inter urban mobility in the study area. The coefficient of determination (R^2) reveals a value of 0.580. This means that the relationship between informal public transport and inter urban mobility in the study area is 58.0%. The Adjusted R Square which makes an attempt to correct the R Square shows that only 53.1% (0.531) of the variation in the dependent variable (urban mobility) is accounted for by the independent variables after taking into consideration all other variables that are not included in the model.

TABLE 4.1: Model summary of the relationship between informal public transport and inter urban mobility in the study area.

Model Summary				
Model	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**
1	.762[a]	.580	.531	.722

a. Predictors: (Constant) connectivity, accessibility, reliability, affordability, conveniency

Source: Author's computation, 2024

The result further shows that the coefficients (β) of urban mobility (URBm), Furthermore, the table below reveals a constant value of 0.801 as the intercept, hence establishing a positive relationship while the row contains the variables that constitute the independent elements connectivity (CNT), accessibility (ACT), reliability (RLT), affordability (AFT), conveniency (CVN). are β = 0.038, 0.047, 0.705, -0.008 and -0.023 respectively as shown in the model below:

URBm = 0.801+ 0.038 CNT + 0.711 ACT + 0.705 RLT + 0.289 AFT - 0.289 CVN

The table presents the coefficients from a regression analysis examining the relationship between various factors (Connectivity, Accessibility, Reliability, Conveniency, Affordability) and the dependent variable.

Constant: The constant term (B = 0.801) represents the value of the dependent variable when all independent variables are zero.

Connectivity: The coefficient for Connectivity (B = 0.038) indicates that a one-unit increase in Connectivity results in a 0.038-unit increase in the dependent variable. However, this coefficient is not statistically significant (Sig. = 0.676 > 0.05), suggesting that Connectivity may not have a significant impact on the dependent variable.

Accessibility with $\beta = 0.711; p<0.05$ suggests that a one-unit increase in accessibility leads to a 0.711-unit increase in urban mobility, this shows that informal transport service. This coefficient is statistically significant (Sig. = 0.000 < 0.05), indicating that Accessibility has a significant positive impact on the dependent variable.

Reliability: The coefficient for Reliability (B = 0.705) indicates that a one-unit increase in Reliability results in a 0.705-unit increase in the dependent variable. Similar to Accessibility, this coefficient is statistically significant (Sig. = 0.000 < 0.05), suggesting that Reliability also has a significant positive impact on the dependent variable.

Conveniency: The coefficient for Conveniency (B = 0.289) suggests that a one-unit increase in Conveniency leads to a 0.289-unit increase in the dependent variable. However, this coefficient is not statistically significant (Sig. = 0.922 > 0.05), indicating that Conveniency may not have a significant impact on the dependent variable.

Affordability: The coefficient for Affordability (B = 0.289) indicates that a one-unit increase in Affordability results in a 0.289-unit increase in the dependent variable. This coefficient is statistically significant (Sig. = 0.005 < 0.05), suggesting that Affordability has a significant positive impact on the dependent variable.

In summary, Accessibility, Reliability, and Affordability are significant predictors of the dependent variable, while Connectivity and Conveniency do not appear to have a significant impact based on the provided significance levels.

TABLE 4.2: Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	*(Constant)*	.801	.761		1.052	.299
	Connectivity	.038	.089	.044	.421	.676
	Accessibility	.711	.093	.429	7.654	.000
	Reliability	.705	.098	.750	7.171	.000
	Conveniency	.289	.083	-.011	-.098	.922
	Affordability	.289	.101	.262	2.859	.005

Source: Author's Computation, 2024

TABLE 4.3: ANOVA[a]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	33.361	17	6.672	54.534	.000[b]
	Residual	19.741	83	.459		
	Total	53.102	100			

a. Dependent Variable: Informal public transport has positive impact on inter urban mobility in the study area

b. Predictors: (Constant), Affordability, reliability, conveniency, connectivity, accessibility

Source: Author's Computation, 2024

The table 4.3 above shows an ANOVA table, which provides an F test of whether the relationship between the independent variable and the dependent variable is significance.

From the table 4.3 above, it can be seen that the F test gives a value of 54.534 (higher than tabulated f-value of 2.32), and an asymptotic significance of 0.000 (less than p value of 0.05). Therefore, the null hypothesis is rejected and the alternative accepted. An indication that affordability, reliability, conveniency, connectivity and accessibility significantly impact inter urban mobility in Ogbomoso metropolis.

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Implication

The results suggest that among the factors examined, only Reliability has a statistically significant positive impact on the dependent variable. This implies that improving the reliability of the transport service is crucial for enhancing the dependent variable, which could be aspects like customer satisfaction or overall performance. However, factors such as Urban Mobility Behavior, Accessibility, Conveniency, and Affordability do not show a significant linear relationship with the dependent variable in this analysis.

Policymakers and transport service providers should prioritize efforts to improve the reliability of transportation services to positively impact the dependent variable, potentially leading to increased satisfaction or performance in the context of urban mobility.

4.3 Discussion of Result

From the findings on the coefficient of determination, the study found that there was great variation in informal public transport which could be accounted to changes in affordability, reliability, conveniency, connectivity and accessibility at 95% confidence interval. From the findings on the R correlation the study found that there was a strong relationship between the informal public transport has no significant relationship with inter urban mobility in the study area and affordability, reliability, conveniency, connectivity and accessibility. From the coefficient result the study revealed that there is a positive relationship between informal public transport and inter urban mobility in the study area.

V. CONCLUSION

The evaluation concludes that informal transport services play a crucial role in complementing formal public transport systems and improving inter-urban mobility in Ogbomoso, Oyo State, Nigeria. While informal transport services provide essential mobility options for residents, they also face challenges related to safety, regulation, and integration with formal transport networks. Addressing these challenges requires collaborative efforts from policymakers, transportation authorities, and stakeholders to ensure the safe, efficient, and sustainable operation of informal transport services while enhancing the overall transportation system in the region. Implement safety measures and initiatives to improve the safety of informal transport services, including training programs for operators, enforcement of traffic regulations, provision of safety gear, and public awareness campaigns on road safety. Invest in infrastructure improvements, including road maintenance, signage, lighting, and designated pick-up/drop-off points, to support the operation of informal transport services and enhance overall mobility in Ogbomoso.

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