ANALYSIS OF PEDESTRIANS' UTILISATION OF FOOT-BRIDGE IN THE NIGER DELTA REGION, NIGERIA

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Abstract

The poor use of pedestrian footbridges in the Niger Delta region of Nigeria is alarming. Many opt for the danger of dashing across busy roads despite the presence of bridges nearby. The aim of this study was to analyze level of foot-bridge usage in the Niger Delta Region. The observatory field survey was used as instrument to gather data for this study. The data were analysed using the Statistical Package for Social Sciences (SPSS) version 20. The chi-square test was used to test the hypothesis on the level of foot-bridge usage. The study revealed that the level of foot-bridge usage is low in the region. Hence,the study recommends among others, to construct barricades such as wire mesh fencing and high medians around pedestrian bridges to prevent pedestrians from running across the highways. This will assist in improving the utilization levels of the foot-bridges.

Keywords: *Compliance, Foot-bridge Usage, Pedestrians*

Introduction

Transport remains one of the vital human activities worldwide. It is a crucial and non-replaceable section of the economy, playing critical roles in spatial relations between several locations (Akpoghomeh, 2012).

Major Roads in the Niger Delta and those of other cities across Nigeria are mainly dominated by a host of users and vehicles, the pedestrians being included. It is generally known that the varying transport system is important and valuable to meeting the rising mobility needs while at the same time posing a challenge to walking and cycling (www.fiafoundation.org).Survey by Rites (2008) indicates that about one third of all trips in most cities are by walking. In spite of this fact, most of the urban transport planning models generally ignored such a significant volume of urban travel. The road improvement / development projects do not comprehensively address these issues. Lack of knowledge, concern and sensitivity towards the pedestrians has led to a situation whereby priorities are given to motor vehicles, enhancing the congestion energy pollution and accident on our roads.

Statement of the Problem

Pedestrians are involved in 13% of vehicle-related fatalities (National Highway Traffic Safety Administration (NHTSA, 2018).In response to the high rate of loss of lives and properties along major highways, foot-bridges were introduced on roads, yet compliance to the use of these foot-bridges has been low especially in developing countries.

The various state Governors in the Niger Delta region of Nigeria are spending huge amount to construct pedestrian foot-bridges and is expected that road users will utilize it in order to safeguard lives and ease the flow of vehicular traffic. However, pedestrian foot-bridges are ignored by pedestrians when crossing the road, therefore making the purpose of providing the foot-bridges not achievable.This is not encouraging to the authorities that provided them. Hence, there is need to examine the level of foot-bridge usage in the Niger Delta region of Nigeria.

Literature Review

Conceptual Review

Foot-bridge Usage

Foot-bridges are known by several other names which include pedestrian overpass, foot over bridge, pedestrian bridge and pedestrian overcrossing. They are bridges designed strictly for pedestrians.

Pedestrian refers to persons either walking or running on foot, while in applicable conditions, those who use skateboards, roller skates and similar devices are likewise referred to as pedestrians. In recent times, the term (Pedestrians) majorly refers to a person commuting on a road or footpath, although that was not the applicable term in the past (Rao, 2013).

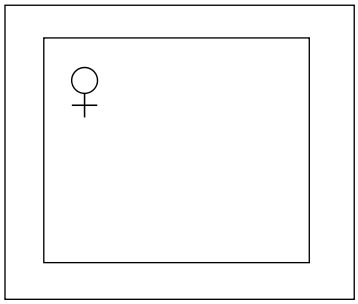
Ogundare(2020)in his report on the use of pedestrian bridges in Lagos on the 1st Feb 2020 stated that only a fraction of Lagos residents sees footbridges as a life-saving facility. He went ahead to report that in Lagos, pedestrians are forbidden to cross the highways where there are foot-bridges. Unfortunately, these rules are not completely obeyed by pedestrians as they are seen most times making a dash across the highway which is usually full of all manner of vehicles, tricycles and motorbikes, most of them being faulty, rather than taking time to walk the few meters of climbing the pedestrian footbridges, though some of them believe that the foot-bridges are far from the bus stops.Others said the bridges are just too high and that they have phobia for height, while some were of the opinion that the footbridges were not user friendly, claiming that the foot-bridges are not properly illuminated at night pointing out that the presence of beggars, mentally deranged people, hawkers and hoodlums is a major repelling factor for them.

Levels of Service for Pedestrians

The flow of pedestrians can also be defined according to the level of service on walk ways in the categories represented in samples A-F below.

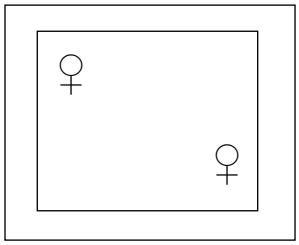
Level A

Pedestrian walks on the desired path without any restrictions by other pedestrians. Pedestrians walking speeds are freely selected. There is no conflict between pedestrians.



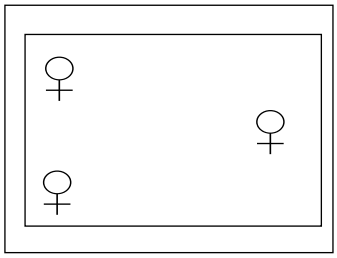
Level B

Level B: pedestrian can select desired walking speeds. There is no crossing or passing conflicts. There are other passengers but no interference between them, and walking paths can be selected freely.



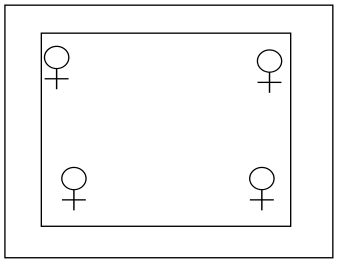
Level C

Level C: Normal walking speed can be achieved. There are other pedestrians but passing them does not involve any conflict. Walking speeds starts lowering and crossing movements may involve conflicts.



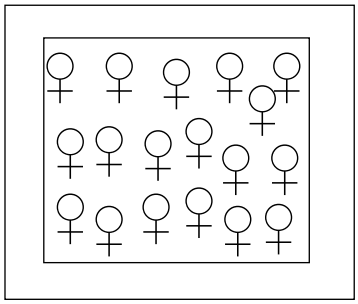
Level D

Level D: Though speed may be normal, passing other pedestrians may be restricted. Friction and interaction between pedestrians may occur. Pedestrians may require to change speed frequently.



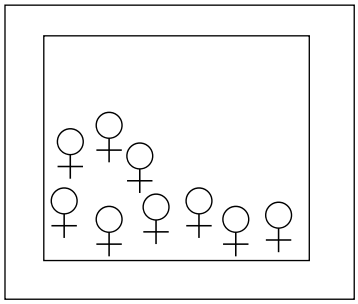
Level E

Level E: The normal speed is restricted. Pedestrian may have to slow down frequently. Passing is not easy due to speed restriction. Crossing or moving in opposite direction is not easy, it reduces the capacity of the walk way.



Level F

Level F: Walking is severely restricted and speed is very slow. There is conflict with other pedestrians crossing and reverse movements are almost impossible. Queues may be formed. Generally, the flow is unstable.



Emperical Review

Ritzati*et al.,* (2013)conducted a research study to assess the rate of utilization of pedestrian bridges in Kuala Lumpur, Malaysia. The study gathered secondary information from pedestrian users and also by observing pedestrian in 16 different study sites. Hence, the study concluded that the rate of utilization is fairly the same in residential homes and in business districts. Factors observed to significantly affect the usage of the bridges include directional flow, presence of median, installation of fences, distance and the volume of vehicle. The most important factors observed to affect the decision of pedestrian to use the bridge is the distance from interested places and the need to save time. Majority of the respondents opted for signalized crossing as the most favourable type of crossing.

Soltani and Mozayeni (2013)in another study conducted in Iran to evaluate the factors on the perceived risk of these pedestrians when crossing the street. This study randomly selected ten footbridges found in both cities of Tehran and Shiraz, while a structured questionnaire was distributed to 200 randomly selected pedestrians. The analysis of the results indicated that there was significant relationship between the percentage of the footbridge users and the average speed of the vehicle. The study concluded that the decision to use the foot-bridge or not is a habit rather than a coincident. The safety of the bridge was the main determinant factor to the usage of the bridge. The results also indicated that adults and the aged hardly use the bridge because of the effort needed to ascend the stairs most especially when they have of luggage. The study suggested that escalators and high barriers if installed will increase the usage of the foot-bridge.

Umah, Samir, Abba, Abdulwarith and Farouk (2019)in their study on Pedestrian's Utilizations of Footbridge in Kano-Nigeria revealed that Pedestrian crossing facilities such as crosswalk, pedestrian foot-bridges overpass, and under-pass at intersection or midblock with crossing facilities are designed to separate pedestrians from the moving vehicles hence improving safety of the pedestrians. Questionnaire survey was used to determine the factors influencing the use and utilization of foot-bridge by pedestrians in Kano city, Nigeria. The survey results show that 70% of the respondents were frequent users of the bridge while 30% were found not be

using it. Analysis of the survey result shows that age and gender were statistically significant in the utilization of the bridge with a p-value of 0.041 and 0.002 respectively while education level was found to be statistically insignificant p-value = 0.688. The major reasons influencing pedestrian to use the bridge were safety (66%), barricades (25%), then traffic flow (9%). For the pedestrians that do not use the bridge, they describe the bridge height (38.5%) as the major reason for not using the bridge followed by poor design of the ramps (26.5%). Improving the design of the bridges and using escalators will surely enhance use of the foot-bridges by the pedestrians in Kano city.

In conclusion, there is unending interest among scholars on the level of pedestrian foot-bridge usage. Moreover, the findings have not been consistent, hence the relevance of this study.

Theoretical Framework

Creswell (2012) describes a theory as an open clarification for perceptions, variables, hypothesis, etc. Theories are, therefore, the perspectives through which a researcher carries out his/her research. For this study, the following theories were considered.

Normative Pedestrian Behaviour Theory

This theory describes pedestrian behaviour, by considering the unifying concept of generalized (dis-) utility of walking and performing activities. The main behavioural assumption is that all actions of the pedestrian, be it performing an activity, walking along a certain route, or bypassing a slower pedestrian, that are performed within the infrastructure facility will somehow provide utility (or equivalently, induce cost), which the pedestrian aims to optimize.Such normativechoice theories will not fully cover real-life human choice behavior (Navin, & Wheeler, 1969) while many experiments show that man violates principles of normative choice. Nevertheless, normative theory does provide a convenient and applicable framework for modeling human decision making, and has been applied successfully in modeling human decision processes in general, and specifically in modeling travel behavior (Ben-Akfva, &Lerman, 1985) Therefore, the rational behavior of a pedestrian *{homo economicus)* will be the main assumption in our pedestrian behavior theory. As seen in the fig below:

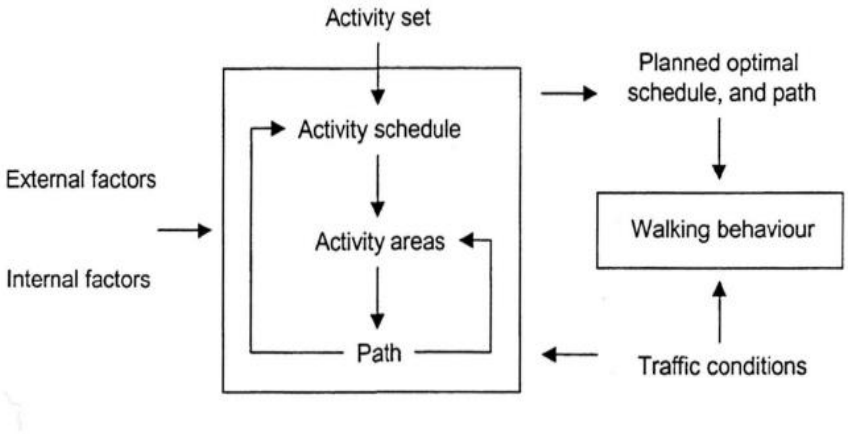


Fig 2: Framework of pedestrian behavior

Utility Theory

Utility theory suggests that individuals will choose to consume or select a preferred alternative which provides them with maximum utility such as satisfaction, cost-saving, etc. This theory can be applied to the pedestrian's road crossing decision. A pedestrian will choose to cross the road by taking various factors into their account such as convenience, safety and security. The utility equation can be expressed as shown in the equation below;

$$U_{in} = V_{in} + \varepsilon_{in} \quad (1)$$

Where U_{in} is utility or satisfaction of an individual n choosing alternative i;

$V_{in}$is observable utility for an individual n choosing alternative i;

ε_{in} is random utility reflecting the "taste" for an individual n choosing alternative i.

Part of utility that an n person recognizes and sees $V_{in}$is mostly defined as a function in

$$V_{in} = \beta_0 + \beta_1 X_{in}1 + \beta_2 X_{in}2 + \ldots\ldots\ldots + \beta_n X_{ink} \quad (2)$$

Where are X_1, X_2,.....,X_k variables associated with utility alternative of i of an individual n; β_0, β_1, β_2....., β_n are model parameters.

Methodology

Research Design

The observational research survey design was adopted for this study. This research design was adopted as it gives direct access through frequency counts on the number of pedestrians who used the foot-bridge.

Sampling Technique

The observational sampling method was adopted for this study. The road users were observed as they crossed the road using frequency counts at each foot-bridge loation. The road users include those who used and did not use the foot-bridge.This method was adoptedto elicit firsthand information about the level of pedestrian foot-bridgeusage.Consequently, a total of 1563 road users were observed as they crossed the road. The distribution of the number of road users / foot-bridges observed was done on the basis of the number of foot-bridges in each of the states.

Study Area

The research study area is the Niger Delta region of Nigeria. The Niger Delta region consists of nine (9) states and they are Abia, AkwaIbom, Bayelsa, Cross River, Delta, Edo, Imo, Ondo and Rivers. However, the study focuses on six (6) out of the nine (9) states. The states include AkwaIbom, Bayelsa, Cross River, Delta, Edo and Rivers. Consequently, the choice of the states was informed by the need to analyse the level of pedestrian foot-bridge usage in the states historically connected traditions and lifestyles. The traditional occupation of people in this area is predominantly fishing and farming.

Participants

The population for this study consisted of pedestrians in the capital cities of the Niger Delta region of Nigeria. The pedestrians comprised of school children (primary and secondary school children), the aged (Elderly road

users), the hawkers (those that hawk things along traffic and major roads were pedestrian footbridges are located), young adults, and wheel barrow peddlers.

Table 1: Population Projection of the Niger Delta States/capitals

State	Capital	2013	2014	2015	2016
AkwaIbom	Uyo	4,785,078	4,950,568	5,121,781	5,482,117
Bayelsa	Yenagoa	2,088,154	2,149,597	2,212,849	2,277,961
Cross River	Calabar	3,544,120	3,648,404	3,755,757	3,866,269
Delta	Asaba	5,144,961	5,312,262	5,485,004	5,663,362
Edo	Benin	3,906,039	4,012,938	4,122,764	4,235,595
Rivers	Port Harcourt	6,595,659	6,823,767	7,059,764	7,303,924
Total		26,064,011	26,897,536	27,757,919	**28,829,228**

Source: *NDR Survey-Based on National Population Commission*

Method of Analysis

The use of simple statistical techniques like *tables, percentages, and charts*were employed to show distribution while the chi-square test statistics was used to test the hypothesis. The choice of this chi-square as a statistical tool is that it allows us to determine whether the observed group frequencies from the different population differ from what we would expect by chance alone. That is, it tells us whether observed differences in each population are random or not.

Chi- Square Formular

$$X_C^2 = \sum_{j=1}^{k} \frac{(o-e)^2}{e}$$

Where:

$e = \frac{Total\ of\ Observed}{N}$ is the expected frequency. (The expected frequencies are equal across the period of study)

O = the observed frequency (Total number of pedestrians using the footbridge)

N = Number of Footbridges (13)

Decision Rule

When the **P–Value < α (0.05)** at a given degree of freedom (df): Reject the Null Hypothesis(H_0)

When the **P–Value > α (0.05)** at a given degree of freedom (df): Accept the Null Hypothesis (H_0)

Hypothesis Testing

H_{01}: There is no significant difference between the observed and expected frequencies of foot-bridge usage among pedestrians in the Niger Delta Region

The above hypothesis was tested using the Goodness of fit Chi-Square.

Results and Discussion

Data Distribution

Table 2: Footbridge usage by States

S/N	State	Total no. that crossed the road	Usage	(%)
1	AkwaIbom	260	58	22.3
2	Cross River	338	11	3.3
3	Edo	134	57	42.5
4	Rivers	831	123	14.8
	Total	**1563**	**249**	**15.9**

Source: *Field survey, 2019/2020.*

Note: *Bayelsa and Delta State had no foot-bridges as at the time of this study*

From Table 2, in Rivers (Port Harcourt), a total of 831 road users who crossed the road were observed but only 123 made use of the bridge resulting to a usage level of 14.8%. Cross-river (Calabar) was the next, out of 338 road users who were observed crossing the road, only 11 were seen making use of the foot-bridge. This implies that the usage rate was at 3.3%. In Akwa-Ibom (Uyo), out of 260 road users who crossed the road, 58 made use of the foot-bridge accounting for a usage level of 22.3%. In Edo (Benin) out of the 134 pedestrians that crossed the road, only 57 of them made use of the foot-bridge giving it a usage level of 42.%.

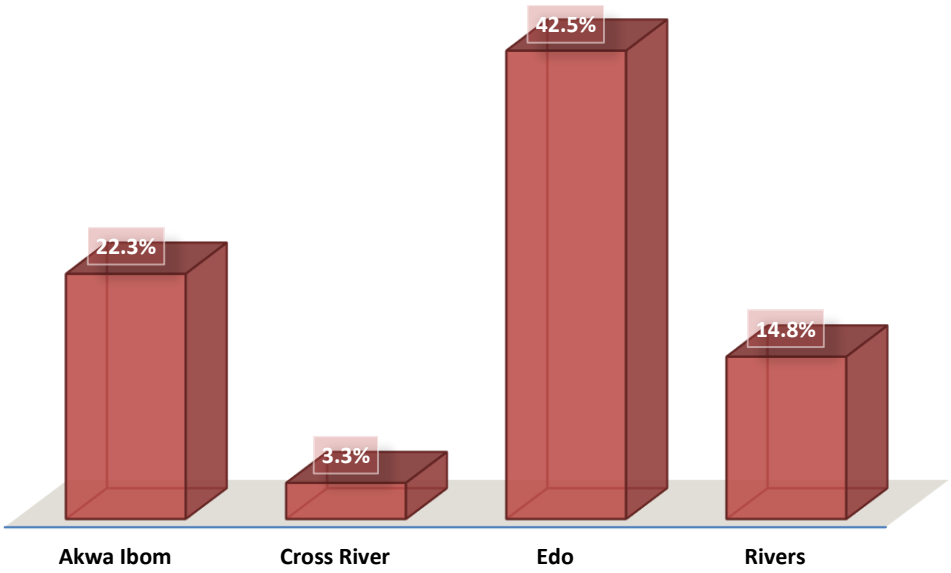


Figure 1: Percentage level of foot-bridge usage by State

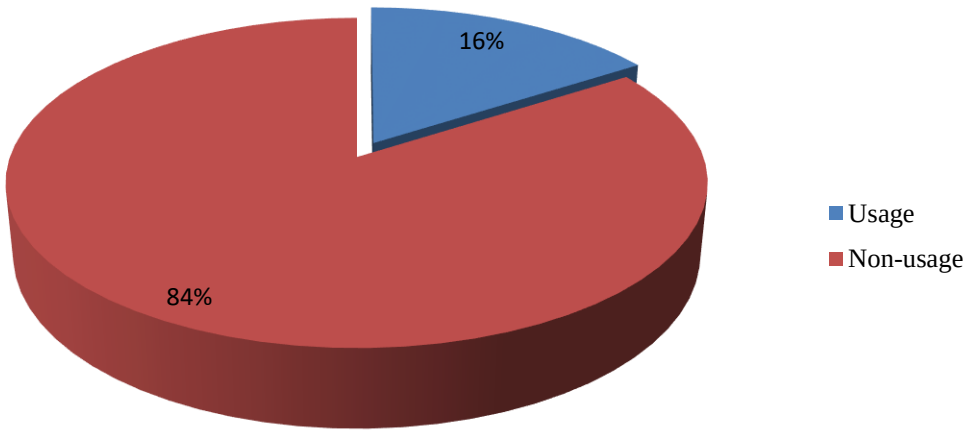


Figure 2: Level of foot-bridge usage in the Niger Delta Region

Contigency Table

Table 3: Showing Observed, Expected and Residuals of Foot-bridge Usage in the Niger Delta Region

Number of foot-bridges	Observed N	Expected N	Residual
1	0	19.2	-19.2
2	32	19.2	12.8
3	45	19.2	25.8
4	42	19.2	22.8
5	4	19.2	-15.2
6	0	19.2	-19.2
7	24	19.2	4.8
8	34	19.2	14.8
9	0	19.2	-19.2
10	0	19.2	-19.2
11	0	19.2	-19.2
12	11	19.2	-8.2
13	57	19.2	37.8

Source: Reseacher's Computation, 2019/2020

The frequency output reports on Table 3 shows that the observed, expected and residual frequencies for each group. The residual frequency is the difference between the expected (E) and the observed (O) frequencies and this is gotten by subtracting the expected from the observed frequencies.

Calculation of Chi-Square Statistics

Table 4: Chi-Test Statistics output

	Level of Compliance
Chi-Square	268.840[a]
Df	12
Asymp. Sig.	;2.000

a. 0 cells (0.0%) have expected frequencies less than 5. The minimum expected cell frequency is 19.2.

Source: Reseacher's Computation, 2019/2020

The Chi-square test statistics output on Table 4 revealed a chi-square value of 268.840 with 12 degrees of freedom (13 groups - 1 = 12) and a significance level of 0.000, which falls below the significant 0.05 alpha level, this showthat there is a statistically significant difference between the observed and expected values of foot-bridge compliance among pedestrians in the Niger Delta Region. Hence the null hypothesis was rejected. This also implies that the level of foot-bridge usage in the Niger delta region varies between states as affirmed by Fig 2 in that some states complied more to the use of foot-bridge than others. Although, this finding is contrary to that of Umah, *et al.*, (2019) who in their study on Pedestrian's Utilizations of Foot-bridge in Kano-Nigeria found out that 70% of the respondents were frequent users of the foot-bridge while 30% were found not be using it.

Concluding Remarks

The study concluded that the level of foot-bridge usage is low in the region and therefore recommends that:

- Education and robust public awareness programs should be conveyed through the media and billboards to all road users (pedestrians and motorist) to enable them apply same when using the pedestrian infrastructures; the awareness campaign could highlight on the traffic hazards associated with non-use of these pedestrian bridges.

- A daily news report through television and radio stations on pedestrian adherence to the use of pedestrian foot-bridges and its resulting effects on humans and the economy in general will also be impactful.

- The various states in the Niger Delta region should enforce the use of these pedestrian foot-bridge by engaging law enforcement agents like was done by the former Governor of Lagos (Gov. Ambode) in 2013, where the governor empowered officers of the Kick Against Indiscipline (KAI) to arrest anyone who crosses the road where there is provision for foot bridge, these offenders are charged to a mobile

court, where they could be asked to pay a fine or given community services to perform as punishment.

- In 2015, the house of representative tried to amend the Federal Road Safety Act. This amendment would enforce the use of pedestrian bridges, if passed offenders would get a fine of N20,000. This will assist in improving the utilization levels of the foot-bridges.

- Also, to strengthen Machinery towards educating children and youths about traffic/safety rules and regulations and also encourage the students at university level to take road traffic safety courses as a general course in their first year of study.

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