International Journal of Civil Engineering and Technology (IJCIET)
Volume 9, Issue 8, August 2018, pp. 1048-1061, Article ID: IJCIET_09_08_106
Available online at http://www.iaeme.com/ijciet/issues.asp?JType=IJCIET&VType=9&IType=8
ISSN Print: 0976-6308 and ISSN Online: 0976-6316

ANALYTICAL STUDY OF A ROAD TRAFFIC CONFLICT AT THE T-JUNCTION OF UNIVERSITY OF BENIN MAIN GATE

Joseph Azeta, Imhade P. Okokpujie, Enesi Y. Salawu
Department of Mechanical Engineering,
Covenant University, Ota, Ogun State, Nigeria

Kennedy O. Okokpujie
Department of Electrical and Information Engineering,
Covenant University, Ota, Ogun State, Nigeria

ABSTRACT

Due to constant occurring of fetal accident at the University of Benin main gate, there is need to carry out analytical study on T-junction traffic system to prevent various accident from occurring also from claiming life's. The analytical method used for measuring traffic conflict approach is a suitable means to conduct a study of traffic safety; the analyses conducted include identification and classification of traffic conflict, volume data at the intersection, this study was carried out for the period 6weeks from Monday to Friday. The daily collection was divided into two sections, morning peak from 7am to 9am and afternoon peak from 3pm to 5pm. Four observers were positioned in different location for the morning and afternoon peak hour each in other to obtain the data for the analysis. One way ANOVA was used to analyze the difference in the volumes of traffic at all locations and shows that there were no significant difference in the volumes of traffic except on holiday's period where the difference was clearly seen. Developed models show that linear relationships are significantly appropriate to explain the relation between traffic conflict and traffic volume with coefficient of determination ranging between 0.47 and 0.76. Cross- merge and merge-merge accurate conflicts were reduced after temporal installment of drums to stop commercial drivers from packing at the intersection. In order to enhance traffic safety the study proposes suitable traffic Conflict Technique (TCT), such as marking the minor road, providing safety indicator, such as signs and signals legible enough for operators, zebra crossing, effective control of commercial drivers.

Key words: Measures of Traffic Conflicts (MTC); Traffic Conflict Technique (TCT); Safety indicator; Micro-simulation.

Cite this Article: Joseph Azeta, Imhade P. Okokpujie, Enesi Y. Salawu and Kennedy O. Okokpujie, Analytical Study of A Road Traffic Conflict at The T-Junction of University of Benin Main Gate, International Journal of Civil Engineering and Technology, 9(8), 2018, pp. 1048-1061.
http://www.iaeme.com/ijciet/issues.asp?JType=IJCIET&VType=9&IType=8

1. INTRODUCTION

Traffic safety is commonly measured in terms of the number of traffic accidents and the consequences of these accidents in terms of severity. While this historical data approach is useful for the identification of safety problems, it is regarded as a 'reactive' approach implying that a significant number of accidents must be recorded before a decision could be taken. A further drawback with this approach concerns the quality and availability of accident data. In order to perform a different form of safety analysis, the use of Surrogate Measures of safety has been suggested as an alternative to accident data analysis [1].

The Traffic Conflict Technique (TCT) is perhaps the most developed indirect method of safety surrogate measure. The technique itself is grounded in the ability to register the occurrence of near accidents directly in real-time traffic and therefore offers a faster and, in many aspects, more representative way of estimating expected accident frequency and accident outcomes. The concept of traffic conflicts was first introduced in 1968 during the (International Cooperation on Theories and Concepts in Traffic Safety) ICTCT meeting in Oslo, as: "*A traffic conflict is an observable situation in which two or more road users approach each other in space and time to such an extent that there is risk of collision if their movements remain unchanged*" [2]. The primary advantage of TCT is that conflicts occurred much more frequently than accidents. The conflict method provided a clearer picture of the initial causes of the accidents, something often lacking from accident reports. Furthermore TOT may provide information on relative risks to diagnose the types of problems at a particular location, and it represents an easy and efficient tool to check location safety issues when there is limited or no crash data [3].

A traffic conflict survey is a systematic method of observing and recording traffic conflicts and other events associated with safety and operations. Traffic conflicts are measures of accident potentials and operational problems at a highway location. Over the years various bodies have utilized various forms of conflict data to assist in its efforts for highway improvement. The first formalized procedure for identifying and recording traffic conflicts at intersections was developed by Perkins and Harris of general Motors Corporation [4]. Major types of conflicts at intersections include weave, pedestrian cross-merge and merge-merge conflicts. This report critically evaluates the traffic conflict technique in an attempt to resolve the safety deficiencies at Uniben main-gate. Based on the positive results of a large investigative study by the federal highway administration FHWA, reported by Baker [5], the TCT has gained popularity as an evaluative tool. The Washington State Department of Highways is using the TCT as a diagnostic tool to determine appropriate countermeasures at high accident locations. Conflict counts may be used to quickly evaluate changes in road design, signing, signalization, and environment. Crude forms of traffic conflict counts have been made since traffic engineers first began making field observations to determine appropriate safety improvements. [7]

It is evident that traffic safety analyses with microscopic traffic simulation have a number of restrictions. Most importantly, driver behaviour in real road traffic is more diverse and less predictable than can be implemented within any model whatever the level of detail. Normal microscopic simulation models are developed for e.g. traffic-flow analyses, and require far less consideration to driver behaviour and error modeling than that essential for safety analyses. There is also little or no lateral vehicle movement. However, despite these and various other it is believed that this type of simulation can give valuable insights into the relative safety impacts brought about by changes of traffic flow, various ITS devices placed inside the vehicle or on the roadway, different signaling strategies, and many other dependent aspects. Measuring safety indicators such as TA, and TTC that emanate from the microscopic simulation of vehicle dynamics and driver behaviour (including the probability of errors) in the traffic environment is an essential part of the SINDI project. [8]

Although the improvement of conditions for pedestrian movement is a key objective of planning for mobility, in the design of transport systems pedestrians are often overlooked, with serious consequences for safety. In 2006, more than 3.500 pedestrians died from road traffic accidents in 14 European countries [9]. This corresponds to more than 14% of road traffic fatalities in these countries. Although largely developed in the case of conflicts between vehicles, TCT presents some gaps or lacks when vulnerable users, like pedestrian, act a role in the conflict. In literature, existing applications report some attempts to define spatial or temporal index to classify the severity of vehicle-pedestrian conflict [10]. Among these, it can be mentioned the Time to Collision (TTC), the time, in different phases of conflict, should occur for a vehicle to collide with another road user, if relative speed and remain invariant

When there is a conflict, the value of TTC varies over time; therefore a proper evaluation requires a continuous monitoring with the identification of the critical value (minimum) [11]. The Time to Zebra (TTZ) was proposed as a variation of the concept of Time to Collision developed in order to estimate frequency and severity of the critical situation between the vehicles that are approaching the pedestrian crossing and the pedestrians who are crossing it. TTZ is determined at the start instant of the conflict that has to be identified by the observer. [12-14]

In other to also resolve this traffic problem safety indicator machining were develop using some electrical and mechanical devices such as pans made of aluminum, wireless network, meter reading system using GSM technology [16-19]. With this study, there will be great reduction in accident, also this will increase the production output and ignite the engineering industries in that environment [20-23].

The aim of this work is to study the traffic conflicts at Uniben main-gate with the hope of proposing measures to reduce drastically the conflict and hence reduce the junction’s accident proneness.

The specific objective for this research includes;

- Improving the overall operations at the intersection
- Identify specific safety deficiencies
- Develop a statistical model that will relate traffic conflict and volume.

2. MATERIALS AND METHODS

Traffic conflict and volume data were collected manually at Uniben main- gate. The procedure involves counting the vehicles and conflicts for each approach; this was done at the same time. The daily collection was divided into two sections, morning peak from 7am to 9am and afternoon peak from 3pm to 5pm. Four observers were positioned in different location for the morning and afternoon peak hour each.

The survey was conducted during a 6weeks observation period from Monday to Friday to ensure reliable data. The conflict and volume count was carried out for two hours at each approach, the traffic conflict and volume data are then compiled for subsequent analysis using the Statistical package for the social science. (S.P.S.S 17).

Vehicles entering Uniben, Vehicles not entering Unben, Vehicles out from Uniben, Vehicles making u-turn, Vehicles going to Oluku

The major types of conflict observed at the Uniben main-gate were:

- Weave conflict: lane change
- Pedestrian conflict
- Cross-merge and merge-merge conflict

3. RESULTS AND DISCUSSION

- Analysis of Traffic Volume (Days and Weeks)

The resulting One Way Anova (by statistical package for the social science) was used to calculate the daily difference in the volume for the 6weeks for all approaches as shown in table 1 to table 5.

It was found that there are no significant differences in the flow of traffic for each approach for both morning and afternoon peak hour. This report agrees with the reported findings in the weekly analysis.

- Analysis of Traffic Conflict

Classification of conflict type according to weeks:

The different types of conflicts reported in each week for the 6 weeks shows that there are significant difference between the mean and the post hoc test shows the day(s) of the week that cause the difference.

- Classification According to Type

Here the conflict types are separately analyzed week by week for the 6weeks. It can be seen that the mean difference is significant at 0.05 level for weave conflict, cross-merge and merge-merge conflict. While for pedestrian conflict, there are no significant difference between the means for both morning and afternoon period.

Table 1 to 8 shows the analysis based on days of the week for each flow direction and the one-way ANOVA was also used to explain the significant of the volume of traffic.

Table 1 Traffic Entering Uniben, Morning Peak Period: 7am-9am

	Mon	**Tues**	**Wed**	**Thurs**	**Fri**
Wkl	2182	2044	2058	2204	1921
Wk2	2190	2067	2103	2184	2115
Wk3	2161	2006	2081	2194	2014
Wk4	2202	1255	1978	442	1950
Wk5	2198	2091	2117	2020	2035
Wk6	2179	2073	2034	2159	2019

Ho: THE NULL HYPOTHESIS: $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$

There are no significant differences in the volume of traffic entering Uniben between 7:OOa.m and 9:00a.m.

HI: Alternative hypothesis: There are significant differences in the volume of traffic entering Uniben between 7:00a.m and 9:00a.m One-way ANOVA

Table 1b Days of the Weeks (Traffic entering UNIBEN Morning Peak period. 7 am-9 am)

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	1189309.6	5	237861.9	2.57	0.053
Within Groups	2216205.2	24	92341.88		
Total	3405514.8	29			

Since Fcai < F_{tab} (2.576<5.19), there are no significant difference in the flow of traffic entering Uniben.

Table 2 DAYS Traffic not entering Uniben. Morning Peak period: 7am-9am period 7am-9am

	Mon	Tues	Wed	Thurs	Fri
Wkl	2382	2156	2328	2364	2340
Wk2	2356	2134	2394	2533	2203
Wk2	2356	2134	2394	2533	2203
Wk3	2319	2185	2361	2399	2272
Wk4	2387	2207	2225	1958	2121
Wk5	2417	2194	2386	2341	2236
Wk6	2365	2171	2293	2496	2303

Ho: THE NULL HYPOTHESIS: $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$

There are no significant differences in the volume of traffic not entering Uniben between 7:00a.m. To 9:00a.m.

H_1: Alternative hypothesis: There are significant differences in the volume of traffic not entering Uniben between 7:00a.m. To 9:00a.m.

One-way ANOVA

Table 2b Days of the Weeks (Traffic not entering Uniben, Morning Peak period: 7am-9am)

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	74523.9	5	14904.78	1.017	0.43
Within Groups	351718.8	24	14654.95		
Total	426242.7				

Since Fcai < F_{tab} (1.017<5.19), there are no significant difference in the flow of traffic entering Uniben.

Table 3 Traffic out from Uniben, Afternoon Peak period: 3pm-5pm

	Mon	Tues	Wed	Thurs	Fri
Wkl	1562	1534	1694	1520	1560
Wk2	1659	1525	1610	1590	1425
Wk3	1573	1530	1642	1555	1493
Wk4	1645	1546	1650	738	1540
Wk5	1586	1540	1660	1490	1615
Wk6	1624	1528	1542	1518	1572

Ho: THE NULL HYPOTHESIS: $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$

There are no significant differences in the volume of traffic out from Uniben between 3:00p.m. and 5:00p.m.

Hi: Alternative hypothesis: There are significant differences in the volume of traffic out from Uniben between 3:00p.m. and 5:00p.m.

One-way ANOVA

Table 3b Days of the Weeks (Traffic out from Uniben afternoon Peak period. 3pm-5pm)

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	86305.07	5	17261.01	0.061	0.7
Within Groups	689434.4	24	28726.43		
Total	775739.5	29			

Since Fcai < F_{tab} (0.601<5.19), there are no significant difference in the flow of traffic not entering Uniben.

Table 4 DAYS Traffic making u-turn Uniben, Afternoon Peak period: 3pm-5pm

	Mon	Tues	Wed	Thurs	Fri
WkI	1015	1240	1096	1117	1192
Wk2	1142	1125	1105	1015	1244
Wk3	1079	1183	1056	1114	1168
Wk4	1099	1065	1320	710	1359
Wk5	1086	1164	1275	1047	1254
Wk6	1121	1089	1054	1028	1296

Ho: THE NULL HYPOTHESIS: $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$

There are no significant differences in the volume of traffic out from Uniben between 3:00p.m and 5:00p.m.

HI: **Alternative** hypothesis: There are significant differences in the volume of traffic out from Uniben between 3:00p.m. and 5:00p.m. **One way ANOVA**

Table 4b Days of the Weeks (Traffic making u-turn Uniben) ANOVA Result

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	9379.2	5	1875.84	0.107	0.99
Within Groups	822664	24	17611		
Total	432043	29			

Since Fcai < F_{tab} (0.601<5.19), there are no significant difference in the flow of traffic out from Uniben.

Table 5 Traffic going to Oluku Uniben, Afternoon Peak period: 3pm-5m

	Mon	Tues	Wed	Thurs	Fri
Wk 1	2750	3170	3025	2977	2980
Wk2	2842	2806	2949	2970	3036
Wk3	2796	2988	2958	2973	3008
Wk4	2800	2792	3056	2187	2840
Wk5	2821	3018	3043	2892	2948
Wk6	2864	2896	2853	3024	2960

H_O**:** THE NULL HYPOTHESIS: $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$

There are no significant differences in the volume of traffic going to Oluku between 3:00p.m. and 5:00p.m.

H1: Alternative hypothesis: There are significant differences in the volume of traffic going to Oluku between 3:00p.m. and 5:00p.m. One-way ANOVA

Table 5b Days of the Weeks (Traffic going to Oluku Uniben afternoon Peak period. 3pm-5pm) ANOVA Result

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	189791.6	5	37958.32	1.44	0.246
Within Groups	632281.6	24	26345.06		
Total	822073.2	29			

Since Fcai < F_{tab} (1.441<5.19), there are no significant difference in the flow of traffic out from to Oluku.

Intersection Traffic Conflict

Table 6 Morning Peak: Time: 7:00-9:00am and Afternoon Peak: Time: 3:00-5:00pm

Conflict Type	WK1					WK2					WK3				
	M	T	W	TH	F	M	T	W	TH	F	M	T	W	TH	F
A(M)	41	37	39	46	32	43	40	41	36	34	37	29	32	41	33
B(M)	34	29	27	30	23	36	31	33	35	33	34	23	26	37	29
C(A)	38	37	40	36	37	35	42	38	40	35	30	28	32	26	23
A(A)	20	16	17	21	15	18	14	17	20	12	14	16	13	10	12
B(A)	25	18	22	20	17	22	19	20	17	18	20	16	18	21	17
A(M)	46	18	25	9	27	43	38	41	35	32	43	39	30	34	30
B(M)	38	29	32	27	24	39	31	33	34	30	37	30	32	39	34
C(A)	32	29	33	15	30	28	26	31	27	32	33	27	25	28	30
A(A)	16	14	18	11	13	18	12	15	14	11	17	15	13	18	10
B(A)	23	20	18	21	20	19	21	17	22	19	24	19	22	20	18

A*= Weave conflict, B* = Pedestrian conflict, C = Cross-merge and merge-merge conflict, (M)* Morning, (A)* Afternoon

Conflict Analysis A(M)

Table 6b Classification According to Type of Case Processing Summary

	Classes					
	Included		**Excluded**		**Total**	
	N	Percent	N	Percent	N	Percent
Days * Weeks	30	100.0%	0	.0%	30	1000%

Table 6c Reports

Weeks	**Mean**	**N**	**Std Deviation**	**Variance**
1	39.00	5	5.148	26.500
2	38.80	5	3.701	13.700
3	34.40	5	4.669	21.800
4	25.00	5	13.693	187.500
5	37.80	5	4.438	19.700
6	35.20	5	5.718	32.700
Total	35.03	30	8.096	65.551

Table 6d ANOVA Result

	Sum of Squares	**Df**	**Mean Square**	**F**	**Sig.**
Between Groups	693.367	4	138.673	2.756	.042
Within Groups	1207.600	25	50.317		
Total	1900.697	29			

Table 7 Post Hoc Tests: Multiple Comparisons LSD

(I) Weeks	**(J) Weeks**	**Mean Difference (I-J)**	**Std. Error**	**Sig.**	**95% Confidence Interval**	
					Lower Bound	**Upper Bound**
1	2	.200	4.486	.965	-9.06	9.46
	3	4.600	4.486	.315	-4.66	13.86
	4	14.000*	4.486	.005	4.74	23.26
	5	1.200	4.486	.791	-8.06	10.46
	6	3.800	4.486	.405	-5.46	13.06
2	1	-.200	4.486	.965	-9.46	9.06
	3	4.400	4.486	.336	-4.86	13.66
	4	13.800*	4.486	.005	4.54	23.06
	5	1.000	4.486	.825	-8.26	10.26
	6	3.600	4.486	.430	-5.66	12.86
3	1	-4.600	4.486	.315	-13.86	4.66
	2	-4.400	4.486	.336	-13.66	4.86
	4	9400*	4.486	.047	.14	18.66
	5	-3.400	4.486	.456	-12.66	5.86
	6	-.800	4.486	.860	-10.06	8.46
4	1	14.000*	4.486	.005	-23.26	-4.74
	2	13.800*	4.486	.005	-23.06	-4.54
	3	9.400*	4.486	.047	-18.66	-.14
	5	12.800*	4.486	.009	-22.06	-3.54
	6	10.200*	4.486	.032	-19.46	-.94

(I) Weeks	(J) Weeks	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
5	1	-1.200	4.486	.791	-10.46	8.06
	2	-1.000	4.486	.825	-10.26	8.26
	3	3.400	4.486	.456	-5.86	12.66
	4	12.800*	4.486	.009	3.54	22.06
	6	2.600	4.486	.568	-6.66	11.86
6	1	-3.800	4.486	.405	-13.06	5.46
	2	-3.600	4.486	.430	-12.86	5.66
	3	.800	4.486	.860	-8.46	10.06
	4	10.200*	4.486	.032	.94	19.46
	5	-2.600	4.486	.568	-11.86	6.66

*. The mean difference is significant at the 0.05 level

Table 7b Conflict Analysis B(M): Means of Case Processing Summary

	Classes					
	Included		Excluded		Total	
	N	Percent	N	Percent	N	Percent
Days * Weeks	30	100.0%	0	.0%	30	1000%

Table 7c Report

Weeks	Mean	N	Std Deviation	Variance
1	28.60	5	4.037	16.300
2	33.60	5	1.949	3.800
3	29.80	5	5.718	32.700
4	30.00	5	5.339	28.500
5	30.20	5	5.718	32.700
6	34.40	5	3.647	13.300
Total	31.10	30	4.715	22.231

Table 7d One-way ANOVA

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	135.500	4	27.100	1.277	.306
Within Groups	509.200	25	21.217		
Total	644.700	29			

No significance difference in the mean

Table 8 Conflict Analysis (A)**:** Means of Case Processing Summary

	Classes					
	Included		Excluded		Total	
	N	Percent	N	Percent	N	Percent
Days * Weeks	30	100.0%	0	.0%	30	1000%

Table 8b Report

Weeks	Mean	N	Std Deviation	Variance
1	37.60	5	1.517	2.300
2	34.00	5	7.036	49.500
3	27.80	5	3.493	12.200
4	27.80	5	7.328	53.700
5	28.80	5	2.588	6.700
6	28.60	5	3.050	9.300
Total	30.77	30	5.728	32.806

Table 8c One-way ANOVA

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	416.567	4	83.313	3.739	.012
Within Groups	534.800	25	22.283		
Total	951 .367	29			

or conflict type A (M) in which the mean are significantly different, a Post Hoc Test was done to show the weeks in which the differences were observed. It was evident that week four had less conflict because of the holiday

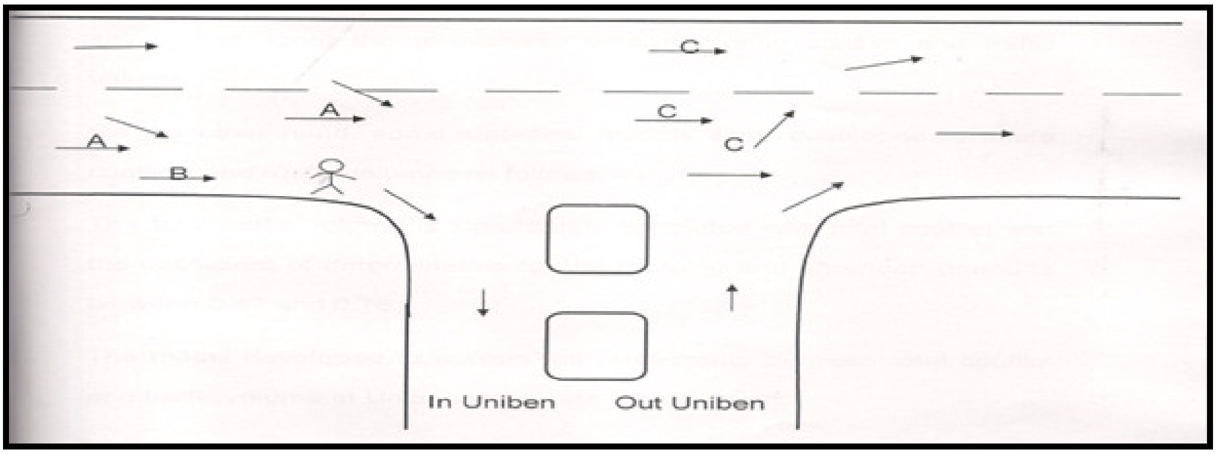

Figure 1 Conflict Diagram at Uniben Main-gate

Conflict Types

A. Weave conflict: Lane changing and turning from wrong lane.

B. Pedestrian conflict

C. Cross-merge and merge-merge conflict

Relationship between Traffic Conflict and Traffic Volume

Most of related literatures show that traffic conflict have a positive association with traffic volume. The Fig. 1 demonstrates a summary of key finding about the relationship between traffic conflict and traffic volume.

On the other hand, some statistical models were developed to relate conflicts and traffic volumes as follows.

The total traffic volume is significantly correlated with total conflict and the coefficient of determination for the morning and afternoon period is between 0.47 and 0.76.

The model developed to explain the relationship between total conflict and traffic volume at Uniben main-gate is as follows.

For morning:

$$Y = 0.04X - 634.96 \quad (1)$$

For afternoon:

$$Y = 716.77 - 0.01337X \quad (2)$$

Y = total conflicts per 2 hours, X= total volume per 2 hours.

Fig. 2-5 helps to explained the conflict interactions in the morning (M) and in the afternoon (A) As shown in the Fig. 5 and Table 9, the total conflict in the afternoon peak is higher for the first two weeks which explain the impact of other environmental factors in the site like bus drivers packing wrongly to drop and carry passengers at the intersection and by the third week a temporal countermeasure was provided which drastically reduced the conflict. From Fig. 2 and 3 it can be clearly seen that in week 4(day Tuesday and Thursday), that there was a great reduction in volume of traffic due to the public holidays, Table 9 shows Total conflict for morning and afternoon peak

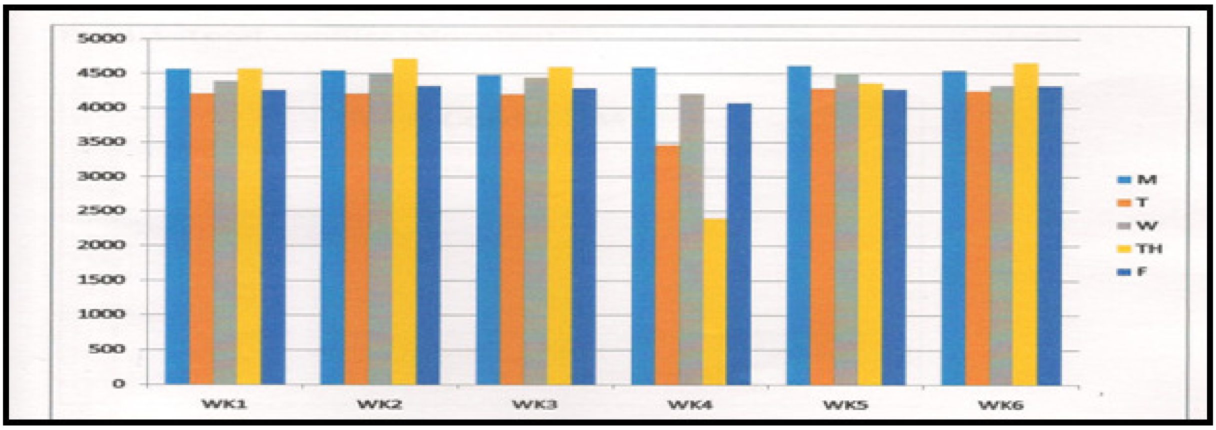

Figure 2 Shows Total Conflict of Traffic for Six Weeks

Table 9 Total conflict for morning and afternoon peak

	Total(conflict (M)	Total conflict (A)
Wk1	338	379
Wk2	362	367
Wk3	354	296
Wk4	275	313
Wk5	356	312
Wk6	348	319

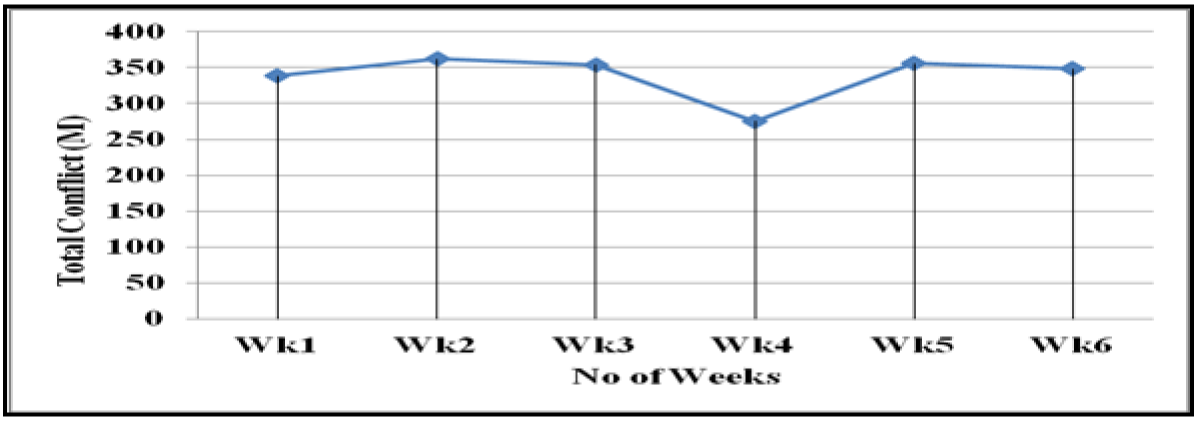

Figure 3 Total conflict morning

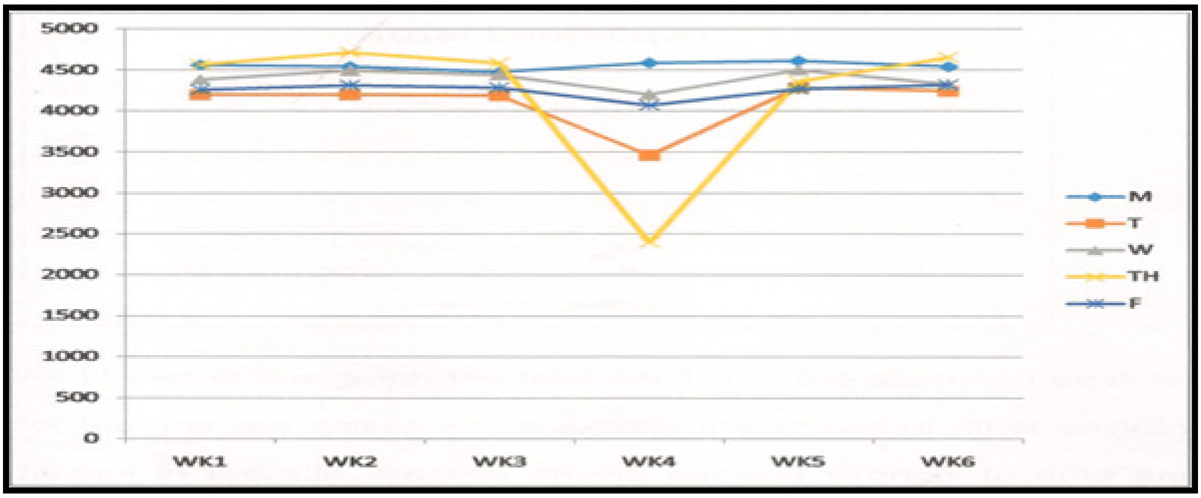

Figure 4 This graph shows the reduction in volume on week 4 which led also to a reduction in conflict which means that the traffic conflict is dependent on volume.

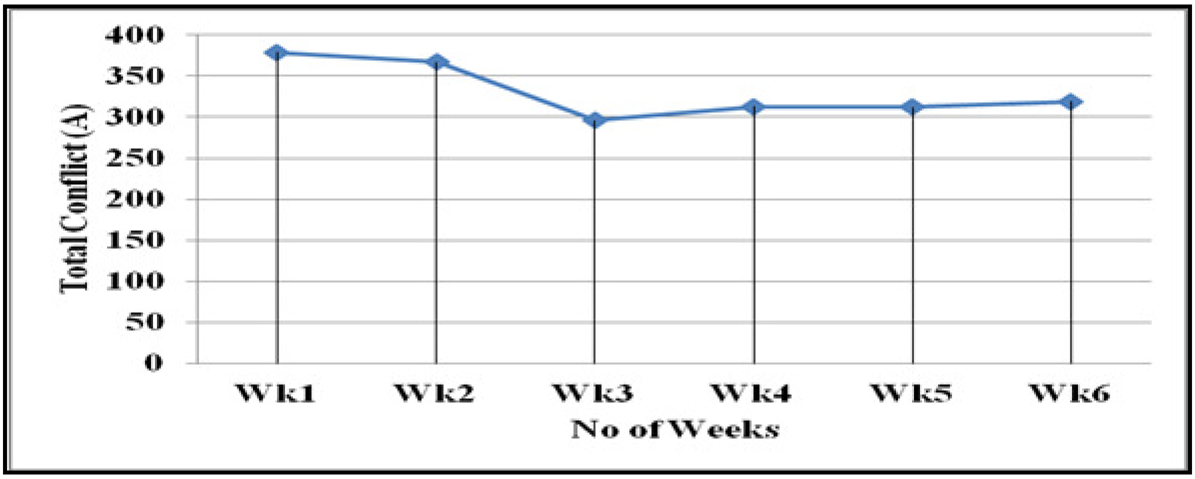

Figure 5 Total conflict (Afternoon) Shows the reduction in the conflict after the 2nd week.

As shown in the graph the total conflict in the afternoon peak is higher for the first two weeks which explain the impact of other environmental factors in the site like bus drivers packing wrongly to drop and carry passengers at the intersection and by the third week a temporal countermeasure was provided which reduced the conflict.

On-Site Observation Report

- Commercial cars obstruct the free movement of operators merging with the vehicles on the major road causing most of them to cross and merge after long wait time.
- There are no adequate signals, or signs or other traffic control device.
- Vehicle speeds are two high on the major road
- There are violations of parking.
- The volume of traffic is causing problem
- Pedestrian movements through the location causes conflict
- No marking on the minor road.

Proposed Countermeasure

- Create separate lane for commercial vehicles
- Visible signals and signs should be provided
- Reduce speed limit
- Measures put in place to check illegal parking
- There should be no zebra crossing
- The minor road should be marked so that operators can maintain their lane.

CONCLUSION

Traditionally road accident statistics are used to assess and evaluate the level of road safety programs. In some cases, the lack of good road and accident records has hampered proper analysis. An alternative approach that overcomes this problem is the safety Surrogates Measures, like, Traffic Conflict parameters which relies on observation of critical traffic situation. An advantage of TCT with respect to crash analysis give a wilder room to analyzed a large sample in a short period of time. The TCT is able to identify and evaluate operational deficiencies and improvements.

REFERENCES

[1] AL- Kubaisy, Y. A. 2002. Development of Hazards Index at Urban Uncontrolled Intersections. M.Sc Thesis, AL-Mustansiriya University, Baghdad, Iraq,

[2] American Association of State Highway and Transportation Officials (AASHTO), A policy on Geometric Design of Highways and Street, *Washington D.C.*, USA, 1994.

[3] Cathy J. Wilton, 1975. “Evaluation of Techniques for the Control of Direct Access to Arterial Highways,” *Federal Highway Administration*.

[4] Baker, William T., 1971. “Evaluating the Traffic Conflicts Technique,” *Federal Highway Administration*.

[5] Box Paul, C. and Oppenlander J.C. 1976. Manual of Traffic Engineering Studies, Institute *of Transportation Engineers*. Virginia, USA.

[6] Brian, L., and Robert, L. 1995. “Pedestrian Walking Speeds and Conflicts at Urban Median Locations”, *Transportation Research Record*, No. 1438, pp.67-73.

[7] Perkins, S. R., and J. I, Harris, 1967. “Traffic Conflict Characteristics; Accident Potential at Intersections,” General Motors Research Publication GMR-718. *Proceedings of the CSCE 2nd Transportation Specialty Conference*, JunelO-13, Halifax.

[8] Zegeer, C.V.,and Deen, R.C., 2004. “Traffic Conflict as a Diagnostic Tool in Highway Safety”., *Transportation Research Record*, No.667, pp.48-551978

[9] Sayed, T., Brown, G., and Navin, F., 1994. "Simulation of Traffic Conflicts at Unsignalized Intersections With TSC-Sim", *Accident Analysis and Prevention*, Vol. 26(5), pp. 593-607.

[10] Katamine, N.M., 2000. "Various Volume Definitions with Conflicts at Unsignalized, Intersections", *Journal of Transportation Engineering*, Vol.126, Nol, pp.18-35.

[11] Bonchuk, Michael. O. 2012. "Academic Research in Borderlands Studies: The Challenge of the Transnational Paradigm". American Journal of Social Issues & Humanities (ISSN: 2276 - 6928) Vol.2(5) pp.294-306.

[12] Al-Hasan, A. Z., Momoh, M., & Eboreime, L. (2015). Urban poverty and informal motorcycle transport services in a Nigerian intermediate settlement: A synthesis of operative motives and satisfaction. Urban, Planning and Transport Research, 3(1), 1–18.

[13] Atubi, A. O., & Ali, A. O. 2016. Motorcycle taxis in Enugu: Implications for development. Sustainable Human Development Review, 1(4), 133–148.

[14] Rémi Jaligot, Armel Kemajou and Jérôme Chenal 2017. "A new approach to spatial analysis of motorcycle taxis activities – the case of Port-au-Prince, Haiti" .Urban, Planning and Transport Research, VOL. 5, NO. 1, 78–91

[15] Ohakwe J., I.S. Iwueze and D.C. Chikezie, 2011. Analysis of Road Traffic Accidents in Nigeria: A Case Study of Obinze/Nekede/Iheagwa Road in Imo State, Southeastern, Nigeria. *Asian Journal of Applied Sciences, 4: 166-175.*

[16] Azeta, J., Okokpujie, K.O., Okokpujie, I.P., Osemwegie, O. and Chibuzor, A., 2016. A Plan for Igniting Nigeria's Industrial Revolution. *International Journal of Scientific & Engineering Research*, *7*(11), p.489.

[17] Okokpujie, K.O., Chukwu, E.C., Noma-Osaghae, E. and Okokpujie, I.P., 2018. Novel Active Queue Management Scheme for Routers in Wireless Networks. *International Journal on Communications Antenna and Propagation (I. Re. CAP)*, *8*(1), pp.53-61.

[18] Okokpujie, K.O., Odusami, M., Okokpujie, I.P. and Abayomi-Alli, O., 2017. A Model for Automatic Control of Home Appliances using DTMF Technique. *International Journal of Scientific & Engineering Research*, *8*(1), pp.266-272.

[19] Okokpujie, K., Noma-Osaghae, E., John, S., Grace, K.A. and Okokpujie, I., 2017, November. A face recognition attendance system with GSM notification. In *Electro-Technology for National Development (NIGERCON), 2017 IEEE 3rd International Conference on* (pp. 239-244). IEEE.

[20] Salawu, E.Y., Okokpujie, I.P., Afolalu, S.A., Ajayi, O.O. and Azeta, J., 2018. INVESTIGATION OF PRODUCTION OUTPUT FOR IMPROVEMENT. *International Journal of Mechanical and Production Engineering Research and Development*, *8*(1), pp.915-922.

[21] Salawu, E.Y., Okokpujie, I.P., Ajayi, O.O. and Agarana, M.C., 2018. Analytical Technique for the Determination of Hoop Stress and Radial Stress on the Tooth Spur Gear under Vertical Loading in a Food Packaging Machine. In *Proceedings of the International MultiConference of Engineers and Computer Scientists* (Vol. 2).

[22] AK, E.C., 2016. Stability Analysis of Model Regenerative Chatter of Milling Process Using First Order Least Square Full Discretization Method. *International Journal of Mechanics and Applications*, *6*(3), pp.49-62.

[23] Nwoke, O.N., Okokpujie, I.P. and Ekenyem, S.C., 2017. INVESTIGATION OF CREEP RESPONSES OF SELECTED ENGINEERING MATERIALS. *Journal of Science, Engineering Development, Environmen and Technology (JOSEDET)*, *7*(1), pp.1-15.