AN EVALUATION OF COMMUTERS' PERCEPTION OF GRAPHIC DESIGN FACTORS IN LIGHT-EMITTING DIODE ADVERTISEMENT IN IBADAN, NIGERIA

BY

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A THESIS
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DECLARATION

I declare that the work in this thesis entitled: **"AN EVALUATION OF COMMUTERS' PERCEPTION OF GRAPHIC DESIGN FACTORS IN LIGHT-EMITTING DIODE ADVERTISEMENT IN IBADAN, NIGERIA"** is original and carried out by me in the Department of Industrial Design. The information derived from the literature has been duly acknowledged in the text and a list of references provided. No part of this theory was previously presented for another degree or diploma at this or any university.

DANIEL OLATUNDE AKANNI _____ _____

Signature Date

CERTIFICATION

The thesis entitled: **"AN EVALUATION OF COMMUTERS' PERCEPTION OF GRAPHIC DESIGN FACTORS IN LIGHT-EMITTING DIODE ADVERTISEMENT IN IBADAN, NIGERIA"** by Daniel Olatunde AKANNI meets the regulations governing the award of Doctor of Philosophy (PhD) degree in Industrial Design (Graphics) of the Ahmadu Bello University, Zaria, and has been approved for its contribution to knowledge and literary presentation.

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DEDICATION

To my mother, Alice Adekunbi Akanni (1915 -1989) of blessed memory, grand and great-grand children

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ABSTRACT

An evaluation of commuters' perception of graphic design factors in Light-Emitting Diode (LED) advertisement (ad) in Ibadan, Nigeria: LED advertisement has received various criticisms due to its perceived abuses on our roads which led to its ban in many countries. In spite of the existential warning from American Medical Association that a glare from roadway illumination imagery from LED advertisement is detrimental to safe driving, and despite the observation that, LED advertisement lining up Nigeria's roadways are characterized by graphic design flaws and could put commuters at risk at any attempt by motorists to want to access the message deliveries on motion, the medium have continued to make its presence felt in many urban centres. This study fills the noticeable daunting gap. The researcher therefore set out to interrogate the perception of commuters on the graphic design factors in the use of LED advertisement on commuter safety in Nigeria. Data were collected using purposive sampling technique with open-ended questionnaire and interview as instruments. Qualitative and quantitative descriptive analyses were adopted using statistical table and chi-square (x^2) to explain, summarize and to draw up conclusions. Findings indicate that, motorists have been operating in a visually complex environment and that, there are indeed problems with graphic design factors on most LED advertisement lining up Nigerian roads. In order to find solution to these problems, visual contents of the sampled materials were redesigned graphically using digital design processes to enhance readability of the message delivery. The efficacy of the redesigned templates could not be empirically tested, because there is no such contemplation to do so, due to time and financial constraint. However, it is of the researchers' view that, the redesigned graphic content (templates) of the LED advertisement will communicate effectively to break every communication barriers for easy visual accessibility. The redesigned (alternative) graphic design content templates for LED advertisement took care of any communication design flaws for easy visual accessibility or readability. This implies that, all things being equal, commuter safety should be guaranteed on Nigeria's roads.

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OPERATIONAL DEFINITION OF TERMS

1. Behind messages delivery: billboard that brightens the roads.
2. Ill-informed graphic design factors: graphic design flaws.
3. Human factor: faulty decision or reaction to environmental factors by motorists.
4. Technological superficiality: Light-emitting billboards.
5. *Oi*: a known knowledge (an existing fact).
6. *Ei*: expected knowledge (what is required).

CHAPTER ONE

1.0 Introduction

Electronic billboard advertisement or Light-Emitting Diode (LED) is a new communication technology, an innovation/development in the annals of message delivery usually placed along major roads to display graphical images to create memorable impression of products or services been advertised. Before now, what motorists experienced along Nigeria's major roads were still (unmovable) graphic images billboards with their peculiar problems. Helm (2003) posits that, advertisers adopted LED outdoor format to attract target audiences because of its comparative advantage of wider coverage to sustain its presence in competitive economy and to maximize profit. Arens (2008) observes that, LED advertisement has either been applauded for its promotional pedigree or criticized for its perceived wide range of abuses – some real, some implied. Omego (2014) noted that, the light-emitting diode (LED) advertisement has both positive and negative impact in an interactive environment. In other words, in spite of its advantages of wide promotional coverage and reach, there are lists of abuses that seem to trail electronic billboards advertising which include higher luminance effects on both human and environment (Chen, 2018), health and pollution related effects (Thuy, 2017), readability and accessibility defects of the message delivery.

The issue of visual content of light-emitting diode advertisement has been the focus of global concern in recent time. McCrea (2008) and Watchtel (2014) documented that, visual contents, physical structures and traffic safety seem to be some of the reasons for the ban of LED advertising display in many global societies. Pete Wilson cited traffic safety and distraction as reasons why he championed the ban of light-emitting billboard advertising in a San Diego law suit in 1971. According to Chen (2018), the artificial light-emitting diodes have higher luminous

efficacy than traditional lighting source, hence their exploitation to provide dual role as a communication device beside illumination without considering the effect to human health. Thuy (2017) posits that, aside the established pollutant effect of the artificial lighting to the environment, LED is increasingly suspected of its susceptibility to a range of health problems. France health authority (2018) has medically established that, the "Blue lighting" from LED devices can damage the eye "retina" to disturb natural sleep rhythms, while American Medical Association (AMA) (2009) warns that, the glare from roadway illumination imagery is detrimental to safe driving. Australia's National Road Safety Strategy enthuses that, roadside light-emitting diodes advertising distract driving attention and it may be one of the contributors to road crashes.

The Outdoor Advertising Association of America (OAAA) (2017) documented that, the new technology (digital billboard advertising) is increasingly becoming endemic to road users as it is capable of interacting with approaching motorist. Wallace (2003) describes LED advertising as "the genuine risk of urban myth". The former Secretary to the Federal Republic of Nigeria, (2008) laid credence to the above when he attributes road crashes to many factors but not limited to the following:

i. Technological superficiality.

ii. Human factor (faulty decision) and

iii. Ignorance of traffic regulations.

He puts it succinctly thus: *"*an ill-informed road user portends a crash waiting to happen often with fatal consequences". The progenitor of Federal Road Safety Commission (FRSC) in Nigeria Prof. Wole Soyinka, the recipient of Nobel Prize for literature, said in one of his lectures on road safety, "The road is patient but it doesn't forgive". According to the FRSC (2008) statistical

report, 80% of road crashes in Nigeria emanate from motorists attempt to look/seek and how they react (action and reaction) to environmental factors (information). The most comprehensive review of the literature to date by Centre for Accident Research and Road Safety-Queensland (CARRS-Q) (2010) found that, crashes risk increases by approximately 25-29% in the presence of digital roadside advertising compare to control areas. According to CARRS-Q (ibid), there is an emerging trend in the literature suggesting that, roadside advertising signs can increase risk, particularly for those signs that have the capacity to frequently change (often referred to as digital boards). The Corps Marshal of Federal Road Safety, Boboye Oyeyemi during the 8th Annual Road Safety Conference in Keffi, Nasarawa State (2019) disclosed that, the 2018 World Health Organization (WHO) global status report on road traffic crashes indicate that, one out of every four road traffic crashes that occur in Africa are reported in Nigeria and warned that, such hazard is of great concern to global community and requires relevant stakeholders to urgently join hands to address the menace head on (Onochie, Daily Trust 2019). WHO's warning to tackle the menace of road crashes in Nigeria serve as existential challenge that requires urgent attention? According to FRSC highway code manual (2008), about 1.2 million people die each year in car accidents worldwide emanating from distraction and drunk driving.

This is to insinuate that ordinarily, LED billboard adverts will not have been alleged to distract motorists if the medium has been designed and structured to generate simply light to brighten the roads even during the night behind message deliveries or advertising. This implies that, motorists are drawn unto the aiding graphic design posts of LED systems to be viewed so much so that, any attempt by motorists to force a glare to read visually impaired (unreceptive) information on LED system may cause visual disorder or complexity and subsequently lead to what Mahmud (2008) described as consequent. The study is therefore premised on the notion

that, effective rendering of graphic design factors (advertising message) on light-emitting diode will precipitate less effort in accessibility to ensure safety on the road. There should therefore be an effective symbiotic alliance or no difference between the messages displays emanating from the medium and the motorists' reaction/attention to it. In view of commuter safety therefore, it has become necessary to interrogate graphic design factors (message deliveries) on LED advertising in line with current global best practices in digital design process; and for the safety of all road users.

By their nature, light emitting outdoor advertisements are designed with graphical images to pull the eyes of road-users (motorists) off the road and unto roadside display as they are placed in a manner as to receive maximum attention in an environment. According to Ogunduyile (2000), electronic billboards have become prominent features in Nigerian urban centres, but sometimes the physical structure and placement seem to obstruct traffic and views of road-users. Lighting Research Institute (LRI) (2008) posits that, graphic images of electronic billboard advert probably draws more attention of everyone's view due to its accompanying lighting system which could have adverse effect on driving tasks of motorists. It is therefore logical that in the absence of effective control or management, safety risks on the road will exist while advertisers and stake-holders whose concern is to promote and maximize profit, will continue to flood the city roads with the commercially inclined message delivery systems without concern to the hazards it may cause to road users, if at all there are effective regulations to manage them.

Meanwhile, the face value of LED billboard advertising design should be simple, clear and easy to read from a distance of 500 feet with legible fonts to motion readers to ease communication (Blue Line Media, 2017). This is to enthuse that designers must understand the

vocabulary of graphic design, know their target audience and also be aware of the constraints that affect graphic communication in order to create effective communication. Iwo-road round-about, Makola round-about and other parts in Ibadan are noted for heavy foot and vehicular movement, dominated by unavoidable aerial displays of ubiquitous mega size and pervasive light emitting diode adverts, some with readability graphic design defects. The researcher therefore set out to evaluate the perception of motorists in the use of roadside light-emitting diode advertising in view of safety on our roads.

1.1 Background of the study

The researcher has encountered a lot of outdoor billboards, pleading for attention from the side of roads and highways on travels and maybe you have too. According to Monroes (2017), outdoor advertising has become an important and efficient way to reach millions of road users. The only ones that left any kind of impression were those Diodes – LED/Digital Electronic Billboards Advertisement (DEBA) with their light-emitting graphic images. Most of these light-emitting diodes advertisement seem to be characterized by peculiarities of graphic design problems which few people have admitted (Dakyes, 2018). This include but not limited to the graphic design flaws that seem to be occasioned by overloaded imageries or information, poor texts messages, poor background, poor typography with their beige (uncomfortably dull) background, which seem to create readability problem, visual complexity or disorder within the context of time and distance for people often on motion at high speed and in high traffic areas. Others include background distraction of the message deliveries.

Advertising theorists have propounded many theories of presenting visual content of product/service advertisement (ad). Fugglesang's (1973) theory of visual communication in Akanni (2015) emphasises that, "visual communications with single image or two images were

more easily grasped, read and understood than multimedia advertisements" especially in motion pictures to stimulate reader's interest, while Hardenbrook's (2013) theory of perception in advertising emphasizes that, one large image eases readability and that colour element of similar value are not legible together. In the same vein, Morones (2017) emphasizes that, bold and high colour contrast creates an even bigger impact that attracts the eyes to a billboard effortlessly, and improve retention of the message. All these theorists align that, elements of graphic design complement each other for effective visual communication. This buttresses the importance of effective marriage between imagery, text and colour usage in design processes to ease visual accessibility and readability while on motion. Electronic billboard advertisement is though a technological breakthrough in the area of graphic communication with its aided lightening message delivery, how safety worthy is the medium on our roads to the target audiences is the issue.

Buser (2006) explains that the explosive growth of automobiles contributed to the growth of the outdoor advertising industry; citing the mass affordability of Henry Ford's Model-T spontaneous inspiration that brought private transportation to the masses, resulting into creating a new mobile audience on which the billboard industry could leverage on. Outdoor advertising therefore, became a visually pervasive and powerful means of influence on our daily visual experience, sometimes with unrecognizable and overloaded texts and images. One major purpose of LED advertising is to capture the road user's attention to create memorable impression with the adverts. Dakyes (2018) however observed that, most of these light emitting graphic designs have comprehensible readability problems. Are the graphic elements bold and visible enough to be read from afar within the time frame and distance on motion? Does the light-emitting message delivery have road safety implication? What is the perception of the motorists on the light-

emitting message delivery? Are the message deliveries effective in their bid for accessibility and readability, if not, what makes it inaccessible. These are pertinent questions the study intends to investigate. Based on this premise, the researcher sets out to interrogate the perception of average motorists on road safety concern over the graphic design factors often accompanied by lighting system; a hypothesis which is probably outside the jurisdiction of the regulatory body of billboards or road traffic management.

A director of Media, Grant (2012) stated the functions of electronic billboard advertising as follows:

- To capture the road users' attention and create a memorable impression very quickly.
- To interrupt as many as possible to create awareness, not necessarily impact, but to broadcast instead of encase.

The Institute of Outdoor Advertising USA (2018) admitted that:

- Digital billboards are designed to display running text and to have several different displays from the same company, or provide several companies a certain time slot during the day.
- The new technology (digital billboard advertising) is increasingly capable of interacting with approaching driver.
- Outdoor advertising has a distracting influence with sheer content, physical presence and size which allows for eye stopping, bigger-than-life illustrations.
- At night motorists encounter no other visual except the electronic billboard emblazoned lighting graphical images across the sky.
- Electronic billboard advertising reveals a natural tendency for visual disorder.

- Electronic billboard advertising creates serious traffic safety hazards to motorists.

Light pollution from electronic billboard ad or sky glow is becoming a recognised form of pollution in developed countries such as USA. According to Cray (2000), light pollution has impact on the following levels and these include:

- Aesthetic implication on environment.
- Astronomical observation at scientific level.
- Road safety issues, unprotected light creates glare and diminishes visibility and contributes to road hazards at night.
- Ecological impact.

Graham (2012) posits that, unprotected light:

- Interferes with human body's biological rhythms by turning night into day.
- Over lit the advertising contents to showcase product and services in order to attract attention.

In certain cases, the internal illuminate billboard may be seen as an important contributor to motion, yet the informational message needs to be grasped and be readable in a short time from far, since they are usually being read by people on motion at high speed and in high traffic areas. One advantage which digital/LED billboard ad has over their static counterparts is that, an ad can be changed within a split of seconds to usher in another. Static billboard messages remain in the same place for a month or longer, and people who consistently drive or walk-by tend to see the same message many times. So planning particular locations or placement has a deliberate purpose and essential to its objectives (Christian, 2012). For instance, a billboard located directly near a place of business can have a great impact in leading consumers to walk in. Location or

placement of billboard advertising is undeniable essential in the scheme of the business but how savoured are they to our road safeties?

Neil (2007) states that the objectives of electronic billboard advertisement are to:

- have ability to reach thousands of people every day and night.
- build a strong identity in a market or location.
- have ability to put out highly memorable messages.
- build powerful brand/image awareness.
- force people to think and leave an indelible impression.
- compel viewers to remember a business.
- strengthen company images.

Others are to:

- present products/services in such a grand scale.
- help consumers remember products/services when the need arises.
- reach target audiences on motion.
- give clear, concise direction to every passer-by.
- remain constantly visible at the exact time and place it needs to be seen.

Consequently, motorists' daily visual experience has been that of continuous perception of billboards that seem to motivate demand for consumer goods without recourse to the contextual defects and detrimental to safe driving of roadway illumination imagery from the lighting-emitting diodes.

Electronic billboard ad is characterized by intermittent changing, swapping, dissolving, and rotational graphical images accompanied by bright luminance which people believe might have road safety implication on motorists. This implies that, the feeling of impermanence of

these visual images can dangerously aggravate by the fact that, most outdoor advertisements are aimed at people in motion with limited time at their disposal to take in information of those ads in a short time. It can therefore be inferred that, where outdoor advertising is managed insufficiently, visual disorder of motorists and deterioration will increase with time. Robbs (2005) advise that:

> "*if advertisement is a form of commercial mass communication designed to promote the sale of a product or service, then regulatory bodies should not throw blind eye on ills of the graphic design flaws on electronic billboards*.

Oshiga (1975) berates the city scenes of being confluent of many diverse things; citing untidiness, incomprehensible individual messages and visual disorders to even motorists. The World Health Organization (WHO) defines visual disorder as limited to situations in which the outer ambient atmosphere contains materials in concentrations which are harmful to man and his environment. Jordan (2015) buttresses the above when he posits that, location of LED billboards have tendency to cause visual disorder to motorists, while Harman (2005) argues that, electronic billboards on our roads are hazardous and thus have safety implications, though the new technology has enhanced advertising practices in the market economy. Jacobs, Cairns and Strebel (2006) argue that, the uniformity and sometimes anonymity of this modernist means of interaction with this promotional large format dominating many urban skylines were unsuited for social interaction and that, the diversity was the great advantage of urban life. Jacobs et al (ibid) reiterate that, postmodern billboards though accepted and indeed embraced with the messy and chaotic nature of the urban life: how do these billboards with their physical structure and graphical content fair with the target audience who are always in motion. Dakyes in Akanni (2015) establishes that billboard:

- does not circulate a message to a market of buyers; the market circulates around a message.
- promotions are delivered around moving audiences that are actively trying to reach some destination.
- presentation of messages must be made simple as there is no time for detailed reading.

It is estimated that six seconds is the average exposure of an outdoor message at one passing time. Based on this premise, the researcher evaluates graphical presentation designs in line with graphic principles and theories of graphic communication. Are they simplified enough to be grasped by motorists? Shapes or forms and images, lines, colours are combined to construct meaning to be grasped by the target audience.

Graphic communication presupposes that motion message delivery should be conveyed in a manner that would easily be grasped. It is in this respect that, the Institute of Advertising Design USA (2018) suggests that the content of mobile advert should:

1. confine the number of elements in the advert to three, if possible two or even one.
2. make sure that the illustration is big enough
3. keep the number of words to a minimum
4. make sure the artwork illustration is in line with the headline
5. use a sturdy typeface, in a medium or bold version preferably a sans serif
6. make sure the product is clearly identified.
7. avoid congested product symbolism.

Oladumiye (2013) stresses that, compatible elements is of necessity in advertising design. They must contain letter forms, images that can be seen and recognized without difficulties. Background of letterforms should not interfere visually with its reading. It must maintain

consistency in height, embrace good colour combination and the size of the letterforms should depend on the overall environment in which the signs are to be placed.

It is important to mention that, although advertising design on billboard is not something new, what is new is the safety consideration in the event that, the problems are characterized by graphic design factors might have on motorists on the road. Illustration, texts and images, shapes, lines and colours are considered essential part of advertising design and since target audience are influenced by it; it requires expertise to produce an effective message to take less effort in reading them to ensure safety on our roads. In making reference to billboard advertising management, Jordan (2015) noted that, where advertising is managed insufficiently, visual disorder will increase with time. He therefore posits that, regulatory bodies should be made aware if at all, of displayed electronic billboards advertisement which poses safety risk to commuters who ply the roads, a gesture that might lead to effective management.

Commuter safety concerns of electronic billboard advertising notwithstanding, there are other interrelated variables that are normally not recognised. The South African Manual for Outdoor Advertising Control and Management (DEAT, 2008) discusses the interrelated variables which include:

- Competition variable. These are referred to as ads and signs that tend to compete for attention of the viewer. In other words, new additions to the scene tend to be bigger, higher, and closer to the street and displaying brighter colours than the existing advertisements. This may cause a snowball effect which can very easily get out of hand.

- Encroachment variable. These deals with ads and signs which tend to advance towards the observer by either encroaching onto or even into the roadway or pedestrian route or by offering information in advance of actual site where the product or service is provided.
- Imperialistic or ubiquity variable. This include any other outdoor advertising media which wants to be ubiquitous and therefore tries to conquer new territories by entering or filling new spaces by making use of new technology and methods such as the electronic billboards.
- Disorder variable of an outdoor advising which has a natural tendency for visual disorder. It can therefore be stated that, where outdoor advising is managed insufficiently, visual disorder and deterioration will increase with time.
- Transition variable. These are the ads and signs displaying a rapid and constant change; and since the display periods of individual ad tend to be relatively short, it cannot be seen as permanent visual elements. This is to say that, if these principal unrecognised characteristics are not managed properly, the placement of outdoor advertising might get out of hand totally.

Hardenbrook (2013) stated the principles of perception that have resulted into negativism among motorists that:

- Over-stimulation or perceiving overloading (congesting) information (graphical images) may lead to various forms of behavioral breakdowns such as confusion, disorientation, a desensitization of setting and decreased environmental awareness, distortion of reality, fatigue, anxiety, tenseness, and extreme irritability, apathy and emotional withdrawal in the final stages.

- It may also lead to social problems such as a lowering in human productivity, the use of drugs, outbreak of violence and vandalism and crime.

It may also influence man's inability of aesthetic perception and appreciation.

Advertising theorist and designer, Hardenbrook (2013) postulates that, overloading principle takes exception of the individual surroundings to perceptually process information (graphic images) to infer meaning and respond emotionally. Hardenbrook further establishes that, image information reduces perception complexity by aggregating visual parts into some recognizable pattern. Bell (2001) confirms that, a motorist has a limited ability and time to process information to form images and ascribe meaning. This implies that, congested information may cause stress where his ability is exceeded. Seen within the framework of information relevance, billboard advertising and especially commercial advertising has an ability to destroy visual harmony due to its natural tendency to accumulate, proliferate and prominent, as well as competing and contrasting. In making reference to symbolism on advert, Obisesan (2008) observed that, designers must understand the vocabulary of graphic design, know their target audience and also be aware of the constraints that affect graphic communication in order to create effective communication materials using creativity to illustrate. In terms of billboard placement, Emeji (2002) postulates that, the millennial Nigerian designers and artists should be concerned about the visual pollution in the Nigerian environment caused by wrong placement of billboards. To attempt to force messages unto contraceptive audiences will only result in cognitive dissonance or complexity leading to visual disorder for the target audiences and subsequent failure of the communication. For a complete study therefore, the quality of copy appeal of the graphic design process of ads and their placement will need to be examined.

It is common sense that electronic billboard advertising might be distracting after all, but while the billboard industry seems to tell advertisers that, “drivers will not be able to avoid it” they tell regulators that the billboards do not pose safety hazards by flooding the roadsides with the new technology to draw the more attention getting messages that are likely to cause the drivers to be less attentive to the driving task (Watchtel, 2009). No wonder Scenic Missouri Online, (2001) opines that, since previous researches on safety consideration of drivers have conflicting data results, the safety of electronic billboard advertising therefore calls for further studies. More so when such researches on safety consideration in the use of light-emitting diode advertising have not been documented to have taken place in Nigeria, this study become necessary. Although EBB advertising has its benefits as a non-traditional media with 24/7 impact, marketers may unconsciously be doing more harm than good to the viewers which they have no perfect control over as perception deals with the power of the mind (Lewin, 2009). It is in view of the above observation that, the study will have to review related literatures that are relevant to graphic communication designs to aid the investigation of the identified problems relating to electronic billboard advertising.

1.2 **Statement of the Problem**

Light-emitting diode (LED) advertisement is comparatively novel in information dissemination strategy though; it is gaining momentum in many countries including Nigeria. Ibadan has in recent times been dominated with mega format electronic billboards advertising to communicate, introduce, display and appeal to wider audiences about products and services graphically due to its acclaimed commercial pedigree. However, Dechesne (2012) establishes that the light-emitting imageries may be harmful to road users and deleterious for community aesthetics. Lee, McElheny and Gibbon (2007) buttress the above that, light glare from electronic

billboards (EBBs) could render roadway light in the area ineffective, while American Medical Association (2009) warned that, a glare from these illumination imagery is detrimental to safe driving. Dakyess (2018) observed that, most of the light-emitting diode advertisements on our roads are characterised by graphic design flaws which may create visual stress to people often driving on high speed in high traffic areas in an attempt to want to read the message delivery/information that are programmed within the context of time and distance. These flaws include but not limited to the following: overloaded/congestion information, poor legible text, poor typography, distraction background and beige colour background. Neither AMA (2009) proffered solution to sudden glare from the neither light images nor graphic design flaws. These two major phenomenon's poses safety challenges that constitute the gap the research seeks to address. According to Reschke (2005), the form and appeal of message delivery of billboards must be bold, simple by eliminating details for effective perception and readability. In other words, graphic message deliveries of LED diode advertisement should break every communication barriers to be decoded by transit audiences with ease?

Since the identified problems seem to founder of global best digital design practices, it remains a argument to promptly diagnose (analyze) the graphic design factors to abate the consequential risk that might confront road users due to human factors (attempt by motorist to force a glare to read these visually impaired/unreceptive information) especially in Nigeria. The researcher set out to interrogate the perception of the motorists on graphic design factors in LED advertisement in view of commuter safety. Do these characteristics of EBB advertising have implication on commuter safety as motorists are always on motion?

1.3 **Aim and Objectives of the Study**

The aim of the study is to evaluate the perception of motorists on graphic design factors in light emitting diode/LED advertisement on commuter safety in Nigeria.

The specific objectives of the study are to:

i. analyze the graphic design factors of LED advertisement.
ii. investigate graphic design problems in LED advertisement on the perception of the motorists.
iii. examine how the physical structure and placement of LED advertisement along the roads affect perception of motorists.
iv. evaluate the perception of motorists on commuter safety in the use of roadside LED advertisement.
v. create alternative graphic design content of LED advertisement in which safety issues are considered.

1.4 **Research Questions**

The study will be guided by the following research questions.

i. In what ways can graphic design factors of LED advertisement analysed?
ii. What are graphic design problems on LED advertisement on the perception of the motorists?
iii. In what ways can the physical structure and placement of LED advertisement along the roads affect the perception of motorists?
iv. What are perceptions of motorists on commuter safety in the use of roadside LED advertising?

v. What are the alternative graphic designs content of LED advertisement in which safety issues are considered?

1.5 **Basic Assumptions**

The research is anchored on the assumption that, some of the message deliveries of electronic billboard advertisement on display have graphic design factors (problems) which:

i. May hamper readability by motorists.

ii. May have safety implication in an attempt to force their glare to seek information on light-emitting ad while on motion.

iii. Physical structure and wrong placement of these electronic billboards may pose safety risk.

1.6 **Hypothesis**

From the problems, objectives and research questions of the study, the following null hypothesis was formulated.

$HO_{1:}$ There is no significant difference between graphic design factors and determinant of design hallmark in LED advertisement.

$HO_{2:}$ There is no significant difference between graphic design problems in LED advertisement and observed frequency on the perception of the motorists.

$HO_{3:}$ There is no significant difference between physical structure and placement of LED advertisement and observed frequency on how LED advertisements affect the perception of motorists.

$HO_{4:}$ There is no significant difference between perceptions of motorists on commuter safety and observed frequency in the use roadside LED advertising.

$HO_{5:}$ There is no significant difference between alternative graphic design content of LED advertisement and observed frequency in which safety issues are considered.

1.7 **Justification of the Study**

There is the wisdom which proposes that, we continue to do serious research on matters that concern humanity beyond assumptions or speculations. Not doing it would have ended in total failure as one would have lived not carry out a mission of making better what one found. This view is in tandem with Plato's (428-347BC) maxim: "talk what you know and what you see". It is also in line with the philosophy of the Federal Ministry of Information and Culture, Nigeria that: "if you see something, say something". The study is therefore justified because the product of this effort will enable advertising industry and other stakeholders in billboard business to be responsive as improving visual quality of LED advertising to engage road users responsibly to suit Nigerian environment. It would also enable road safety agencies to understand and address significant emerging safety issues of light-emitting display technology of outdoor advertising. In other words, stakeholders in advertising business would find this study an indispensable companion. The study would create safety awareness involving ill-informed graphic design factors or process for effective management. It would sensitize advertisers to recognise the danger associated with defection of graphic illustration on LED advertising. It would create awareness on emerging safety issues of light-emitting display.

1.8 **Significance of the study**

The issue of commuter safety on roads is a global concern that seeks lasting solution. The study will contribute to solving graphical flaws that causes visual stress on LED advertising device to reduce accidents on the roads. The study will bring standard in the graphic design industry by which stake-holders in LED billboard advertising industry seeks professionals for their graphic illustrations that will in turn bring monetarily gain to the graphic industry. This implies that, the

alternative (redesigned) graphic design contents could be applied on LED advertisement in Nigeria when found effectual.

1.9 **Scope and Delimitation of the Study**

The study area for this research is Ibadan, the capital of Oyo state, an industrial hub and presumably largest urban city in West Africa, a symbol of modern entrepreneurial environment with intimidating electronic billboards advertising structures of various sizes and heights, spread in two local governments' areas of the city. The city has a long standing history of administrative status dating back to the 1920s, a factor which perhaps has made Ibadan a political and economic oasis of Oyo state, with multiplicity of road networks, concentration of numerous companies and markets which tend to encourage the hustling and bustling of transportation and commercial activities on daily basis, thus engendering phenomena of urbanization and transportation demand in response to urban sprawl, complex land use and social interaction of light-emitting diode advertising; which before now, traditional compound buildings with few exemptions of reticulation road networks define the entire morphological make-up of Ibadan.

Light-emitting diode (LED) advertising has therefore become a part and accepted norm of the landscape in Ibadan just like other urban centres of the world. The study will delimit its scope to the contextual graphic design content and placement of LED advertising in two local government areas in Ibadan viz-a-viz along Iwo-round-about (North- West) and Elewure and Makola (North- East) in a manner closer to the-real-world of motorists who ply those areas. Those areas are though not limited, but made up of busiest inter-sectional major road-networks and roundabout with a lot of traffic exposure of heavy foots and vehicular. Iwo road-round-about for instance is a site of four LED advertising Mega billboards, one of which is four-sided electronic advertising device, about 40 feet above the ground with internally highly illuminated

images. The visual screened space panel measures 34 feet (width) and 19 feet high with juxtapositions of adverts of variety of products and services? Others are the ultra-waves, strollers and digital electronic billboard advertising panels branding the environment in Elewure junction leading to Bodija market on the left and Makola round-about access road area of Ibadan respectively. The efficacy of the alternative graphic design content templates is subjected to none predetermine testing with LED channel or any other. This is due to foreseeable time and financial constraints. LED advertisement billboard industry by natural account is a big business hub often embarked upon by multipurpose companies and business men as it involves big money. Ironically, this is out of reach of the researcher because of financial and time constraints.

1.1.0 **Theoretical framework**

Marshal (2010) describes theoretical framework as concepts, expectations, beliefs and assumptions that supports and informs a research. They form the key basis of a study". The main idea of this study is to evaluate the perception of motorists on graphic design factors on road safety consideration in the use of LED advertising based on the theories of graphic communication. Two theoretical frameworks were adopted for this research. They are: Graphic Communication Model (GCM) and Investigative and Interpretative Phenomenological Analysis (IIPA). Graphic communication relates to the production of visuals which involves a multiplicity of analytical considerations bound up with theories and principles of learning, illustration, perception, symbolism, communication and philosophy. Ejembi in Akanni (2015) expounded a theory of communication programme (model) which Galante (2003) describes as a conceptual notion of effectiveness. The model which was a modified one from Lanswel (1948) communication process has six characteristic variables. The model conceptualises who (source I), says what (message), to whom (receiver), encoded by whom (source II), in which channel and

with what effect (feedback) as graphically described in figure 1, page 25. The model seems to have emblazoned its possibilities for adaption as a framework for understanding the visual or graphic communication process in empirical exercise. The model consists of six basic characters. These are:

- Source I (By who)
- Message (Says what)
- To whom (Receiver)
- Encoded by whom (source II)
- Which channel and
- effect (feedback)

The model stresses the importance of the "graphic encoder" and the "feedback" variables in communication process. Ejembi in Obisessan (2008) declares that the introduction of graphic encoder emphasizes its role in the development of communication programme that is seldom recognised in most attempts". Drucker and McVarish (2009) opine that, adapting a model for evaluation or research purposes explains vividly the quality of the graphics and copy appeals of the ads to be examined. Meggs (1983) posits that, the essence of communication model gives order to information, forms, ideas, expression and feelings to visual/graphic communication or documented human experience to enhance messages delivery. This implies that, good graphic communication should be marked by effective presentation of layout, texts and images, especially when the encoder is conscious that, the message deliveries is going to be programmed on the principle of transition to create scene of impermanence graphic information by light-emitting system.

1.1.1 **Investigative and Interpretative Phenomenological Analysis (IIPA)**

The IIPA concept hinges on investigation of a phenomenology that is cognitive to a particular situation using either qualitative or quantitative analyses to arrive at a result. The IIPA process will investigate visual functional order of the electronic billboard advertising that will lead to accumulation of data – the raw material of the study, of which analysis of sufficient data collected, may lead to the knowledge of wisdom of "what" the medium works. This theory is in line with philosophical choruses of Eliot's (1934) poetic enquiry of man's wisdom embedded in knowledge and lost in information (Hewlett, 2003). This implies that, "knowledge" is buried in flood of data. Eliot's (1934) poetises the theory of IIPA with a title: "the Rock":

> *"Where is the life we have lost in the living?*
> *Where is the wisdom we have lost in knowledge?*
> *Where is the knowledge we have lost in information"?*

Greek authors call the path to knowledge "*gnosis*" while the Hebrew calls it "*daath*". Seeking knowledge is a philosophical disposition of Greek thinkers such as Plato and Aristotle who defined knowledge as a "*ledge"* of knowing. Ali (n. d) describes knowledge as lost property of knowledge seekers or residual of wisdom. According to Hewlett (2003), this philosophical theory embraces the ideological negritude of solving problem(s) for humanity and has become the standard ideal model and dominant paradigm for investigatory (survey) and real observatory (perception) for intellectuals, burgeoning universities and higher education all over the world.

1.1.2 **Limitation of the Study**

The challenges from this study emanated from the target audiences (motorists) from whom data were collected, the FRSC officers and time and finance constraint of the researcher. Motorists are always on motion attending to their daily routines and would not be prepared to spare even

few minutes to attend to the questionnaire. Few respondents who eventually attempted the questionnaire did it reluctantly. Some could hardly read. On the part of FRSC, officers will not allow me see their controller and when eventually they did after four attempts, the controller demanded for a letter of “introduction” from my school before they could agree to attend to the questionnaire. Of course, the researcher could not produce introductory letter because it never occurred to me to do so, the FRSC officers eventually did attempt the questionnaire after merited persuasion. The researcher could not display or test the efficacy of the alternative designed templates on LED advertisement device because there is no such contemplation to so. It is cost demanding and time consuming. LED advertising project is big business and cost intensive. The project is often embarked upon by corporate institutions, companies and billboard industrial hubs for public consumption.

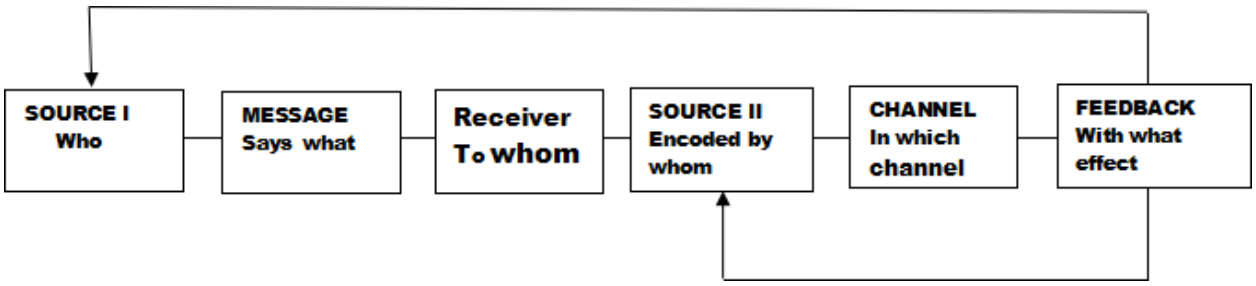


Figure 1: Basic model of graphic communication (Source: Obisesan, 2008)

CHAPTER TWO

Review of relevant Literature

2.0 Introduction

This chapter undertake literature review of original researches that are relevant to the research being carried out. The study undertakes a critical review of the literature on historical overview of outdoor advertising (2.1), emergence of public information display billboard (2.1.1), electronic billboard advertisement (2.2), variety of billboard formats (2.2.1), characteristics of electronic billboard advertising **(**2.2.2), the theory of illustration (2.2.3), the principle of transition (2.2.4), potential complexities of light-emitting advertising display on our roads (2.3), management of outdoor advertising display (2.4), synopsis of electronic billboard advertisement (2.5), concept of communication in graphics (2.5.1) visual predisposition of advertising message (2.5.2), graphic communication theories (2.6), global best practices in digital design or communication process (2.6.1), the concept of colour in graphic communication (2.6.2), the concept of text in graphic communication (2.6.3), the concept of imagery in graphic communication (2.6.4), creativity and placement strategy (2.6.5), propensity of committee of advertising practice (2.6.6), previous studies, and other relevant materials for the study.

2.1 HISTORICAL OVERVIEW OF OUTDOOR ADVERTISING

Understanding the history of outdoor advertising is very crucial to this study. This is to justify significantly and appreciate the new innovation in the billboard industry. Freitas (2006) avers that, billboard has a legacy dating back to the 1830's when it began outdoor advertising with just about everyone's favourite tag – "the circus is coming to town," and when before then, town criers were used to sell wares in villages and towns in Africa or to announce the arrival of ships and to tell the residents of ancient Europe about available cargoes, when Babylonians used

signs (picture(s) of the products and services) to advertise their wares as early as 3000 BC before 550 years to Gutenberg's inventing movable types - the first printing press (Kamen, 2006).

The first printing press brought with it innovations on how to advertise in publications such as the newspapers, magazines and periodicals. According to Baily (2016), typical of most newspapers of its day, the *Pennsylvania Packet* and *Daily Advertiser*, in which the constitution of the United States was first published, carried advertisement of goods which had just arrived from abroad. It also published ships sailing notices and offered the services of tailors, cobblers, candlesticks makers and other tradesmen of that time.

Two incidentals activities set the stage for what might be called the "contact of graphic communication" in Nigeria. Ezuaghah, (1988) witted that, nationalistic movement and indigenous political propaganda in the 1930's brought a new printing process in Nigeria. Gust (1977) asserts that, the Industrial Revolution brought about new attitude and inventions, both of which contributed to sudden growth not only in transportation but to graphic communication. It was a period of rapid industrial growth; when machines and large-scale production replaced hand and tools and when Nations shifted from an agricultural to a manufacturing base. A spirit of innovation and progress gave rise to a new interest in providing information about their product to an entire culture. As country grew, transportation, communication and distribution systems gradually improved (Buser, 2006). Quoting Richard White in his book "The Second Industrial Revolution, 1870-1914, Engelmam (2014) retorts:

> "*if a Western Rip Van Winkle had fallen asleep in 1869 and awakened in 1896, he would not have recognized the lands that the railroads had touched. Bison had yielded cattle; mountains had been blasted and bored. Great swaths of land that had once whispered grass now screamed corn and wheat; population had increased across much of this vars region, and there growing cities along its edges. A land that had once run largely North-South now ran East-West. Each change could have been traced back to the railroads (transportation) and information dissemination".*

The growth of population centers, industry and improved production technique increased the need for dissemination of information. As a result of this development, many businesses were eager to expand their sales into the market. Like products of industrial design, outdoor advertising messages were made available everywhere in the interactive environment of major highways of urban cities calling for audience's attention and shaping attitudes and way of life through their ubiquitous and pervasive visual billboards (Amy, 2007). Although the medium was from the onset entirely local, modern capitalism extended the spread and practice globally. The entire world was brought into the market system. According to Buser (2006), much like the automobile industry that has been changing and growing since the introduction of Ford's Model-T, outdoor advertising steadily evolved to meet the needs of a growing and continuously more sophisticated unregulated marketplace.

The innovation in the outdoor advertising industry has seen growth in the size of billboards, changes in the materials being used, as well as upgrades in technology such as improved mechanical components and digital billboards. Improvements in other industries like lighting industry since the time the original mass produced billboard were introduced, made it possible for electronic billboards to be visible even at night, and in a more attractive and effective way (Liginbuhl, 2009). Solar powered lights and outdoor LED screens also made it possible to light a billboard in a more economic way. According to McChesney (1997) in Buser (2006) outdoor advertising which was initially almost exclusively for domestic audience, developed haltingly to encourage the growth of new communication technology to expedite commercial interaction.

Amy (2007) reveals that, prior to the invention of lithography, billboard copies (texts) could only be produced on a very small scale which made it significantly less effective as a market tool than

it is today with limited but still appreciably commercial value. Amy (2007) reiterated that, the genius of this invention is that, it made it possible to mass produce as many posters and announcements as a business needed. Print advertising flourished during the time, as great stride were made in printing technology to announce new product to the masses. The resultant effect is the adoption of sensual images on the advertising media of the time to attract and persuade audiences. According to Aynsley (2001), Jules Cheret and Fredric Walker who were christened the fathers of modern posters designed and produced over a thousand posters; some of them close to seven feet tall. Those sizes were achieved by joining sections mounted on walls; thus the art of posters which were initially meant for galleries and private homes was brought out into the street showcasing organic and decorative quality of original forms that were often inspired by nature (Aynsley, 2001). The trend has since continued unabated to predate development of sophisticated advertising industry. Originally local in nature, OFT (2011) report reveals that, the growth of road transport saw the development of poster contractors offering panels over a wider area, while the advent of commercial television spurred consolidation of the sector and the formation of industry associations to promote Outdoor advertising as a medium. In other words, as roads and highways multiplied, the billboard business thrives.

Narrating the history of advertising in an article, Ada (2010) traced the genesis of advertising in Nigeria to the colonial era which earnestly started with the birth of the West African Publicity Limited (WAPL) in 1928, during the emerging of advertising companies such as the West African Publicity (WAP) Company, U.A.C., and later Afromedia, etc. began to prepare the use of billboards for highway advertising. Manufacturing industries with their increase in the volume of goods imported into the country, and later the petty traders and indigenous business men eventually grasped the importance of billboards which they use initially

to boost their trade. In 1990s, signs and billboards became grossly abused which resulted to the chaotic and unpleasant situation in the cities because many people embraced petty trading which they advertised.

Tony Fusco (2014) took us through memory lane when he writes about the frenzy that followed the emergence of new form of outdoor display in the global landscape thus:

> *"From the year 1890 to 1900, Europe and America were in frenzy over a new form of advertising which was also a new form of art: the illustrated colour advertising poster. Gone were the drab streets and boring broadsides. The boulevards of Paris, the tiny streets of Belgium and Holland, the otherwise solemn squares of London, and the shop windows of America proliferated with colourful images, a veritable public poster parade, created by some of the most talented artists of their time".*

Buser (2006) writes, the explosive growth of automobiles contributed to the growth of the outdoor advertising industry; citing the mass affordability of Ford's Model-T spontaneous inspiration that brought private transportation to the masses, resulting into creating a new mobile audience on which the billboard industry could leverage on. Outdoor advertising therefore, became visually pervasive and powerful means of influence on our daily visual experience.

2.1.1 **Emergence of Public Information Display Billboard (PIDB)**

Thanks to recent technological advancement in Video Walls large-screen billboards which are on display everywhere particularly in well-trafficked public places such as the major highways, train stations, airports, hotels and taxi stations. According to Rip (2006), condition of installing each sign of (PIDB) is based in part on favourable location and vehicle demographics of how many cars pass by that site on an hourly basis. However, these public displays have been receiving considerable attention as distract and visually compelling communication platform, delivering a wealth of pertinent information and related commercial advertising. According to Hanjong (2016), public information displays (PIDs) have been used as a global delivery tool for

years to enhance information dissemination and product compelling imagery in advertisement. History has it that, the growing popularity and expansion of the medium in recent times first started in hotel lobbies and airports, and subsequently find its way in departmental stores, banks, hospitals, schools and even Bus stops. It is now a sightseeing the newest emerging PIDs called e-Boards adoring roadside of many cities, taking schools, higher learning institutions and corporate conference rooms delivering Full Higher Digital (FHD) and Ultra Higher Digital (UHD) resolutions, even in large-sized display that are durable and minimize overall discoloration during long periods of operation (Lahtuneday, 2011; Honjong, 2016). According to Stanley (2000), information to the public efficiently across the widest variety of environment, outdoor display must have improved brightness, greater durability and higher thermal resistance. How safe in respect of its visual disposes and placement to road users should be any displayed electronic billboards advertising lining up our roads.

2.2 THE FUNCTION OF ELECTRONIC BILLBOARD ADVERTISEMENT

Electronic billboard advertisement (EBB) functions as both an indoor and outdoor medium which has become one of the fastest growing modern advertisements in urban centres all over the world including Nigeria. In addition to roadside billboards, outdoor advertisement comes in variety of display formats at various types of locations such as bus shelters, car and railway stations, airports, shopping malls and supermarkets even in Nigeria until railways became comatose in Nigeria in the immediate recent times. Outdoor Advertising Association of America (2017) describe electronic billboard as a medium of purely visually contextual information slot machine exclusively meant to create awareness. Within this context, it is a purposeful act of creating messages or ideas or awareness of something or to promote a product or service in a visually creative format.

Kadry (2015) states that, advertising functions as artistic design to point out how a product or service can be of social, political, cultural or economic value to a consumer in a given society. This implies that advertising is a form of graphic communication. Dakyes in Akanni (2015) describes advertisement as an "instrument of business that links buyers and sellers in a vast efficient communication network". It implies that advertisement is a creative design and organization of visual work for products and services propaganda. It can also be conceived as non-personal communication of information usually persuasive in nature about products, services or ideas by identified sponsors through various media. Jonathan, (2017) posits that, advertising is often adopted to promote sales of products, encourage desire for products and to make the world go round while Encyclopaedia Britannica (1998) defines advertising as the technique and practices used to bring goods, services or opinion to public notice towards promoting a good that is for sale. It implies that, any form of advertisement including electronic must have both persuasive and informative qualities to attract attention.

It also implies that, the closer a print medium like billboard illustration comes to pure information, the closer it comes to pure graphic design. What message means within the context in which the ad is presented and for what purpose it is created, by whom it is created and for whom it is created depends on how well the adopted elements are married together to be read at a range. Human beings associate various levels of catching certain shapes; and letters/text and symbols on a platform to create meaning. The design elements used may include fancy lettering, borders, cartoons, illustrations, and photographs. Good billboard advertising design must reach, be grasps and compel the target audience not only for purchasing purposes of the products and services, but also to make an impact through graphic communication, creativity and concept

without necessarily endangering their safety. A picture they say is worth 1000 words in term of creating impression (Monroes, 2017).

2.2.1 **Variety of billboard formats on our Streets**

Oladumiye (2002) perceives billboards as large structures erected on highways and roads for display of huge advertising posters. In Nigeria, billboard can be seen in the light of a structure display of advertisement at the roadside in human environments. Billboard advertising comes in a variety of formats with Vinyl, cloths or flexes material surfaces and novel monitoring electronic/computerized screens; including conventional phone box posters (0.7x1.6m), conventional four-sheet (1.0x1.5m) panels in train stations, bus depots and shopping malls; conventional six-sheet (1.2x1.8m) panels on bus shelters and free standing units on high streets and in pedestrian areas; conventional 48-sheet (6.1x3.1m) panels on main roads, conventional 96-sheet (12.2x3.5m) panels in city centres and on main roads. Amy (2007) postulates that, billboards advertising should be more than 3inches (18cm) high at 100 feet (30m) and over 12 inches (30cm) at 400 feet (120m), some with external lighting system. Outdoor advertising display format which according to Lazzari (2008), account for a growing proportion of marketing strategy in many urban cities of the world, has led to new innovation such as computerized and electronically LED screens installation billboards as well as digital mobile billboard advertising.



Figure 1: Mobile Electronic Billboard (Source: Ilorin Highway - Akanni, 2017)

The mobile billboard which perform digitally video imaging and audio system, is typically LED television screen, programmed to rotate at an axis of angle 360 degrees as at when due. The audio system is programmed to continuously announce or play musical sounds while the computer screen or monitor transmits the video information (images) of the products or services. Figure 1 above is an example of computerized mobile electronically LED screens installation billboards advertising.

The choice of advertising or campaign environment of mobile electronic billboard advertising however, depends on the audience been targeted on daily basis. This is to bring goods and services to the doorsteps of the consumer. With this hi-tech, billboard industry has more than ever before added another dimension to advertising industry in human interactive environment. Digital imaging involves computer-based storage of still or moving images with information, sometimes with or without sound and digitized still imaging resolution installation

that invokes the memories of passers-by. Billboard display has often been described as transit advertisements and which must emphasis visual simplicity and directness to catch the attention of the passers-by. Amy (2007) admonishes designers to remember that the message should be seen from a moving vehicle at a distance of at least 30cm. Experts in graphic and advertising design posit that, message of more than seven words is difficult to read and that, a single image is easiest to grasp and recognizable to make a strong visual impact than a multi- imagery message. The problems presented by transit advertisement therefore, are but not limited to the audiences always in motion, forms of appeal, bold, legible and simple visual elements but also brightness of the electronic billboards screens. A strong intellectual and visual unity becomes important in message delivery of electronic billboard advertising display to strike impact to the sight of a commuter. Aside the visual impact, arbitrary and clustering display of billboards can cause visual and environmental pollution. No wonder, display of billboard without planning permission is a criminal offence in United Kingdom (Farmer, 2010).

The billboard advertising (fig. 2) is another example of digital electronic billboard advertising. This is a single-four-sided advertising billboard with digitized imaging resolution located at Iwo-road in Ibadan. It stands almost about 40 feet above the ground with its sign face measuring about 34 feet width and 19 feet high. The billboard is centralized within a roundabout of four conjoining roadways, highly visible from about 2900 feet away from all the four angles of the interactive environment. The constantly changing, flashing, dissolving and motion texts and images ensure maximum wide exposure which Wallace (2006) criticizes as “distraction”; capable of distracting motorists performance to initiate motor accident.



Figure 2: LED Electronic Billboard Advertising (Source: Iwo-Road/Roadway Ibadan – Akanni, 2017)

2.2.2 **Characteristics of Electronic Billboard Advertising**

Electronic billboard advertising is characterized by intermittent change over's, swapping visual display, dissolving and rotational graphical images with bright luminance which people consider safety risk to commuters. The working is based on the principle of transition where advertisements and signs display have a tendency for relatively rapid and constant change with short period transit for each advertisement which cannot be seen as permanent visual elements (Bell, 2001). This implies that, the feeling of impermanence can be aggravated by the fact that, EBB advertisements is aimed at people in motion with limited time at their disposal to take in information on such advertisements. It can therefore be stated that, where outdoor advertising is managed insufficiently, visual disorder of target audiences and deterioration will increase with time.

Jordan (2015) buttresses the above when he posits that, location of electronic billboard advertising has tendency to cause visual disorder to motorists while Harman (2005) argues that, electronic billboard advertising may be hazardous to safety of motorists even though, the new technology has enhanced advertising practices in the market economy. Jacobs, Cairns and Strebel (2006) argues that, the uniformity and sometimes anonymity of this modernist means of interaction with these promotional large format billboards dominating many urban skylines were unsuited for social interaction and that the diversity was the great advantage of urban life. Jacobs et al (2006) reiterates that, postmodern billboards though accepted and indeed embraced with the messy and chaotic nature of the urban life; how do these billboards with their graphical factors fair with the target audience who are always in motion because billboard:

- does not circulate a message to a market of buyers; the market circulates around a message.
- promotions are delivered around moving audiences that is actively trying to reach some destination.
- presentation of messages must be made simple as there is no time for detailed reading.

2.2.3 **The Theory of Illustration**

Illustration is a coded message designed to clarify a literary work or being made to articulate or remove obscurity for proper education and understanding in graphic communication. Illustration is related to graphic production or visuals which involve a multiplicity of analytical considerations bound up with theories and principles of learning, perception, symbolism, communication and philosophy. The philosophy of Green (2000) states that, “win through action and never through argument”. Meaning that, the overt purpose of any outdoor advertising including light-emitting diode is to be read and understood. To win this

argument within this context involves manual and mechanical technique for production of images and texts to improve contents which in this case is the LED advertisement. Since the intent is not only to attract attention but to communicate in such a way that, there is a positive feedback, it requires adequate and clear information which implies understanding on the part of the receiver of the information as well as the effectiveness of the appeal. But how has the graphic communication so presented on the light-emitting diode fare in terms of visual accessibility and readability within a time frame and distance by a motorist? In many cases, the LED ad only seem to convey those distinct impressions with mere complexities (graphic design flaws, distraction, illumination etc) to attract more and longer glancing time that may constitute safety hazards to road users. According to Dukic (ibid), the obvious explanation is that, the production (illustration) so presented seems to create readability complexities that seem to draw more attention and time.

Poppy (2006) theory of illustration suggests that, good production of visuals is bound up by simple, clear and effective marriage of the graphic design factors to ease perception, readability and understanding. Poppy reiterates; "the production requires clear information (concept) through the techniques of good quality images to communicate in such a way that, the content should be visually accessible and readable", that requires absolute simplicity of design process (Monroes, 2017). The process of illustration (production) according to Barrett (2003) is derived from the mathematical theory of information which establishes that, communication always takes place between those units that transmit the information and those that receive it. The process therefore requires explanation, and since the transmission of the coded message occurs between man and man; graphic design and visual communication find their natural diffusion through the instrument of mass media and at least through the techniques of image

production. Therefore, visual reproduction should be well presented as well as communicate an idea which when perceived would be testy, meaningful and understood (Alozie, 2005).

2.2.4 **The Principle of Transition**

Transition is a process or a phrase connecting one part of a discourse to another. The Advanced Oxford Dictionary describes transition as "conveyance". Dow (2012) describes transition as "the softening of opposition with curves". Within this context, transition is an act of motion (changing) of images from one particular role to another programmed to appear and disappear (exit) in line with internal programming to be perceived, viewed, and detected within split of few seconds by target audiences. Lewin (2009) liken perception of messages from electronic billboard advertisement to a movie playing model controlled by the mind that can hardly be ignored, a phenomenon created by transitional/motion message delivery. According to Jordan (2015), Hardenbrook (2013) and Wallace (2003), transitional images from LED advertising has the penchant to create visual disorder, distraction and perception complexity. The above assertion was buttressed when Walker and Wainscot (2010) observe that; motorists have been operating in an increasing complex visual environment over the use of light-emitting diode advertising on our streets.

Harman's (2005) theory on visual disorder laid credence to electronic billboards as hazardous to road users even at night. This is probably because of inconsistency in the adopted design format of the designer. No wonder, Wallace (2003), describes LED advertising as "genuine risk of urban myth". This study is therefore premised on the assumption that, effective encoding of graphic design factors with regard to short message, big idea, regular font, bold, large, thick and legible texts/images as well as sharp and contrasting colours and devoid of distraction background could lead to effective perception of motorists to ensure safety on the road. The

designer must however be equipped in the knowledge of the "golden rules in graphic composition". Ely (2021) itemised the golden rules of composition to include the following:

- Use of consistency or regular format and design for all the branded materials.
- Avoid using too many fonts at a time for same branded materials.
- Avoid too much colours. Using suitable colours can be very powerful.
- Scale image proportions correctly. It is wiser to experiment with image sizes and scales, but not to stretch photos to look untidy on print. It makes the brand look unprofessional.
- Align design elements correctly. Scattered random design elements on a page will look disorganised and messy, and will look like designer have not thought about the reader at all.

White space is important in design platform. It helps the design breathe and take in its surroundings. According to Ely (2021):

> *"white space is another reason why designer should not use too many fonts and colours. White space means less clutter and it also gives readers a chance to rest their eyes and brains. These are the keys to get rid of anything unnecessary so as to emphasise the important stuff.*"

This implies that, designers should always think about the logic of the information being displayed to someone seeing it for the first time.

2.3 COMPLEXITIES OF LIGHT-EMITTING DIODE ADVERTISEMENT ON DISPLAY IN URBAN CENTRES

LED advertising is a semiconductor device visual technology that emits visible light when an electric current passes through it to display graphic messages to be perceived and read. Freemam (2003) describes perception as visual events in which information, meaning and pleasure are sought by a viewer in an interface visual technology. Visual technology (LED) has

ability to display anything which is television or computer monitor including motion images or signs (Shenzhen, 2011). LED advertising has been described as visual or environmental pollutant due to its ambient light, temperature and humidity while Australia's National Road Safety Strategy (ANRSS) perceives roadside LED advertising as source of driver's distraction; a source of inattentive driving task to road crashes. Australia's National Road Safety Strategy notes that, roadside advertising may be one of the contributors to such inattention; a criteria that calls for the management of roadside advertising devices. Wallace (2003) describes driver's distraction as "genuine (potential) risk of urban myth". Studies conducted on perception by Shenzhen (2011) shows that, having something in our field of vision is either much brighter or darker than its surroundings which tend to cause an involuntary shift of our vision towards the object. It is logically obvious therefore that, a movie playing mechanism along a highway will attract attention or perception which may constitute grossly unsafe on the road because of its luminance and swift flashy-rotational graphic imagery effects. The basic assumption is that, when a sign (image) changes to another within a person's view, the viewer's visual system perceives that changes as motion through the mind. What the eye perceives in the process of changing is a flash (luminance) and (or) movement which they may not be able to avoid watching. Lewin (2009) and Luginbuhl (2010) subscribes to the logic above that, "luminance across a frame of any device encourage the viewer to stare sign/image for a long time to see the next installation". This implies that, all things being equal, there is the tendency of visual impact from electronic billboard advertising to initiate distraction. Buser (2006) subscribes the above theory when he said, "most of these media live by their bidding to catch the attention of readers and make them to dwell favourably on the information to enjoy the real construct beauty of the advertising medium".

Dukic (2013) studies on visual behaviour established that, electronic billboard adverts have effect on gaze by attracting more and longer glance than regular traffic signs. Dukic (ibid) concluded however that, whether the attraction and too much visual attention precipitated by LED adverts constitute safety hazards to road users could not be established conclusively in his studies; one of the premises which this study tends to research into. More so when it has been established that, illustrative defects (ill-informed information) on LED advert makes readability difficult (Wachtel, 2014); and could lead to fatal consequences on the road; but could be prevented (Mahmud, 2008). Dukic (2013) posits that, billboards displays' of different companies of light emitting graphic images and texts have maximum impact and wide exposure that blur sights of road users. No doubt therefore, a San Diego law in 1971 championed by Peter Wilson cited traffic safety and drivers distraction as reason for the billboard ban but was narrowly overturned by law after ten years (1981) because the ban included both non-commercials as well as commercial billboards.

Lemish (2005) avers that, billboard advertising mechanism advances capitalism and patriarchal interest, perpetuation of stereotype subjugation of women and promotion of patriarch in the society. Larry (2006) reveals that, the adverse effect of some billboard advertising display gave birth to the highway beautification act (law) of 1965 in America to regulate among others such as the commercially displayed billboards. Such guidelines define acceptable and appropriate behaviour of these devices. The violation of such legislation attracts punishment in many countries (Farmer, 2010). The law require that, each State set standards based on customary use for the size, lighting, spacing of billboards and visual defects. In substance, it requires States to maintain effective control of billboards. In most jurisdictions (such as USA),

the law requires total ban of visual signs on promotion of health related risks products (McCrea, 2008).

According to Stuart (2001), the four major United States tobacco companies signed the Tobacco Master Settlement Agreement which eliminates billboard advertisement of cigarettes in 46 states in America. World Health Organisation's 2004 ban on cigarette promotion in Nigeria was because it is believed to inhibit health related issues (Oluwafemi, 2006). Advertising of cigarette and alcohol on billboard is equally forbidden in Brazil (The Brazil Business, 2006). Silvanom (2006) who himself is an advertiser however, voted against the ban on billboard display in Brazil. He argued that, advertising ban will not only entail revenue and job loss, the cities involve would look like a bland concrete jungle with the billboards removed.

Taylor and Franke (2005) findings on public opinion on a electronic billboard advertising indicates that, majority of Americans do not favour a ban because it provides useful information and helps businesses, while Neilsen (2007) studies on public opinion on outdoor advertising shows that, generally people like outdoor advertising and they want to be entertained by it, as it reaches consumers and travelers outside their home with their messages. This implies that, billboards make outdoor an ideal environment even for road safety campaigns. Silvanom (ibid) rhetorically describes billboard advertisement as both an art form which entertainment helps relieve solitude and boredom when you are in your car or alone on foot. The management of billboards in Oyo State (Ibadan), OYSAA (2012) argues that, LED/light-emitting diode is a plus to many benefit provided by outdoor advertising by enhancing message delivery. According to the report, the network of electronic billboards allows advertiser to achieve high impact, high resolution, and outdoor communication on a digital/platform. The agent reiterates that, LED billboards combine the impact of the iconic symbols with motion, adding to visual impart,

increasing awareness and decreasing site fatigue. These arguments portends that, there has been a highly conflicting interest with regard to intends at which billboards are perceived as less of a problem. Rip (2006) expresses that from all research and indications, electronic billboard will be seen as a healthy product for advertising for years to come. Electronic billboard display has been restricted in some states and declared no-billboard zones within a city because of its identified phenomenon. What is the perception of the motorists who are always confronted with light-emitting graphical factors advertisement along the roads in Nigeria?

Regulation covering electronic billboards (EBBs) signs varies globally. Larry (2006) reveals that, in the UK, billboards are controlled as part of environmental planning system and that displaying an advertisement without planning permission is a criminal offence; while the government has the right to remove or retain any billboard deem unsafe and distraction. Municipal tax on billboards displays was implemented in April 2010 in Toronto. Yin-Wang (2015) lauds the updated legislation in China which stipulates between 30,000 and 160,000 dollars for any superlatives – "best", "highest" or "national level" to describe products on adverts. This implies that, regulation and implementation practices differ significantly from State to State and even countries ranging from lenient control to the prohibition of outdoor advising among which prohibition act covers:

- Signs which are not effectively shielded as to prevent beams or rays of light from being directed at any portion of the travelled ways of the interstate or primary highways.
- Signs which are of such intensity or brilliance as to cause glare or impair to the vision of the driver of any motto vehicle.
- Signs which otherwise interferes any driver's operation of a motto vehicle.

In Nigeria, regulation of billboard display has given rise to association of billboard advertising agency recognized by advertisers as a subsidiary of the Advertising Practitioner Council of Nigeria (APCON), saddled with power to regulate, inspect and control the practice of advertising in all its aspects and ramification (Abayomi, 2002). It is the spirit and power conferred on it that, APCON developed a code of ethics to regulate the practice of advertising in Nigeria vis-a-vis as listed in the recent past guidelines as follows by Okiyi, (2015):

- Placement of the medium
- Mutilated advert
- Advertising of tobacco
- Alcohol, food, beverages, drugs and cosmetics
- Financial institutions as well as
- Political institutions.

In spite of the regulatory measures in the developed world and Nigeria as well, billboard advertising of some of these prohibitions code of conduct ethics, and indeed electronic billboard has come to assume the centre stage of modern marketing strategy and one of the major promotional outlets of product and services. This implies that, the technology for outdoor advertising to the travelling public and transiting pedestrians will continue to evolve and the regulatory role of APCON and others like, Association of Advertising Agencies of Nigeria (AAAN), Media Independent Practitioners Association of Nigeria (MIPAN), Outdoor Advertising Association of Nigeria (OAAN), Advertisers Association of Nigeria (ADVAN) etc., will continue to bring their professional duty to bear as at when due. These agencies, according to Estsaname (2007), have formed a monitoring body called the Advertising Standards Panel (ASP), whose duty is to monitor and regulate billboards.

2.4 MANAGEMENT OF OUTDOOR ADVERTISING DISPLAY

Like many areas of public life, operation of outdoor advertising in an environment has its rules and regulation governed by Local Planning Authority (LPA). The rules range from permission for displaying ads, to self-regulatory rules guiding the content of the ads themselves. The rules give a good grounding in advertising ethics. Signkick (2017) posits that, these assertions justify a stricter advertising control in a bid to conserve the visual amenity of the environment. Amenity refers to public safety, whether or not the billboard is distracting or confusing to puts vehicles or pedestrians in danger when travelling over a land, water or in the air. Removal or a discontinuance of a particular ads or the use of a particular ad site of billboard is deemed necessary when the ad in question poses a safety risks. Morones (2017) states that, among the conditions which advertisers must comply, covers placement and the contextual designs and should:

- Be kept clean and tidy
- Be in a safe condition.
- Have permission from the sight owner.
- Not obscure or hinder or endanger the use of transportation such as official roads, aircraft signs, rails and waterways.
- Be removed carefully as required by the Local Planning Authority.

Signkick (2017) posits that, the question of amenity is usually understood to relate to how appropriate an ad is to its surrounding environment. For instance, a large billboard format found obscuring an area of scenic beauty or poses visual demeanour to public safety is likely to be refused. Visual demeanour within this context refers to defection of graphic designs and wrong placement of the billboards ad. In other words, amenity relates to aural as well as visual concerns

so that, an ad that creates visual pollution or closer to a busy local high-street, church or building may likely be removed.

Local Planning Authorities have control policy statements which explains factors they deem relevant to their decision to or not to display a roadside billboard advertising. These regulations, for instance is in consonance with the UK advertising codes that are written by Committee of Advertising Practice (CAP). According to Sugget (2017), various roadside advertising regulations are complex and vary from council to council and countries to countries. This implies that, when getting permission to display roadside ads, the first point of call is the local council authority regarding the site in some councils or society. For instance, the CAP is a self-regulatory body that writes the rule book for non-broadcast advertising in UK. Their philosophy is to ensure that, all ads are legal, decent, honest, truthful and maintained confidence of consumer safety. The CAP code is administered by the independent Advertising Standards Authority (ASA) which ensures that, self-regulation serve the public interest. In some cases, they could be referred as Trading Standards. Display of the billboard is offensive when it obstructive movements. Signlink (2017) infers that,roadside billboard advertising falls foul of regulatory codes if the content messages are:

- Misleading
- Harmful
- Offensive
- Readability defect

This implies that, asides the attraction of the medium to create memorable impression to the target audiences, roadside billboard must be visually and safety friendly. In making reference to billboard advertising management, Jordan (2015) noted that, where advertising is managed

insufficiently, visual disorder and deterioration will increase with time. He therefore posits that, regulatory bodies should be made aware of the sometime placement of electronic billboards advertisement which may be of safety risk to commuters who ply the roads, a gesture that might lead to effective management.

2.5 SYNOPSIS OF ELECTRONIC BILLBOARD ADVERTISEMENT

These are personal possessions by which functional activities of electronic billboard advertisement are perceived as negative or positive by road users or experts in design or advertising process. McLuhan in Buruji (2014) for instance cited outdoor billboard advertising as an isolationist influence in a society, which has given rise to categorization, linear sequencing and dogmatism, swallowed up by the surrounding space to impart a sense of isolation and information. Stuart (2001) however questioned the assertion role and impart of advertising in a society in view of the enlightenment in the way of thinking. Kruger (1987) a graphic communicator who in an attempt to answer many unresolved questions about outdoor advertising explored a reassuring familiar format (a mockery of typography devices and imagery) to achieve advertising goal of persuasiveness and consumption cycle to sell consumer goods and to subvert the typical use of non-representational imagery. The advert exposes the deceptiveness of some of the media messages which viewers often complacently absorb. For example, the huge 5ft by 6ft format billboard (words-and-photographic imagery - figure 3) below challenge cultural attitudes often embedded in some commercial advertising. The photography of a classical hand and horizontal row of composed text, “I shop therefore I am”, suggest persuasive and consumption impact of visual data of an advertising. But can the words be taken in with a single glance and reading them in a staccato exercises with an overlaid cumulative quality that delays understanding and intensifies the meaning? Reading them is synonymous to reading a series of

road billboard advertising messages from a speeding vehicle or car. The public's familiarity with the format of paralleled use of both words and images in advertising ensures greater receptivity to the designer's message but how quality is the information to be understood quickly in other not to creates distraction in the light of many vehicles coming behind, a distraction that may cause an accident.



Figure 3: Untitled – "I shop therefore I am". (Source: Babara Kruger, 1987: in Graphic Design Basics, 2007)

2.5.1 **Concept of Communication in Graphics**

In graphics, communication is an art form of using design elements and symbols to convey a message in visually printed language through a medium. Communication design as we have today involves combination of words and pictures to create visual communication. Graphic design and graphic communication are anecdotal to each other but are inextricably functional paradigms working towards achieving a common goal. Both are involved in a campaign of some sorts. The most important function of typography and imagery in graphic communication must be bold, legible and informative to the target audiences about products and services as in advertising, to create brand awareness and to promote brand communication. The purpose is exclusively to avoid misconception about the message that is been communicated to be read and

understood. Wisegreek (2014) observed that, the primary purpose of advertising which had existed since the primitive ages still remain the same which is communication of information about product and service. Horn (2002) describes communication as a symbolic behaviour that occurs between two or more participating individuals with three principles which:

1. Process is transactional and effective in nature.
2. Is purposefully goal-directed-behaviour that is instrumental to the consummate?
3. Is an exchange of meaningful symbols that requires a medium? The medium in this context is the electronic billboard.

Smith (2005) describes graphic communication as exclusively a "limited and exclusive production" which encompasses all phases of graphic communication processes from origination of idea; design, layout, and typography through production, finishing and distribution of products. Graphic communication in this sense is more than the production of good quality images, since the intent is not only to attract attention but to communicate in such a way that there is a positive response. In this context, graphic communication requires finding out about the effect of the message. Are the visuals used to relay the message synchronized well enough to be grasping and understood? It requires adequate and clear information which implies understanding on the part of the receivers of the information as well as the effectiveness of the appeal. The process therefore requires explanation, and since the transmission of a coded message occurs between man and man; graphic design and visual communication find their natural diffusion through the instrument of mass media and at least through the techniques of image reproduction. Hewes (2005) posits that, the fundamental principle governing the process of graphic communication is derived from the mathematical theory of information which establishes that, communication always takes place between those units that transmit information

and those that receive it. Hence, visual reproduction should be well presented as well as communicate an idea which when perceived would be grasp swiftly with understanding which intensifies meaning. Waton, et al (2005) observes that, the role of advertisement is effective information about the superior quality of products or services.

Mmitchell and Daniel (2003) define successful design as those that most effectively communicate their messages which eases understanding and which tend to persuade consumers to act upon it. The impact of visual data of any advertising campaign including billboard however depends on the individual level of literacy, experience and cultural background. The medium encompasses visual images that identifies the product, information dissemination, point of view illustrated and the mode of communication directed towards audiences with persuasive intent; sometimes with what a designer Helm (2003) describe as "wacky combination of drawings and a very personal text to catch attention of the reader to dwell on it even if only for a moment". Helm (2003) posit that, advertising agencies sometimes hardly care to examine the information whether or not the advertising business is ethical, the product is injurious or beneficial to human development. This contradiction according to Helm prevents advertisers from ever achieving real beauty of advertising business. Amy (2007) buttresses the above statement when he posits that, optical vocal has always been structured to affect even when the communication is exactly opposite the intended message. McLuhan (1964) in Buruji (2014) further buttresses the above when he said; "the medium is the message". This assertion explains why there must be a symbiotic relationship between how a message is received or perceived and the medium/person who delivers it. Be that it may, information helps consumers decide whether or not to buy a product based on their personal conviction, visual perception, visual literacy and

visual interpretation of the advertisement. In other words, information has affection on human psyche.

Expressing how individual process visual statement for understanding, often the receiver has to learn the visual language of the sender through the power of the mind and his cultural background. It is worth noting that culture differs from culture, therefore, both the sender of a message and the receiver should operates within a fluid context in which the significance of the visual statement is presented. The philosophy of existentialism (ontology) which most scholars trace its root to a Danish theologian Soren Kierkegaard (d. 1855) in Graphic Design Basics (2017) states that, the human mind play a decisive role in structuring reality. Balm (2014) agrees that, a large percentage of human brain dedicate itself to visual processing; while Lewin (2009) argues that, the mental structure provide the cues to understanding the transformation exercise of how the viewer comes to interpreter a picture. The philosophy further suggests that, subjectivity rules over absolutism, therefore, there is absolutely no universality or single correct interpretation or answer to how individual perceive and process information on advertising display. This theory implies that individual is responsible for shaping meaning of a copy within the context in which the visual message is created, for what purpose is created, by whom it is created and for whom it is created. Gregory (1966) in Amy (2007) is of the view that, human beings associate various levels of meaning to certain factors. The psychologist posits that, interpreting of objects involves many sources of information beyond those meeting the eye when we look at an object. He reiterates that, seeing involves knowledge of objects from previous experience, and even knowledge in terms of taste, smell, hearing and perhaps pain. This implies that, our past experience, expectation and structure of the brain on sighting an object filter the information of reality based on the convention of our culture and personal background to create

visual understanding. To large extent, the vital context surrounding visual statement gives the information, just as the meaning of spoken language is derived from its immersion in the surrounding culture. Based on this philosophical analogy, it could therefore be explained that, a successful visual whole of any billboard advertising campaign or message could be achieved by the careful combination of various parts of design elements which tend to have influence on the message receiver. Heller and Marshal (2000) states that, a good illustration of advertising copy are those that are legible and effectively interact which when perceived would be grasped swiftly with understanding. Poppy (2006) who likened illustration to photographs enthuses that a hand of good illustrator can results into both humorous and entertaining copy. He itemized functions of illustrations as often used to:

1. Enhance or exaggerate reality.
2. Help to reinforced understanding of words, text with imagery.
3. Help stimulate imagination and creativity.
4. Help an audience visualise something that cannot be seen or better understand something that is complex.
5. Help an audiences understanding concepts that are difficult or impossible to photograph.

For instance, the two billboards advertising below exemplifying billboards which are flawed by same visual copy (figure 5a and 5b) on pages 55). The advertising copies were designed by Rapp Collins Communication as part of the Bugs campaign for Minnesita Zoo. Any person on transit who is confronted with these messages, "*They're Coming*," may be marred by the visual deficiency to be read from a distance of about 30cm/100 feet. The illustrations appear not legible enough and may create visual disorder trying to read while on transit or moving vehicle. Comparably, "*They're Coming*" text on figure 5a even lacks the more, expressive quality to be

read from such a distance. The visual disorder which may emanate from these two billboards relate to the following probing questions: Are the design elements legible enough to be seen from afar? Are they readable from such a distance? Are the visual variables intellectually coherent to give any meaning? These questions are better answered by the target audiences. Although the text, colour, and stylistic illustration of the two billboards vary, they may not as well help to unify or create understanding. The copy seems to void quality treatment to attract the sight to be read for effective understanding. The elements in figure 5b (p. 55) are even more scatted to make a good coherence copy to be understood. The effect is that, the purpose for which it was created is defeated thereby creating an illusion, the result of which might have impact on driving performance. Atoki (1980) in Atta (1995) puts it succinctly thus:

> "*Several mediocre advertisements abound in our media today....., hence horrible art work, crook voice and sloppy drama all in a bid to advertise are especially annoying to the public and surely do sell no product. Good advertising is the handwork of superior artists".*

Omotayo (1981) in Atta (1995) made similar observation when he accuses that, the agencies care less about the quality of the advertisements they produce as long as the advertisers paid their commission.

Graphic design enhances transfer of knowledge and visual messages, aids in selling a product or idea through effective communication. The challenge of good copy billboard advertising design is often in the organization of texts and the imagery(s) so that, information is presented clearly and forcefully in a way that is balanced. Graphic design project may involve the stylization and presentation of existing text, and either pr-existing imagery or images developed by the graphic designer who organize the page into a reasonable layout and determine if any other graphic elements should be required. Or the designer may utilize stock images, photography and

photographs or computer generated art for the same purpose. This is to say that, contemporary design practice has been extended to the modern computer in the user interface, often referred to as interactive design or multimedia design, though the mind may be the most important graphic design tool. However, the organization of elements on billboards (figure 4a and 4b) below is riddled with what could have likely engaged prospective readers with readability, legibility and persuasiveness.



Figure 5a: "They're coming" – Characterized with overloading and readability defect of images and text. (Source: Graphic Design Basics, 2017)



Figure 5b: Untitled - (Source: Graphic Design Basics, 2017)

William and Theodore (2004) assert that:

> "*A well design billboard contains bold written and visual information that attracts and entice potential consumer. The graphic treatment of the content is typically organized with elements of design so positioned so much so that information is quickly assessed, giving the reader a taste of what the content is all about".*

Poppy (2006) describe organized graphic treatment as a conceptual-driven; an idea that create visual interest, visual expression and visual clue to hook or draw potential readers attention that should both be responsible, meaningful and easy to read to avoid distraction. Most designers of visual communication recognize this fact.

2.5.2 **Visual predisposition of advertising Message**

The way billboard advertising is experienced when on transit is that which is quick or swift therefore, the medium we encounter and processed each day must reflect our visual predisposition. It is therefore important to understand how the human eye processes messages. This understanding helps to better plot a design layout. Visual communicator is responsible for routing the readers through the visual plane, streamlining the communication and constructing the layout for a graceful sequence. Garcia and Adam in Williamet al (2004) studies on visual processing have documented the nuances of sight, reading pattern, and what seem to attract and hold our attention visually. The studies reveal that, our normal reading and visual processing patterns may be directed by colour, optical weight, strong entry points and other strategies. Sometimes the physical arrangement of the design can literally engage the reader to move or engage the sequence pattern swiftly. Accordingly, it is no coincident therefore that, artistic dominance of the messages tends to follow a sequencing pattern of dominating the layout with pictorial materials, headlines, and then text.

According to William et al (2004), one effective ploy of attracting audience vision is to have a dominant subject that will lead them via strong diagonal lines of force or line of sight. It follows that, proper sequencing of the elements is a logical fashion that establishes a rhythm that routs the audience smoothly through the message by the power of sight. Dominance emphasizes a focal point of emphasis. Emphasis entails giving a single graphic element within a layout a visual significance to increase readability. Basically, emphasis is typically element that stands out to be seen first – singling out or stressing one and only one element within a page or layout where our vision goes first. A designer, Chad Verly provides a delightful example of emphasis in his award – winning advertising design for SONY, employing an unusual exaggeration product imagery or format to create a focal point to catch attention of anybody at a bang – "Headphone". See figure 6 below.



Figure 6: SONY Headphone (source: Graphic Communication Today, 2004).

Sometimes, artists create emphasis on a shape or position of the words that may not achieve the intended focus. In this copy "Boy Band" in the design (fig. 7, page 58) is focusing not on the product which is more subtly presented in the background at the extreme right down of the advert. Instead, a memorable and humorous reference to the dental floss - "MUSIC" is suggested

by emphasizing it to create the focal point. Lauer and Pentak (2008) describe focal point as point of emphasis which encourage viewer to look closer or that has less attention value than the focal point that guarantee design success. Sometimes a design contains secondary point of emphasis. In other words, there can be more than one focal point. El-Lissitzky in Lauer et al (2008) posits that focal point interrupts an overall feelings or pattern and this automatically attracts the eye as results of element differentials. Be that as it may, billboard advertising must have a good attracting and stopping power over the audiences transiting around the media and those on a moving vehicle without necessarily distracting them. Billboard media not only compete with one another, their content components must vie for attention. Lauer et al (2008) reiterate that, emphasis is basically achieved by making all other components within a layout subservient to one that dominates.



Figure 7: Music – P and G Glide Dental Floss Campaign (Source: Design Basics, 2008)

William et al (2004) contends that, there is no single best way to show emphasis and that a survey on a design layout will give a clue that, the most common tactic of rendering emphasis is the size or weighty manipulation of either the imagery, colour dominance of the headline, backdrop or full colour image, striking contrast or prominent location in the space and several

other strategies the designer might deem fit. Size or weighty in this context is not necessarily how big a size or small the adopted subject might be but how much the subject is applied in a design layout to attract and accelerate the sight through the page at one shot. In design, the creative use and placement of design elements is limited only by designer's own imagination to increase readability of audience even on transit. Lauer et al (2008) observe that, the ingenuity of creative exercise of a designer is characterized in success of the finished work. Douglas (2009) suggests that, two goals are uppermost in the mind of a designer:

1. Communicate quickly as in mobile outdoor advertisement
2. Find a proper match between words and images.

This is to enthuse that; the end product of a designer should justify the means.

2.6 **GRAPHIC COMMUNICATION THEORIES**

The world encyclopedia perceives graphic communication as drawings, designs and paintings which involve the use of lines or strokes to express or convey ideas in terms of forms. Smith (2005) describes graphic communication as exclusively a "limited and exclusive production" which encompasses all phases of graphic communication processes from origination of idea; design, layout, and typography through production, finishing and distribution of products. The most successful designs are those that most effectively communicate their messages which ease understanding and which tend to motivate consumers to act upon the message (Mmitchell and Daniels, 2003). Hurwitz and Day (2007) hold that communication is the major function of written letters made up into words, the pattern of letter forms which allows for artistic expression; independent of verbal meaning. When people communicate, they try to establish commonness with one another or share information, idea or an attitude.

Communication relates to the message sent sensitively to the message receiver. Graphic communication, relates to the production of visuals which involves a multiplicity of analytical considerations bound up with theories and principles of learning, perception, symbolism, communication and philosophy. Obisesan (2008) postulates that, designers must understand the vocabulary of graphic design know their target audience and also should be aware of the constraints that affect graphic communication in other to create effective communication materials using creativity to illustrate the message. Emeji, (2002) buttresses that, the millennial Nigerian designers and artists should be concerned about the visual pollution in the Nigerian environment caused by wrong placement of billboards. This buttresses the philosophy of Green (2000) which states that, "Win through your action, never through argument". In this study, however, graphic communication is regarded as that which applies to manual and mechanical technique for production of images. Graphic communication in this sense is more than the production of good quality images, since the intent is not only to attract attention but to communicate effectively to be understood. Designers must therefore understand the vocabulary of graphic design; know their target audience in order to create effective communication materials. It requires adequate and clear information which implies understanding on the part of the receivers of the information as well as the effectiveness of the appeal. In this context, graphic communication requires effective message delivery. Are the visuals elements used to relay the message related well enough to be read, bearing in mind that your target audience travelling past your billboard at 65 miles per hour within 5-10 seconds of vision?. Hardenbrook (2013) observes that, the goal of a designer is for target audience to read the message from far off as possible and that, designer's must muster single imagery on graphic communication platform as single image

reduces perception complexity by aggregating visual parts into some recognizable pattern on a medium.

2.6.1 **Global best practices in digital graphic design/communication process**

Global best practices in digital graphic design process in communication anchors on principles and theories of seasoned theorists like Hardenbrook 2013, Morones 2017, Blue Line Media 2017, Bottomley and Doyeley 2006, McMahon and McMahon 1982, and Labrecque and Milne 2011. Communication principles establish communication flow of a message. The principles are based on the notion of effectiveness of both the sender and receiver of the message. The principles of communication involve a process of effective adoption and implementation of design components to draw unto itself an effective response or feedback. In this instance, the process of communication should be structured on the conceptual notion of effectiveness. Galante (2003) observed that communication principles have been moving more towards audiences built on the conceptual notion of effectiveness which poses a question of, "with what effect is the communication process". Communication in advertising involves a number of steps and functions.

- Advertiser determines the appropriate message for the target audience
- The message is encoded usually by graphic encoder. This is done so that the message will be understood clearly in a different context.
- Messages are sent through media channels to the audience who decode and react to the message in various channels including billboards. This implies that, an effective outdoor advertising must function effectively through the following principles:

1. Attract attention
2. Communicate a message

3. Persuade audience but also
4. Stimulate response.

An effective outdoor advertising must illicit a feedback. The feedback includes its goals and objectives; an idea assumed to be shared by the sender and the receiver. An effective message changes a receiver's perception, attitude, knowledge and behaviour. According to Akanni (2015), quoting Ejembi (1989), the result of any communication should emphases on getting a feedback based on the consideration of the effect of the communication that should be a continuous process in a communication web. A growing number of practitioners in the field of communication practices are urging receiver's collaboration with senders in order to design messages for effective delivery. This implies that, building receivers into communication process for a feedback is of necessity. It foretells the effect of the communication process. The feedback is often the effect-driven of the message that enables both parties to work towards achieving a common goal. Morones (2017) listed few principles for effective design processes.

1. Getting your story straight.
2. Keep it short, sweet and safe. This implies making large, bold, thick and legible copy type, preferably Non-Serif fonts.
3. Be loud with simplicity of every aspect of the design.
4. Be colourful. High contrast, bright and bold colours.

Ogunduyile (2000) enthuse regulations regarding display of electronic billboard advertising be effective in terms of managing them, while Blue Line Media (2017) admonish graphic communication illustrators to keep the face value of LED billboard advertising design simple, clear and easy to read from a distance of 500 feet with legible fonts to motion readers to ease communication.

Sugget (2017) emphasizes that, effective adaptation of these principles of designs enhances readability as drivers driving past a billboard looking at it from fifteen feet away for only five seconds, while beige, turquoise or neutral background flattens the texts and the images and tends to hamper readability. McQuarrie and Babara (2005) posit that, the fundamental principle governing the process of graphic communication is derived from the mathematical theory of information which establishes that, communication always takes place between those units that transmit information and those that receive it. The process therefore requires explanation, and since the transmission of a coded message occurs between man and man; graphic design and visual communication find their natural diffusion through the instrument of mass media and at least through the techniques of image reproduction. Hence, visual reproduction should be well presented using sharp contrast colours, bold and legible types as well as communicate an idea (concept) which when perceived would be grasp with ease with meaning and understanding.

2.6.2 **The Concept of Colour in Graphic Communication**

The concept of colour has always been recognized for its symbolic power and appreciation of reach. The understanding of colour symbolism and reach is measured in terms of effective application in graphic design and communication. High colour contrast is a key to good readability. According to BLM/Blue Line Media (2017), complimentary colours, such as red and green, are not legible together because they have similar value. Neither would Figure 8a with subtle, low contrast, flat colour, beige or neutral and background work for out-of-home EBB advertising. Such background could mar effective message delivery. Colour combinations (figure 8b) work best for viewing outdoor designs at far distances. Figure 8b relates various colour contrasts to guide designers to create a good out-of-home electronic billboard advertising.



Figure 8a



Figure 8b

Figure 7(a) and 7(b): Colour Schemes (Source: http://www99designs.com.blog.tips.billboard) (December 6th 2017)

According to McMahon and McMahon (1982), colour is a critical factor in design processes and should not be underestimated because it is just not possible to be aware of everything at the same time, no matter how attentive one might be. It is a powerful mechanism for effective and efficient communication, and variously used to attract attention, indicate action, create mood and cause reaction in peoples mind. Aside the conscious, unconscious and pervasive impact, colours psychology in marketing and branding of product and services cannot be over emphasised. An advertiser therefore uses it to influence consumer's emotions, behaviour, attitude, performance `and perceptions. Colour influences taste and even readability. According to Labrecque and Milne (2011) the physiological and psychological effect on how people perceive colours is individualistic and it influences individual with varying dispositions by factors which include culture, profession, religion, race and even age. This implies that, colour can even have influence on the way individual motorists sources information when passing along a displayed EBB within seconds of visual interaction with the medium. Making colour decision in a design process, it is important for designer to determine the target audience, equipped with good knowledge in colour vocabulary so as to convey the right and effective message delivery. Hull, Hull and Knopper (2011) posit that, since colour decision can influence direct messages in any graphic

communication, it should carefully be selected to align with the key message been conveyed on a piece(s) to be read with effectiveness. For example, (fig. 9) below is a sponsored AirTell network advert on a LED electronic billboard advertisement displayed at the centre-circle of four inter-sectional roadways at Iwo-road in Ibadan, which among its intended objectives is to relay messages to reach and be read by motorists from about a distance of about 600 feet, to decrease sight fatigue and increase awareness. How readable is the message delivery at such distance to a motorist who is always transiting on high speed? Every advert has a sponsor.

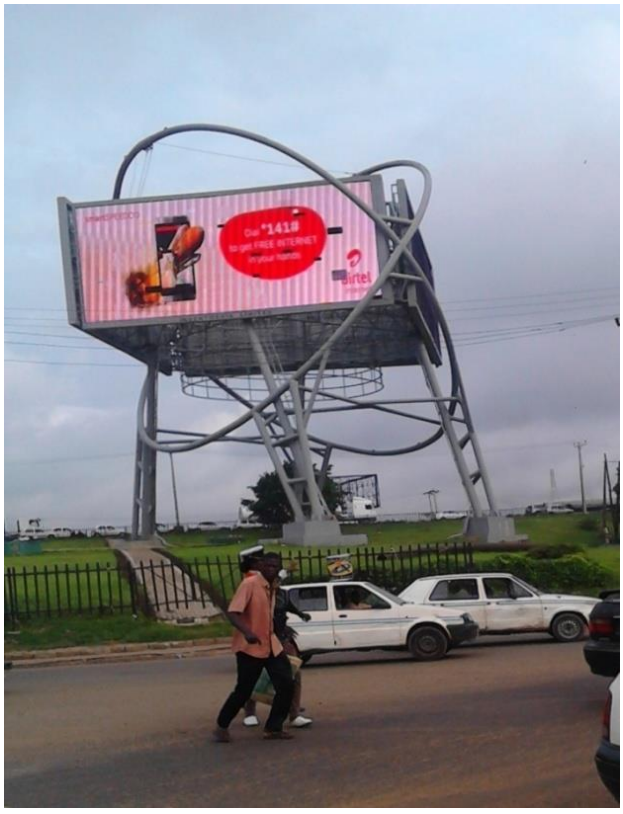


Figure 9: LED Electronic Billboard Advertising-Airtel network social service provider advert (Source: Iwo-Road/Highway Ibadan - 28th January, 2018 – Akanni D. O)

Bottomley and Doyeley (2006) studies on ranking colours on how functional and appropriate of solving communication problems on web reveals that, colour is judged based on how colour had appropriated on product function(s). They contended that, if a product is considered functional

and fulfills a need in a graphic communication point of view, then it is true to conclude that, functional colour is seen as more appropriate and effective when colours were the conveyor of those attributes like attitudes, status, functions and the connotation in a message delivery with effectiveness.

Aside the psychological and symbolic impact to a viewer, the postmodernist view of electronic billboard should be marked by sharp, bold and contrast use of not only colour(s) but texts and imagery(s) since motorists are always on motion. Though the billboard advert (figure 9, page 65) reflect colour symbolic values, the low, subtle and beige background of the advertisement could render the communication ineffective in terms of readability of the message delivery by motorists at a distance of 30cm away, causing stress to the eye and create no awareness at all. Colour contrast is a design norm which helps other design elements to stand out more than others or itself. Elements with sharp contrast background ensure prominence than those with neutral or low contrast background. Contrasting colours maintains visual hierarchy and readability. Bold, bright contrasting colours within a graphic communication design create an even bigger impact that will help improve the retention of the message delivery (Morones, 2017).

Figure 10 (page 67) below are reproduced 18 colour combinations tested for visibility at various distances by the Outdoor Advertising Association of America (OAAA). Visibility is ranked in the sequence shown, with 1 the most visible and 18 the least visible. The color wheel and colored bars, also below, illustrate the need for designers to choose colors for outdoor that are complementary and have a high contrast as well as value. For example, green and red are opposite each other and are therefore complementary colors. They represent a good contrast in hues, but in values they are very similar. The result sets up an annoying vibration. The same is

true of blue and orange. Look at the design from 15 feet away for only 5 seconds will create understanding the colour contrast and values. This simulates driving past a billboard. This implies that determine effective message delivery in terms of colours should involve sharp and low contrast backgrounds to determine visibility impacts on the viewer. The colour schemes (fig. 10) below interpret visual effects of either the low, neutral or sharp colour schemes backgrounds. In the example below, one can infer or see that, sharp contrast in terms of colours is powerful means for effective graphic communication design because various backgrounds have sharp contrasted colours while the low or neutral contrast of some background could impair visibility from a distance with low beige characteristics (Monroe, 2017).

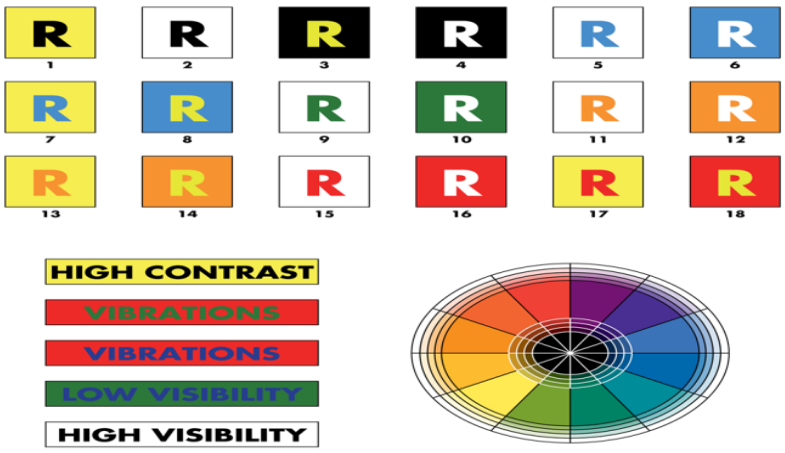


Figure 10: Colour Contrast (Source:http://www99designs.com.blog.tips.billboard) (December 6th 2017)

Visually, colour is said to induce a mental image through the eye and brain. Before a viewer reads or identifies the object on an advertisement, colour has already created an atmosphere which he/she responds to. Colour by its characteristics command attention. No wonder Lauer and Pentak, (2008) describe colour as "attention grabber". Visual attention certainly is just one aspect of the process involved in visual communication. Dakyes (1999) in Akanni (2015) classified values of colour into three. According to him colour has:

- Artistic value
- Illustrative value
- Attention value

Morones (2017) classifies value of colour in terms of it contrasting functions. This explains why colours are equally used to create emphasis in design. A strong visual element that dominates other elements establishes emphasis. In visual perception, colour is used to create emphasis to perform the following:

1. Describe the characteristics of colour as attention grabber.
2. Add dimension to images that were once outlined.
3. Provide a visual unity that might not be obvious in the initial pattern of shapes
4. Create moods and feelings for a product whose image is represented to complement the message of the ad.

The colour wheel and colours bars above (fig. 10, page 67), illustrate the need for designers to choose colours for outdoor that are complementary and have a high contrast as well as value. Practically, green and red are opposite each other and are therefore complementary colours. They represent a good contrast in hues, but in values they are very similar. The result sets up an annoying vibration (Morones, 2017). The same is true of blue and orange. This implies that, looking at the design from 15 feet away for only 5 seconds could create simulating driving past a billboard. The psychological effect of colour on people has to do with its power to engage the senses in a direct contact between the emotions and senses (Bevlin, 1977). Psychologists have long established that, specific colours have the power to draw attention quickly to evoke emotional responses in viewers. There is however no doubt that, colours can be pleasant or

unpleasant, attractive or repulsive with poor legibility text, dignified or riotous depending on an individual's mood or circumstances. In terms of colours, BLM/Blue Line Media (2017) noted that, colours of similar value are not legible together and could create perception complexity.

2.6.3 **The Concept of Text in Graphic Communication**

One of the most important norms in graphic communication to follow is keeping message short in a design with a maximum of 7 words or less to communicate effectively (Monroes 2017)**.** A larger-than-life-sized layout is no time to be meek. A designer makes sure that, any text in a design is printed in clean, bold, and loud font to ensure the best readability. The larger the font, the less time a driver has to read and understand your message at a distance. So "go big", Morones (ibid) reiterated. Based on this conceptual principle therefore, LED advertising can be considered a defective when a driver passes a sign where the text has poor legibility. The weakness in legibility may be due to poor character font design, improper spacing of letters or other factors. Wachtel, and Netherton, (2009) summed up these findings on impact of poor legibility of signs on drivers thus:

> *"When a driver passes a sign where the text has poor legibility, distraction could occur, and if the information is of sufficient interest, the driver may try to read all the text. Such decision (human factor) by a driver according to him, could take time away from the drivers task, thus increase crash risk. If on the other hand, the sign had text that met legibility standards less effort would be required to read the sign since the situation is a more subtle distraction than that due to perceived emotion in a sign; it still could present potential for crash risk".*

Wachtel et al (ibid) concludes that, hence, ergonomics principle of providing information in the most efficient way, such that viewers can access the information quickly and clearly may reduce drivers' distraction to ensure safety.

2.6.4 **The Concept of Imagery in Graphic Communication**

Picture worth's thousand of words in any contextual message delivery or advert. Balm (2014) expresses that, visuals tell a thousand words. In other words, a dynamic use of image on advertising keeps the brand top of mind. In fact, an image helps retain advertising message better than by using words alone. **A** large dynamic image can tell it all. Monroe (2017) advises that, advertiser should make sure the image really does make an impact in 5 seconds or less and that using bold image in a design effortlessly attract eyes to your billboard. Contrasting colors within the design will also create an even bigger impact that will help improve the retention of your message. Figures 11, (p.71) and 12, (p.71) respectively below are sponsored adverts characterized by heavy or overloaded message deliveries with poor legible texts. The imageries seem to be fighting for visual accessibility or attention. There is no white space to give readers a chance to rest their eyes and brain. Reading could be slow, tasking the eye and time consuming exercise in getting the message. In other words, it will take longer time to read and analyze their visual scenes thereby creating visual complexity to motorists. Figure twelve (12) is even worse with heavy and clustering images with poor legible text for the eye to behold. That could take time away from the driver's task, thereby increase crash risk. According to Ely (2021), creating white space on design platform helps the design breathe and take in its surroundings, thereby getting rid of anything unnecessary so it emphasizes the important stuff.



Figure 11: LED Electronic Billboard Advertising – Lagelu Radio Station advert -Overloaded and equal weight imageries. (Source: Iwo-Road/Highway, Ibadan - 28th January, 2018 – Akanni D. O)



Figure 12: Digital Billboard Advertising: characterised by overloaded Service imageries and poor text | messages. (Source: Elewure access road, Ibadan – 10th January, 2018 – Akann D. O.)

A sponsored advert is Coca-Cola on light-emitting diode advertising (fig. 13, Page 72) placed along Iwo road in Ibadan North-South Local government area. The advert is at the right side of Iwo-Road-round-about subjected to the view of motorists coming from the Nigerian Breweries or Alakia - Ibadan axis. The advertising copy is characterized by riotous-clustered images, poor legible text on a beige colour background. The white colour text on the extreme down right and the turquoise colour texts at the extreme left of the advert have poor legibility that could hardly

be visually accessed or read from a distant of 30 feet. Any attempt to read may take time away from the driver's task, thus increase crash risk.



Figure 13: LED Electronic Billboard Advertising -Riotous-clustered background on a beige colour background of Coka-Cola advert (Source: Iwo-Road/Highway, Ibadan - 28th January, 2018 – Akanni D. O).

No wonder, Luginbuhl et al (2010) observe that, motorists have been operating in an increasing complex visual environment and yet, there have been little or no concern to safety consideration of motorists. The background seems to be visually distracting to viewers', aside its beige background. Neither are some texts visible to be read between 5 -10 second from such a distance. The principle of attraction states that, the degree of attraction of a design depends largely on the absence of subordinate elements (Daniel, 1978 in Akanni, 2015) while beige background with less contrasting value impair visibility (Monroe, 2017). According to Fugglesang (1973), visual communications with a single or two images devoid of any subordinate images were more easily understood than multi-image advertisements. Monroes (2017) further proffers that, the use of bright and bold colours in a design effortlessly attract eyes to billboard design. According to Monroes (2017), the average driver will only have about 5/10 seconds to view electronic billboard design, read any text, and comprehend the message. In those 5 to 10 seconds, the driver could also be glancing from the billboard, the road and back to the billboard again depending on the severity of traffic thereby creating even less viewing time for the motorist.

Another sponsored advert on electronic billboard advertising is MTN communication service provider in fig. 14, p. 74. The advert is characterized by not only with congested images but also poor background. Poor subdued unreceptive image background may be a catalyst for distraction to motorist's attention in his attempt to force his glare to fathom what the images are. This may take much more time at reading them; a factor that may be unfavourable. The degree of attraction takes exception largely from absence of subordinate elements (Fugglesang, 1973). This assertion is in tandem with the theory of Scott (1978) which states that, "the power of any object to compel attraction depends upon the absence of counter attraction", which implies that, "anything" which causes a motorist to dwell more time in accessing advert while on motion may be catastrophe. It is worthy of mention here that, reading multi-images advertisement of typical electronic billboards may be inimical to motion audiences.

Graphic communication presupposes that, it is more appropriate and effective for designers to stick to one large image or photo than any other strategy to ensure less effort accessing the information to avoid any eventuality. This is to enthuse that, one dynamic image will create much more visual impact than a handful of images that only take up a quarter of the layout to impair readability as in figures 9, 11, 12, 13 and 14. In other words, for illustration to be effective for readability within a time limit and distance, a designer will have to stick to one or two and big idea with simple background to avoid the images fighting for attention especially for motorists to avoid any road mishaps. Morones (2017) and Blue Line Media (2017) advise that message will need to be concise, simple, short, bold and legible; the best accepted norm of global design practices.

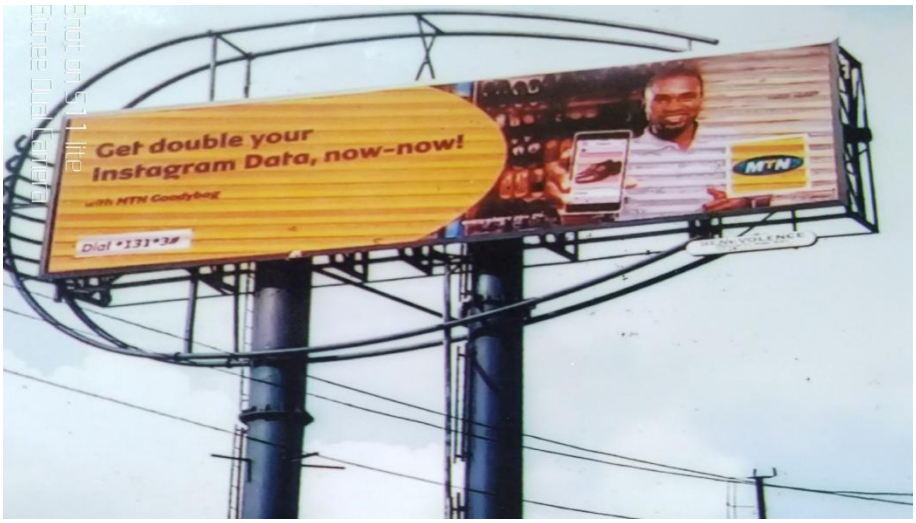


Figure 14: Digital Billboard Advertising (MTN ad): characterized by congested and poor background images (Source: Makola round-about access road Ibadan – 10th January, 2018 – Akanni D. O)

According to Balm (2014), images helps to educate and therefore, in an event where human beings are bombarded with various degree of stimuli, target audiences must be made to have easiest and fluent way of acquiring and learning information. Imagery in ad helps to learn, grasp attention, explain concepts and inspires to act on the message. Human love of images lies in the cognitive and ability to pay attention. The images draw our attention easily to it to be processed and analyzed at a speed or at a very short possible time before attempting to read the text. Balm further reveals that, our brain is able to recognize familiar objects within a speed of hundred milliseconds while a familiar face is with a speed of 380 milliseconds. This implies that, human vision and brains are wired in terms of reaction to scenes or imageries. This is to suggest that, since motorists are always on the roads and confronted with this modern electronic billboard advertising 24/7, the best way to engage their attention to ensure safety is to create visual content which is quick to consume and faster to process. Quoting the statement of Lynell Burmark, in Lucky (2016), “unless our words, concept, ideas are hooked onto an image, they will go in one

ear, sail through the brain, and go out the other ear". This implies that, the memory of advertising might have been defeated when the creative concept strategy is defective.

2.6.5 **Creativity and Placement Strategy**

Creative concept is based on the communication strategy and creative briefs. This ensures that concept is informed by a strong understanding of the situation, the target audience, and the channels that will be used. The objectives of advertising campaign seek to reach the audience to be grasps and responded to. In other words, a good advertising campaign involves creativity and imagination when the message of the ad matches the aspiration of the target audiences. This is achieved by effective inter-dependency of the adopted elements of design. The creative person develops multiple creative concepts based on the information and then tests them to determine which one resonates best with the audience. In today's busy and constantly changing communication environment, Social and Behaviour Change Communication (SBCC) must involve creativity and strategy to compete with commercial advertising and capture the audience's attention to be read from a distance. The creative concept shapes the core of SBCC campaign, which helps create consistency across message and materials. According to Vassinen (2012) developing creative concepts is also important because it allows the designer(s) to:

- Test which benefit is most appealing to the audience.
- See how the campaign will work or not across multiple media channels.
- Identify an idea that ties the whole campaign together.
- Reach the audience more effectively by finding "big idea" that resonates with them.

Wehbe (2017) states that, outdoor media platform is an indispensable form of marketing which cannot be ignored. The benefit of connecting target audiences increases exposure and traffic

generate leads, grow customers and develop loyal fans. The advertising strategy can therefore be said to be a distraction, while reinforcing certain values and lifestyles through a story to be remembered with images. Since this view is a core to the function of an outdoor advertising practice (OAP), advert should be displayed and placed in a risk free manner to protect the safety of the public (Ogunduyile, 2002). Hollis (1994) in Oladumiye (2013) opines that, billboards belong to the category of presentation of promotion where images and the structure need to be economically connected. These can be found in the advertisement of products in Nigeria.

The placement and impact of billboards in Nigerian cities are essential to the understanding of the complexity in the built environments. They are important because on the whole they are permanent and imposed. Unlike television or the printed word, they force us to look at them precisely because they are part of the fabrics of the environment and such can take on a life of their own. Actually they are subtle indicators of attitudes and change within society.

According to Broadbent (1988) in Oladumiye (2013), if a society cares about the trivialities such as either saving or creating a fine piece of lettering, it will probably care about the structures and care about the street that it is in, and care about the country itself. If they are to perform these roles, there are some qualities expected of them. All symbolism, be it on rotational, swapping and diffusing, electronic billboard is expected to be legible and harmonious to be read. They must contain letter-forms and images that can be seen and recognized without difficulties. Background of letter-forms should not interfere visually with its reading; it must maintain consistency in height, embrace good colour combination and the size of the letter-forms should be dependent on the overall design in which the sign is to be placed, devoid of juxtaposition of incompatible elements that cause visual disorder, overload of visual information, and obstruction to motorists in a given environment (Oladumiye, 2013).

There are rules that govern advertising content and placement of outdoor advertising billboards. Advertising codes or rules as written by the Committee of Advertising Practice (CAP) include:

- No alcohol, e-cigarettes, fast food, sweet and toys ads within 200 meters to schools.
- No political advertising on bus shelters

CAP regulations are extensive and cover wide-ranging roadside advertising. There are however two main factors that need to be born in mind regarding the take–up of the roadside advertising.

- Owner of the site on which the ad is displayed have to give permission to display ads?
- Does the highway authority and local agree to the display of the ad? That is to say that, do they find the placement and visual display friendly to the local areas and not to be causing any obstruction or physical risk, including its potential for distracting traffic and the vision of the commuters?

In Nigeria, rules guiding the displaying of billboards spelt out necessary and acceptable conditions which could be applied to the control and development of outdoor sites, content and placement of advertising medium. According to Osunbiyi (1999):

- Billboards can be located on the verges of defined walkways.
- Billboards should not, in any way impede pedestrians and vehicular movements.
- Billboards should not be placed in a way to disrupt or endanger movement.
- Minimum distance of 100 meters must be allowed for on either side of a T-junction before location of a ground surface billboard in order not to obstruct the view of the motorists.
- A standard of 100 meters must be allowed between billboards.

The term highway covers all roads, carriageways, foot paths, and pavement and so on. Federal Highway Authority (FHWA - 1980) states that, any advertisement deemed to obstruct road

access, obstructing signs, or that is dangerously distracting to motorists can be taken down, even if permission was initially granted.

2.6.6 Propensity of Committee of Advertising Practice (CAP)

Committee of Advertising Committee (CAP) is a self-regulatory body that writes the codes or rule books for non-broadcast advertising in United Kingdom (UK) which is in turn administered by the independent Advertising Standards Authority (ASA) to ensure that, the self-regulation serves the public interest. Their philosophy is to ensure that, all ads are legal, decent, honest and fruitful and consumer friendly (Signkick, 2017). According to Signkick, a leading booking platform for outdoor advertising, "the codes are self-imposed rules agreed upon to ensure lasting reputation of the marketing community and the industry to avoid the need for the legislation and costly, time consuming legal battles. They concluded that, where there is potential serious breach of the code, consumers have the right to complain about misleading, harmful or any other offensive ads, and that, it takes just one complaint to prompt action from the ASA.

Previous Studies

Federal Highway Authority (FHWA, 1980) published the first comprehensive literature on the safety consideration of the motion pictures on digital electronic billboard that prohibit in part, any sign that utilises flashing images, fading and dissolving imagery effect, intermittent or moving light (Watchtel and Netherton, 2014). It followed suites with critical and comprehensive review to updates the agency's regulation on electronic billboards (EBBs) when it was observed that, it causes distraction with its quick and visual impact. The billboard industry however argues that, the technology did not present any of the visual characters prohibited in the FHWA regulations and therefore should be permitted under the existing regulations. Lee (2007)

collaborates with the view of the billboard industry when he claims that, findings on electronic billboard found no linkage between roadside billboard and traffic safety. Rip (2006) posits that, researchers have proven conclusively that electronic billboards are not a driver's threat. This view tallies with Lee finding. Cairney and Gunatillak (2002) of Australian Road Research Board (ARRB) however expressed strong disagreements with Lee findings. Wallace (2003) suggests that, since some studies seemed to suggest that, safety related issues seem too adversely affect by such billboards advertising, research into the phenomenon must continue unabated until lasting solution is sought. This implies that, there has been argument for and against relationship between roadside display of electronic billboards advertising and safety of commuters. Freitas (2006) noted however that, electric billboards are really no different from their printed counterparts except that they successively rotate through different advertising messages; a situation which Johnson (ibid) describes as an out of hand reaction.

Shephered (2007) posits that, guidelines on outdoor advertising is increasingly encouraging shopping and local business centres to use the new technology (LED) screen billboards because of its affordability and display capabilities of attention grabbing power? According to Shephered (2007), though regulatory agents which addresses problems related to Commercial Electronic Variable Message Signs (CEVMS) message transition duration, time, brightness, spacing and allowable locations is a welcome development, these regulations are based on little sound empirical data; and in several cases subjective which give room for multiple interpretation. Lewin (2009) observes that, surface brightness play significant role in how graphically messages on these billboards interaction with environment around it. Stanley (2000) enthuses that, electronic billboard advertising messages display must have greater durability and higher thermal resistance to deliver information to the public efficiently across the widest variety

of environment. This is because the accompanied lighting is often set at high level to luminance objects around it during the day, and potentially active to draw a motorist or a pedestrian to it when they need to be looking elsewhere for safety operation. Stanley (2000) views tallies with principle of perception which states that, “something in our field of vision is either much brighter or darker than its surroundings which causes involuntary shift of our vision to the object”. This implies that, a successful visual whole of any electronic billboard advertising campaign or message should be achieved by the careful combination of various parts of design elements to engage target audiences in well informed manner that should have no influence on the message receiver.

William et al (2004) observe that, effective way of attracting audience is to have a dominant subject that will lead them via strong diagonal lines of force or line of sight. Proper sequencing of the elements is a logical fashion that establishes rhythm that routs the audience smoothly through the message by the power of sight such that, it would increase readability and minimizes distraction among transiting audiences (Dukic, 2013). According to Rip (2006), the potential impact from these latest technologies goes far beyond a simple replacement of the traditional static billboards and that, ‘our research suggests that, such alternative uses of the newest technology for outdoor advertising to the travelling public will continue to evolve at a rapid pace’ and that research should continuously be intensified to deal with readability and distractive issues of digital billboards. Blue Line Media (2017) posits that, simplicity should be the hall-mark of every aspect of digital billboards ad. In other words, easy visual accessibility and readability of information by commuters in most effective way should be the mind set of advertisers on digital display billboard since motorists are always on motion.

A study by Monroes (2017) on effective billboard design and advertising align that; the visual disposition of electronic billboard advertising should be simple, clear, bold, large, legible and easy to read from 500 feet away preferably with non-serif fonts. Poppy (2006) recommended that:

- Designers should avoid thin lines as it tends to optically fade or break up advert at a distance, and any attempt to force our vision to read may pose safety risk to commuters.
- They should avoid decorative and italic fonts.
- As a general rule, upper and lower case sans serif fonts provide the best readability.
- It is highly recommend that a thin dark stroke around the text to separate it from the background should be added.

Poppy (2006) warns that, designers should not present a complex message or numerous images, while Monroes, (2017) recommend that designers should stick to "One Message or Big Idea". It implies that, designers should have one thing that they want their audience to do or to recognize swiftly. This is to say that, an effective outdoor media should reduce a complex message to its essential elements. The message should be short and sweet. To create effective EBB therefore, Monroes (2017) recommends that designers should:

- not use more than ten words on the entire billboard – and that should include the logo/product tag-line.
- use seven words or less for the headline.
- keep the words short for faster comprehension.

In terms of colour usages, BLM (2017) and Monroes (2017) suggest that designers should:

- use bright, bold and high contrast colours.

- stick to fully saturated web-safe hues, and that complimentary colours, such as red and green, are not legible together because they have similar value.

According to the theorists, contrasting colour combinations work best for viewing outdoor designs at far distances and that, strong contrast in both hue and value are essential for creating good digital out-of-home billboards.

In terms of imagery, the theorists recommended that designers should:

- pick their adverting image(s) wisely.
- avoid using landscapes or complex scenes.
- use a total of three visual elements or less. For example, one image, one logo and one headline.
- white space does not apply in digital outdoor advertising like in printed material. Increase your logo, font sizes and imagery. Having unused visual space at 300 - 500 feet is not recommended.

The review of related literature has laid a foundation for understanding the purposes of this study. It has provided an overview of the important issues that must be taken into consideration for successful electronic billboard advertisement. It has been established that, all symbolism of electronic billboard is expected to be legible and harmonious, be it on rotational, swapping and diffusing with lighting system. They must contain letter-forms and images that can be seen/accessed and recognized without difficulties at a specified distance and time. Background of letter-forms should not visually interfere with its reading, embrace good colour combination and the size of the letter-forms be dependent on the overall design in which the sign is to be placed, devoid of juxtaposition of incompatible elements that may cause visual disorder or distraction, as well as avoid overload of visual information which may be obstruction to

motorists in a given environment. Successful advertisement requires that, a designer understand the vocabulary of graphic design and other related issues involved in advertising, know their target audience and also be aware of the constraints that affect graphic communication in other to create effective communication materials using creativity to illustrate the message. From the review, it has been established that, the eye of the target audience cannot escape the television-like display of visual communication of electronic billboard; and therefore the designer should plan the layout in a way for easy accessibility, processing and understanding. It requires that, illustration demands bold lines, good contrast, minimal number of imageries, clarity of message delivery and creative draughtsmanship for effective communication. Chandler (2001) posits that, the deeper a designer understands and awareness of these factors, the better the control over the success of the product created.

Summary

In spite of its related graphical flaws and illumination imagery, light-emitting diodes (LED) advertising devices have continued to flood Nigeria's urban centres to become a mainstay of outdoor advertising more than ever before as in many global societies. The high-tech format is wonderfully an idea in advertising revolution engaging motorists' visibility with graphic communication message delivery accompanied lightening system. The most important function of the elements that constitute the message delivery (colours, texts and images and lightening) is to inform target audiences about product and services in a most accessible way, taking exception in simple, short, bold and legible rendition to create brand awareness for easier visual consumption and analysis. It is the duty of a designer to clearly represent the colours, texts and images with effectiveness. Bradley (2014) describes effective usages of visual elements as a measure to engage the eye where visual communication is expressed in colours, text, images

with dominance principle to create harmony for easy readability. Harmony relays elements in consonance with each other to achieve an effective design which is accessible with ease. The harmonic marriage of these elements which comes in a form of diagrams, figures, typography or texts and colours pave way for easy accessibility, processing and understanding especially when on motion. Attaining visually hierarchical harmony in design in digital billboard advertising for effective readability therefore, relies on the effective application of the graphic elements to deliver the message while the surface brightness have higher thermal resistance to deliver information to the public efficiently across the widest variety of environment.

CHAPTER THREE

Methodology

3.0 Introduction

This chapter focuses on the method of gathering data or information. It discusses the research design through which the researcher intends to achieve the set objectives. The research design provides systematic process or information about the objects of the study – who are they, where can one locate them, how will the survey data be collected and how will the survey data be analysed? Rajaseka, Philominatha and Chinnathamb (2012) simply define research design as a systematic way of solving a problem, while Kolo (2003) defines research design as a plan through which the researcher systematically collects data for research in a controlled form. Kolo (2003) further describe research design as a master plan of activities of carrying out assignment to solve a problem. Anaekwe (2002) describes research design as a tool that carries a researcher from state of ignorance to that of knowledge. This implies that, research design is a technique of unraveling a phenomenon from the unknown to the known through a systematic process of selection, collection and analyzing the collected information. The study was guided by these research processes.

The conduct of this research was guided by the concept of investigative and interpretative phenomenological analysis (IIPA); the philosophy of man enquiry of wisdom to discover what should be known about philosophy of existentialism (ontology and epistemology); an investigation of nature, source and effect of the phenomenon. Esterby-Smith (2012) in Abdullahi (2015) avers that, the two paradigms which attempt to seek knowledge using valid, reliable and precise variables to investigate, interpret and report findings in its contextual settings, guides the researcher to seek information from the flood of data within the confined framework of the research. In other words, it enables the researcher to understand the meaning to explain findings

in its contextual setting. Fellows and Liu (2007), Creswell (2014) refer to these approaches as mix-method or triangulation method. Hopkins in Akanni (2015) suggested three ways of reporting results of the collected data. Hopkins documented that statistical tables, statistical formulae as well as quantitative and qualitative paradigm can be employed to summarize results statistically as the context of the study can be analyzed by relating them textually to the variables under study. This study employed statistical table, chi-square (x^2) formula, quantitative and qualitative paradigm to summarize the findings. Chi-square (x^2) was adopted to measure quantitatively the statistical disposition discrepancies existing between *Observed and Expected* (*O - E*). Based on decision rule that, a statement is considered accepted (agree) if the calculated (x^2_{cal}) greater > critical value (x^2_{tab}), and rejected (disagreed) if < *O*, where the level of significance is 0.05. Oseni (2008) theorizes that, quantitative paradigm is better and most effective in humanity based researches with the simple reason that, it facilitates easier statistical manipulation and interpretation of results. Qualitative description was employed in the analysis of the graphic design factors of the medium.

3.1 **Research Design**

The research design adopted for this study was the survey method, based on its comparative merit of allowing a complicated network of trade-offs consideration of reach, reliability and financial consideration. The method has been found to be suitable by several investigators who conducted studies in similar areas as this. For instance, studies conducted by Ebigbagaha (2009) on "graphic encoding choices in development communication", Shagaya (2010) on "appraisal of typography usage in poster design" and Chindo (2015) on "developing a framework for constructing craft skills training for Nigerians" came out with findings that were found reliable.

3.2 **Population of the Study**

The issue of population in research goes beyond people (Kolo, 2003). It includes test materials and observations. Isidor (2021) defines population as the entire set of relevant units of data serving as the basis for generalization which comprised a subset of the population. The population for this study are made up LED advertising billboards (thirteen, 13), motorists (definite number not available), graphic designers (ninety, 90) and FRSC (Federal Road Safety Corps of Nigeria (thirty-five, 35). The number of LED advertising billboards at Ibadan North-West (Iwo-round-about) and North-East (Elewure and Mokola) local government areas constitutes the population (test materials). Motorist's population to the test materials were drawn from a cross-section of drivers who ply the two local government areas viz-a-viz Iwo-road off Alakia (North-West) road and Sango-Elewure-Makola road axis in the North-East in Ibadan.

Other respondents are graphic designers and FRSC also drawn from the two earlier mentioned local government areas in Ibadan. Ibadan was chosen for the study because Ibadan is a highly concentrated commercial nerve centre of Oyo State with various construct designs of electronic billboard advertising and overwhelming transportation and human population. Ibadan has the same characteristics of hustling and bustling of businesses and overwhelming transportation system found in many urban cities of the world which encourages billboard advertising of various sizes, heights and basement ranging from Diodes, Monopole, Steel Multi-Pole, Steel I-beam, and Wooden Multi-Pole to Digital/LED Advertising. Only the LED advertising along Iwo-road-round-about, Elewure and Mokola roundabout road axis are selected for the study. These roadside LED advertising engage road-users on daily basis with display tasks of message deliveries across time and distance between 5 and 7 seconds, day and night.

3.3 **Sampling Technique**

Purposive sampling technique was adopted for this study. Bloomberg and Volpe (2012) postulate that, the logic of purposive sampling involves deliberate selection of particular units of population considered appropriate criteria under investigation to constitute the sampling variables. Selecting a sample is called design. Based on this premise, only electronic billboards advertising on display in identified locations in Ibadan metropolis believed to be relevant to this study were sampled. Same goes for motorists, graphic designers and FRSC personnel. Adefila (2008) calls the technique, "convenience sampling".

3.3.1 **Sample Size**

The sample size is a representative of sectional whole, made up of small relevant unit of a population who are consulted to get artisanal information about the phenomenon under investigation. Ritchie and Lewis (2003) opine that, selecting sample size for a research involves identifying what and who, by virtue of their number and relationship with the research questions, are able to provide relevant, comprehensive, reliable and rich information on the subject matter. Five (5) sampled test materials were sampled from population of thirteen (13) that represents relevant units. Thirty-six (36) motorists' were sampled to represent relevant units of the population while twelve (12) graphic designers were sampled from population of ninety (90). Seven (7) FRSC personnel were sampled from the population of thirty-five (35) for the study.

3.3.2 **Motorist Sampling Technique**

The researcher sampled minimum motorists of thirty-six (36) to represent the larger group. The reason being that, the divide of sampled population into different unit groups within the fourteen (14) local government areas of Ibadan will be cumbersome, time consuming and financially

costly to bear. According to Piroski (2013), if population is less than hundred a researcher needs to survey all; and if the researcher has no plan to divide the sample into different groups during analysis but only plan to use a few large groups because the researcher feels that, the people will illicit similar answers. Findings from the study do not have significant consequence as the researcher only need rough estimate of the result to draw conclusion. According to Tongco (2007), sampling is useful for the reason that, it helps the researcher to find and pick the right population sufficiently based on his discretion that best meet the purpose of the study.

Complimentary data were also collected by interview from few motorists on their perception in the use of LED advertising on safety concern on the road during the night. However, the FRSC personnel were also interviewed in collaboration with lead agency on traffic, face value of LED ads, management and placement administration. Just like the distributed questionnaire, interview followed in sequence of sections A and B. Section "A" covered personal data (information) such as age group, gender, and level of education, address, professional experience if any. The interview is preceded by introducing the researcher's topic, and followed by a paragraph introducing the researcher and his pledge to treat all information supplied confidentially. Section "B" focused on grey areas relating to phenomenon as regard commuter safety in the use of light-emitting diode advertising on roadsides.

3.4 **Instruments for data collection**

There are categories of instruments and these include questionnaire, interview and experimentation. For this study observation, questionnaire and interview schedule were employed for gathering qualitative and quantitative data. Extensive review, structured questionnaire; and in-depth focused interview were employed to gather information from motorists because these were found to be flexible and reliable. The collected data were

systematically organized, described, verified, analyzed and interpreted through both qualitative and quantitative data analyses. According to Harry and John (1980), focus interview allows elaborate investigation. Khan (2000) perceives interview as a two-person conversation initiated by the interviewer for specific purpose of obtaining research relevant information based on the objectives of a study. The researcher adopted interview technique for motorists and FRSC officers because they are involved in the experience regarding the situation under study. Secondly, it is assumed that some of the motorists may not be able to read nor write and thirdly, some of them may not have permanent office where the researcher could visit them and collect their responses as at when due if structured questionnaire has to be administered to them. The essence is therefore to avoid any hitches that may emanate regarding the nature of the information needed from them based on their knowledge of the identified problems. Structured questionnaire were also administered to some motorists who could read. FRSC personnel's were also interviewed based on their profession and duties respectively. Computer generated designs were used for the creation of the alternative visual contents of the sampled LED advertising. Computers are considered an indispensable tool in graphic design industry. Jann and Jerry James (2001) enthused that, computers and software applications are generally seen by creative professionals as more effective production tools in modern time designs

3.4.1 **Validation and Reliability of the Instrument**

The instrument schedules that were generated through pre-test among the motorists were subjected to content, constructs and sensual validation to ascertain its reliability by the researcher's supervisors in the Department of Industrial Design and Multimedia, Ahmadu Bello University, Zaria, Nigeria. Nworgu (1991) posits that in any research, it is necessary to provide a means of establishing the content validity and reliability of the instrument to be adopted. This is

usually preceded by the commencement of every research. To ascertain the reliability of the instrument to be use for the study, a pilot test was carried out among some portion of the motorists in Ibadan using interview technique. This helped the researcher to effect corrections on research questions that seem unclear to the respondents. The number of motorists for the pilot test was six (6) respondents.

3.5 **Questionnaire**

The researcher adopted the instrument of questionnaire using Likert rating scale format to source information from the identified population; motorists, graphic designers and FRSC personnel. The structured questionnaire sought respondents to indicate their degree of agreement or disagreement with the statement by ticking (✓). Two types of statistical data were adopted for this research. These are quantitative and qualitative paradigms of enquiry. Quantitative paradigm (numerical data) was employed to gather information from the three identified categories of the respondents for research questions two, three, four and five while qualitative paradigm (quality information) was however employed research question one.

The response options to research questions two, three, four and five are assigned numerical values to facilitate easy computation or statistical measurement of individual's stand to all the statements. The instruments have two sections: A and B. Section A covers personal data (information) such as age group, gender, and level of education, address and experience, if any. The questionnaire is preceded by introducing the researcher's topic, and followed by a paragraph introducing the researcher and his pledge to treat all information supplied confidentially. Section B focuses attention on particular areas of the stated objectives such as questions relating to design problems on the medium, effect of structure and placement and any

other factors that may deem a challenged to safety on the road. Total scores obtained to determine the individual's standing on the variables being measured.

One of the common formats for generating information/data in the humanity or social science survey is the rating scale. The researcher adopted "*Likert rating scale*" of five potential categories or choices with numerical codes accorded to collect the data as follows. SA: Strongly Agree (Score: Five), A: Agree (Score: Four), D: Disagree (Score: Three), SD: Strongly Disagree (Score: Two) and U: Uncertain (Score: One). The numerical codes that accompany these categories were interpreted to present the intensity of the response categories; so that the higher or lower the number, the more or less intense the response to draw conclusion.

3.5.1 **Interview**

Interview research methodology is often employed by a researcher to collect extra data from respondents either by some written or verbal interaction between the interviewer (researcher) and interviewee (respondent). Kahn (2000) posits that, collecting information through these instruments calls for a great deal of skill on the part of the researcher. It is a face-to-face `interaction to draw information from the respondents. Interview questions were structured to collect additional potential facts from the motorists and FRSC personnel's on the operational and management respectively of LED advert devices that were not captured in the questionnaire. Numerical data (quantitative mode of enquiry) was collected while percentile statistical formula was used for the analysis. The researcher adopted focused interview technique. Merton and Patricia (1946) in Frank (2009) define focused interview as a form of structured interview that takes place with respondents known to have been involved in a particular experience regarding the situations under study. The information expected from the motorists by interview is to determine whether or not LED advertising should be used during the night or be banned from

being displayed along the roadsides, while information expected from the FRSC personnel's by interview is to determine whether or not the management and administrative of placement and face value of the LED advertising be performed collaboratively by Lead Agency and FRSC personnel's. The interview questionnaire items were five in number. See Appendix F in page 173. The questions were structured to interrogate the perception of the motorists on the use of roadside LED advertisement in the night in view of commuter safety. Information collected from the respondents helped to establish the findings of the study.

3.6 **Pilot Test**

Pilot test was conducted in Ibadan city, using interview technique. Duniya (2004) sees pilot test or study as significant method of kick starting a research. According to him, it helps to establish the research. To this end, six motorists were used to test the original sampled test materials. For example, motorists were asked to look or read the pictures (message delivery) of the test materials from 15 feet away for only five seconds in a moving vehicle. The responses however vary. Five of the respondents (motorists) claimed they could not read it on motion as it is a distraction. According to Rip (2014), electronic billboards advertising are not print advert. The average viewing time is only about 5-10 seconds and that, a good test is to show a design to someone from a distance for only 5-10 seconds and then ask them about it (Monroes. 2017). Can they read and understand it? Can they visually access the message delivery? Did they understand it? Who was the advertiser? What do they think the advertiser wants them to do? Etc, etc, etc. The pilot test accorded the researcher the opportunity to interact and observe the respondents and imbibe the salient experience of the culture well enough to undertake successful research. It afforded the researcher the opportunity to rely on the validated instruments and eventually adopted for the final research output.

3.7 **Quantitative analysis of the alternative graphic design content**

Graphic designers and road users' (motorists) views were sought whether or not to create alternative design contents through a questionnaire. The responses were in affirmation. Alternative graphic design contents template was created. However, the efficacy of the redesigned could not be empirically tested since there is no such contemplation to do so. They could only be tested on diodes' (i.e. electronically controlled imagery devices), a channel that is out of reach of the researcher. LED advertising billboards are owned by companies or stakeholders in LED advertising business. However, the researcher is of the view that, the redesigned graphical contents of the LED ad has the potential to communicate effectively to break every communication barriers for easy visual accessibility or readability without visual distress when adopted by the stakeholders in electronic billboard business. Monroes (2017) however postulate that, a good test is to show the design to someone from a distance for only 5 seconds and then ask them about it. The average viewing time should be only between 5 to 7 seconds. Can they read it? Did they understand it? Who was the advertiser and what do they think the advertiser wants them to do in the light of commuter safety in the use of roadside LED advertising?

3.8 **Method of Data Analysis and Presentation**

Simple percentages (%) were used to represent the relevance of respondents' bio-data, while statistical tables and Chi- Square (x^2) test formula was used to analyzed relevance of data collected where applicable; and where the format is given as: $x^2 = \sum_{i=0}^{n} \frac{(Oi - Ei)^2}{Ei}$.

This was to provide distinct and fascination results that could make the research findings comprehensible to all readers. Based on decision rule that, a statement is considered accepted (agree) if the calculated (x^2) is greater (> 0) or rejected (< 0) (disagreed) where the level of

significance is 0.05. The aim is generally to measure the discrepancies existing between observed and expected (O - E) frequency. So that if (x^2) = (equal) or < (less) observed (O_i) than expected (Ei) frequencies they are equal exactly, while if (x^2) > 0, they are not equal exactly. It implies that, the greater the value of (x^2), the greater is the discrepancy between observed (O_i) and expected (E_i) frequency. The "*Oi"* represents number observed frequency while "*Ei"* represents expected frequency. The researcher employed descriptive content analysis (qualitative) and descriptive narration analysis (quantitative) to summarize the findings of the collected data. This implies that both research design paradigms were adopted. Wilkinson and Birmingham (2003) and Tewksbury (2009) opine that, analysis for qualitative and or quantitative data involves elaborate analysis of conceptuality of a particular content of information. According to the authors, the two paradigms help the analytical and comparative discussion to draw conclusion and recommendations in order to address the challenges associated with the subject matter. The choice of these analytical variables was informed by their flexibility which allows for seeking elaborate information on reality and hypothetical issues of the focussed medium. Oseni (2008) theorizes that, this method of chi-square (x^2) is better and most effective in humanity based researches with the simple reason that, it facilitates easier statistical manipulation and interpretation of results. The researcher described and interpreted the collected data within the context of the manifested results as indicated by the respondents. Hypothetical statements (Null hypothesis) were developed to interpret the findings.

CHAPTER FOUR

DATA ANALYSIS AND DISCUSSION OF FINDINGS

4.0 **Introduction**

In this chapter, three sets of respondents are described. These are the motorists, graphic designers and personnel from the Federal Road Safety Corps (FRSC) Nigeria, Ibadan office. Data collected were collated, coded, tabulated and analysed using statistical tables and narrative description.

Research questions were structured in tandem with the objectives. Questionnaire to investigate the existence of the analysed graphic design factors (problems) on the roadside light-emitting diode (LED) advertising, and the envisaged consequences of the graphic design problems to motorists while on motion was designed for two categories of respondents: motorists and the practicing graphic designers. Questions were also structured for motorists to evaluate their perception in the use of roadside LED advertising in view of commuter safety. Questionnaire was equally designed to examine the views of Federal Road Safety Corps (FRSC) personnel on the envisaged problems associated with physical structures and placement of LED advertising along the roads.

FRSC responsibilities cut across instilling discipline among road users to ensure safety on Nigerian roads. Questionnaire was also structured to garner response from graphic designers regarding possibilities of creating alternative graphic content to enhance readability of LED advertisement in the light of commuter safety. Graphic designers were used as respondents in the study based on the assumption that, they should understand principles and theories of design based on their professional training. All the questionnaires were designed with close-ended statements of five potential choices with accorded numerical values for the respondents to show

their level of standing by ticking (✓) the spaces provided on the test schedules (questionnaires). Motorists are the targeted audience in this study because motorists seem to be the victim of light-emitting diode advertising lining-up the roadsides in their driving tasks on motion.

Result of the study

The research questions were developed in tandem with the objectives of the study and the data were collected through research question two, three, four and five were converted into frequency scales of Chi-square (x^2), while the research question one was descriptively analysed.

SECTION A:

ANALYSIS OF THE DATA

Personal Data of Respondents: Motorists and Designers.

When the research questions were formulated, the tests were validated and tested, using respondents sourced within Ibadan to determine reliability of the test schedules. The instrument so found to be reliable was used for collecting required data. The data so collected through the instruments of questionnaire and interview were collated and analysed. The results were summarised through statistical tables and quantitative description based of reporting.

The respondents that were drawn from the public to indicate their level of agreement or disagreement to the statements raised in the questionnaires are motorists plying Iwo-road towards Alakia axis from Ojoo, Sango - Elewure road axis (Bodija junction), and Mokola off Queen Elizabeth axis road. Same goes for graphic designers who situate within Ibadan metropolis; as well as the FRSC personnel. A total of thirty-six (36) motorists were selected as respondents, twelve (12) graphic designers and seven (7) FRSC were also selected. Five samples of LED advertising placed along the major roads within the three localities mentioned (see p.20) formed the test materials. Copies of the questionnaires were administered to interrogate motorists

on the existence or otherwise of graphic design problems, and their perception in the use of roadside LED advertising in view of commuter safety. On the part of graphic designers, copies of the questionnaire were administered to investigate the existence of graphic design problems on LED advertising on our roads. Other copies of the questionnaire were also administered to investigate the possibilities of creating an alternative graphic content of LED advertising to enhance readability in the light of commuter safety. Copies of the questionnaire were also structured, and distributed to FRSC personnel to examine in what ways the physical structure and placement of LED advertising along the roads affect perception of motorists on motion.

4.1a **Distribution of Respondents: Motorists and Designers by Gender**

Table 4(1a): Distribution of (Motorists and Graphic designers) Respondents by Sex

No of Motorists: 36 **No of Graphic designers: 12**

VARIABLE	**MOTORISTS**		**GRAPHIC DESIGNERS**	
	No	%	No	%
Male	36	100	12	100
Female	-	-	-	-
Total	36	100	12	100

Source: Field Survey, 2019

Table 4.1a above indicates the gender of the respondents which constitute the sample. From the quantitative analysis of thirty-six (36), all the motorists' respondents are males, representing hundred percent, while the twelve (12) graphic design respondents are also males, representing hundred percent. This result shows that motorists plying Iwo-road - Alakia axis road, Elewure and Makola axis road, and graphic designers in Ibadan are predominantly males.

4(1b): **Distribution of Respondents by Age**

Table 4(1b): Distribution of (Motorists and Graphic designers) Respondents by Age

No of Motorists: 36 **No of Graphic Designers: 12**

VARIABLE	MOTORISTS		GRAPHIC DESIGNERS	
	No	**%**	**No**	**%**
20 – 30 years	04	11.1	07	58.3
30 - 40 years	08	22.2	04	33.3
40 – 50 years	14	38.9	-	-
50 years and above	02	5.6	-	-
Not Indicated	08	22.2	01	8.4
Total	36	100	12	100

Source: Field Survey, 2019

Table 4.1(b) above indicates the age group of respondents, motorists and graphic designs. The analyses indicate that, majority of motorists who responded are between the ages of 30- 40years, representing 38.9%, while among the graphic designers, majority falls within the 20-30 years age group, representing 58.3%. This is an indication that majority of motorist's respondents belongs to the matured group, while graphic designers are in their mid-thirties. This finding could be translated to mean that graphic designer respondents belong to the youthful age. 22.2% motorists and 8.4% graphic designer respondents did not respond to the item. However, 11.1% and 22.2% motorist' respondents falls within 20-30 and 30-40 respectively, while 5.6% motorists falls between the ages of fifty and above. 33.3% graphic designer's respondents fall between the ages of 30- 40years while none among the graphic designers falls within fifty years above category.

4(1c): **Distribution of Respondents by Level of Education**

Table 4(1c): Distribution of (Motorists and Graphic designers) Respondents by level of Education.

No of Motorist: 36 **No of Graphic Designers: 12**

VARIABLE	**MOTORISTS**		**GRAPHIC DESIGNERS**	
	No	**%**	**No**	**%**
Primary (JSS)	7	19.4	-	-
Secondary (SSS)	23	64	03	25
Tertiary (ND/HND)	03	8.3	07	58.3
Degree	-	-	02	16.7
No education	03	8.3	-	-
Total	36	100	12	100

Source: Field Survey, 2019

As it indicated in the analyses in table 4.2(c), twenty-three (23/64%) of the motorist respondents attended Secondary School while seven (7/19.4%) respondents completed primary School. Three (3/8.6%) however have (ND) certificate. It shows that the level of education of the motorist respondents means that they could read and write except (3/8.3%) who never indicated their level of education. The result of graphic designers respondents shows that, Seven (7/58.3%) have Higher National Diploma (HND) while Two (2/16.7%) are university graduates while only three (3/25%) attended secondary schools. This is an indication that all the respondents among the graphic designers are quite educated.

4(1d): **Distribution of Respondents by Professional experience**

Table 4(1d): Distribution of respondents by Motorists and Graphic designers' number of years in practice.

No of Motorists: 36 **No of Graphic designers: 12**

VARIABLE	MOTOTISTS		GRAPHIC DESIGNERS	
	No	**%**	**No**	**%**
1 – 5years	01	2.8	-	-
5 – 10years	08	22.2	02	16.7
10 – 15years	19	52.8	03	25
15years and above	08	22.2	07	58.3
Total	36	100	12	100

Source: Field Survey, 2019

Table 4.1(d) show that nineteen (19) motorists field survey respondent fall within 10-15) years of experience, representing (52.8%). This is indication that a higher percent of respondents have cognitive experience spanning almost fifteen years. This result shows that, motorists plying Iwo-road, Elewure and Mokola axis roads have many years of driving experience, with only one respondent having only cognitive experience of between a year and five, representing 2.8%. On the cognitive experience of graphic designers, there is an indication that seven (7) respondents representing (58.3%) have been practicing for fifteen years and above. Three (3), representing 25% and two (2), representing 16% have been practicing for between 5-10years and 1-5years respectively.

4(1e): **Personal Data of Respondents (Federal Road Safety Corps) FRSC personnel**

Table 4.1(e): Distribution of Respondents (FRSC) by Gender

No: 07

VARIABLE	Federal Road Safety Core (FRSC)	
	No	**%**
Male	06	85.7
Female	01	14.3
Total	07	100

Source: Field Survey, 2019

Table 4(1e) shows that, 85.7% FRSC personnel respondents are males while only (14.3%) is female. This is an indication that FRSC is dominated by male gender.

Table 4(1f): Distribution of Respondents (FRSC) by Age groups

No: 07

VARIABLES (Age Group)	Federal Road Safety Corps (FRSC) No	%
20 – 30years	01	14.3
30 - 40years	01	14.3
40 – 50years	03	42.9
50years and above	02	28.5
Not Indicated	-	-
Total	07	100

Source: Field Survey, 2019

In table 4(1f), 42.9% respondents (FRSC) fall within the ages of 40-50years while percentile ages that falls between 20-30 and 30-40 are 14.3%. 28.5% respondents respectively however fall within the ages of fifty years and above.

Table 4(1g): Distribution of Respondents (FRSC) by Level of education

No=7

VARIABLE	Federal Road Safety Core (FRSC)	
	No	**%**
Secondary school	-	-
Degree	04	57.1
OND/HND	03	42.9
Total	07	100

Source: Field Survey, 2019

Table 4(1g) above, shows that all the seven (7) FRSC respondents attended tertiary institution. 57.1% have University degree certificate while 42.9% have HND certificate. This implies that, all the FRSC personnel respondents are well educated.

Table 4(1h): Distribution of Respondents (FRSC) by Years of Job experience

No=7

VARIABLES Federal Road Safety Core (FRSC)		
(Job Experience)	**No**	**%**
5 – 10years	01	14.4
10 -20years	03	42.6
20 -30years	02	28.6
30 -40years	01	14.4
40 -50years	-	-
50years and above	-	-
Not Indicated	-	-
Total	07	100

Source: Field Survey, 2019

Table 4(1h) indicate that, 42.6% respondents have job experience of over ten (10years) while 28.6% have over twenty (20years) of job experience. One respondent (14.4%) has five (5years) experience while another one (14.4%) has thirty (30years) job experience. The result shows that all the respondents have significant cognitive experience on their job.

Table 4.2: **Total Number of Collected Questionnaire from the three groups of respondents (Motorists, Graphic designers and FRSC)**

No of Motorists=36	**No of Graphic designers=12**		**No of FRSC=07**	
NUMBER OF QUESTIONNAIRES ADMINISTERED	**Number returned**		**Number not Collected**	
	No	**%**	**No**	**%**
Motorists	36	65.5	-	%
Graphic Artists	12	21.8	-	%
FRSC	07	12.7	-	%
Total	55	100	-	-

Source: Field Survey, 2019

Table 4.2 indicate that, the total number of returned copies if questionnaire. Total numbers of fifty-five copies of the questionnaires were administered to the three sets of respondents. They are motorists, graphic designers and FRSC personnel. The number of respondents to the study is thirty-six (36), representing 65.5% motorists'. Twelve (12) graphic designers' respondents represent 21.8% and seven (7) FRCS Personnel's represent 12.7% respectively. The returned copies of the questionnaires indicate that, all the copies were returned. This population are sampled from the public within Ibadan metropolis which constitute the respondents to the test.

Motorists' respondents who have ND certificate are three (3), representing 8.6%. Twenty-three (23) respondents, representing 64% are Senior Secondary School (SSS) leavers while seven (7) respondents, representing 19% motorist' respondents completed primary School. Three (3) respondents (8.3%) however never indicated their level of education. The result shows majority of the motorists can read and write. In terms of experience, result indicates that, majority of the motorists (respondents) plying designated roads have cognitive experience spanning over fifteen years. This result shows that, motorists plying Iwo-road, Elewure and Mokola axis roads have cognitive job experience.

The data from graphic designers shows that Seven (7/58.3%) have Higher National Diploma (HND) while two (2/16.7%) are university graduates. Three (3) respondents, representing 25% had Senior Secondary schools (SSS) certificate. This is an indication that graphic artist respondents have adequate formal education that enables them to read and write. It also indicates that there is a high level of literacy among the artists that responded meaning that, reasonable numbers of practicing designers are trained in their chosen career.

Analyses of FRSC respondents indicate that 57.1% are well educated with university degree with many years of cognitive job experience of over five, ten and even twenty years respectively to their sleeves. The result also indicates that FRSC traffic management and administration is dominated by male gender.

SECTION: B

In order to answer the research questions, the research adopted qualitative and quantitative descriptive analyses. Qualitative analysis was however adopted for question one only to interrogate the graphic design factors of the original sampled test materials relating to image symbolism, legibility of texts, message deliveries, colour values, layout and background designs while quantitative was adopted for questions two, three, four and five. In order to answer research questions two, three, four and five, a set of research statements was formulated in tandem with the objectives of the study for the respondents to choose by ticking (✓) appropriately their level of agreement or disagreement. The statement (close-ended questions) were presented in tabloid format to collect data from research questions two, three, four and five respectively while statistical formula Chi- square (x^2), where $x^2 = \sum_{i=0}^{n} \frac{(Oi - Ei)^2}{Ei}$ was used for analyzing it.

OBJECTIVE 1: Analyze graphic design factors of the LED advertisement

In order to answer research question one as regard graphic design factors on the sample test materials, there was the need to first describe the graphic design factors on the LED ad that constitute the message delivery. Message of a typical ad is measured by the quality of face value.

A. Research question one

Q4.3: IN WHAT WAYS CAN GRAPHIC DESIGN FACTORS OF LED ADVERTISEMENT BE ANALYSED?

4.3: Analysis of Graphic Design Factors on the LED Advertisement: Qualitative Mode of Enquiry (Researcher)

Qualitative mode of enquiry was adopted by the researcher for research question one to draw inference. Five test materials (templates) from five LED advertising medium were sampled: vis-a-vis figures 9, 11, 12, 13 and 14. The graphic design factors on each template was subjected to qualitative mode of enquiry (analysis), using the standard global best practices in digital design process of advertising production on light-emitting diode billboard as a resource of query.

Standard within this context is rooted in the conceptual notion of simplicity of the message deliveries. Simplicity is a concept of minimalism; an idea of expressing design in a more simplified manner or an idea rooted in simplicity of composition characterised by well articulated forms, colours, texts, image(s) and any other related elements of creativity to define message delivery on LED advertisement. Are the messages readable or comprehensible enough to be perceived from a distant within a time limit? Are the elements (images, colour and texts etc.) so adopted to relay the message bold, sharp to be read by motorist on motion? Are the elements and background designs and other variables relating to the message deliveries well expressed to ameliorate visual distress? According to VanEenoo (2011), the idea of minimalism is exemplified by extreme simplicity and direct purpose approach. From the analysis, the

researcher observed that, each sampled template is characterised by peculiar graphic design problems ranging from:

- Overloaded design symbolisms
- Colours of similar value
- Poor legible texts messages
- Profuse (distraction) background
- Poor colour background

The researcher observes that, these flaws could have maximum impact and wide exposure to blur sights of the road users to kick off potential risk to commuters. Visual behavioural studies by Dukic (2013) establish that, LED advert has effect on gaze by attracting more and longer visual attention than regular traffic signs. Wallace (2003) describes driver's distraction as genuine risk of urban myth to buttress the above. Paradoxically, factors that determine standard message delivery on LED advertisement are documented by theorists as resolute limited rules to be applied, so that the transmit message delivery so programmed to be relayed within time frame of between 7-10 seconds could ease perception. Hardenbrook (2013), Bradley (2014), Blue Line Media (2017), Morones (2017) and Ely (2021) propose that, design factors within message delivery for a typical electronic advertising are domicile of simplicity, concise open statement, limited font, bold, thick, legible text, and or dominant large image(s) or symbolism, map-up by creative presentation layout. The theorists suggest that, avoiding too much colours (sharp though) with contrasting effect can be very powerful to void distracting motorists on motion. These factors form the nucleus and simplicity hallmark of global best practice in digital design process for effective and efficacious message delivery on LED advertisement. This buttresses Obisesan's (2008) position that, graphic designers should understand constraints that affect

graphic communication in other to create effective communication material using creativity to illustrate message(s) for easy visual comprehension.

Qualitative enquiry into the graphic design factors of each sampled test materials negates to large extent the standard global best practice in digital design process. This implies that, some LED ads along Nigeria's urban roads have design problems that may provoke various complexities such as readability rundown and visual stress to motorists on motion within time frame, and distance while on high speed in traffic areas. Further investigation was conducted to interrogate cognitive existence of the potential graphic design problems on the LED adverts. Sets of statements were formulated for quantitative empirical enquiry targeted towards two audiences (motorists and graphic designers). Questionnaire/statements were formulated for motorists to choose by ticking (✓) their level of acceptance on research question two (2) and four (4) respectively. Same goes for graphic designers. They were to choose by ticking (✓) their level of acceptability on research question two (2). This implies that, two responding variables (motorists and graphic designs) responded to research question two (2). Research question five (5) goes for graphic designers while research question three (3) goes for Road Safety Management staff (AFRC) respectively to choose by ticking (✓) their level of acceptance because of their responsibilities as a body that ensures safety on the road. This implies that, questionnaires were formulated for motorists, graphic designers and AFRC personnel with close-ended statements. Each choice was accorded mark as follows: SA: Strongly Agree (Score: Five), A: Agree (Score: Four), D: Disagree (Score: Three), SD: Strongly Disagree (Score: Two) and U: Uncertain (Score: One). Based on decision rule that a statement shall be considered accepted (agree) if the calculated chi-square (x^2) mode in any response is greater (>) than x^2 tabulated (critical value),

while the less (<) score would be recorded as reject (disagreed) to the statement. Here, one can state whether the null hypothesis Ho should be rejected or not on the decision rule.

OBJECTIVE 2: Investigate graphic design problems in LED advertisement on the perception of the motorists.

In order to obtain information on cognitive existence of the speculative graphic design problems in objective 2, two categories of respondents were sampled. These are thirty-six (36) motorists and twelve (12) graphic designers.

- **Motorists:**

A copy of research statement with nine (9) questionnaire items was formulated for thirty-six (36) motorists to indicate their level of acceptance by ticking (✓) their choice. Table 4.4(*ai*) below (p. 100) shows questionnaire items (information) and G_T (Grand Total) scores (x^2) for motorists.

Research Question Two

Q4.4a WHAT ARE THE GRAPHIC DESIGN PROBLEMS ON LED ADVERTISEMENT ON THE PERCEPTION OF MOTORISTS?

Table 4.4(*ai*): Distribution of (Motorists) respondents on Graphic Design Problems on LED advertisement on the perception of Motorists.

G_T =324

S/N	QUESTIONNAIRE ITEMS	SA	A	SD	D	U	R_T	REMARK
1	Light - emitting diodes advertising along the roads are unavoidable sight.	23	13	00	00	00	36	Accepted
2	Some graphic design factors on LED ad have design problems which makes reading and legibility difficult.	22	14	00	00	00	36	Accepted
3	Problem of overloaded design elements portends reading complexity when viewed in motion.	21	15	00	00	00	36	Accepted
4	Problems of colours of similar value on light-emitting diode create visual complexity on motion.	13	20	00	00	03	36	Accepted
5	Colours of the same value on LED advert have the tendency of emitting more light to \distract motorists in motion.	03	12	00	07	14	36	Unaccepted
6	Poor legible texts on light-emitting diode create visual puzzle and reading complexity within the context of time and distance.	22	14	00	00	00	36	Accepted
7	Poor backgrounds of LED ads emit excessive intense light that impact negatively on the vision of motorists in motion.	10	12	00	00	14	36	Accepted
8	Decoding problematic messages on LED advert while in transit constitute a risk.	27	09	00	00	00	36	Accepted
9	A motorist who tries to read poor legible text and information of sufficient interest could distract and take time from their driving task.	29	07	00	00	00	36	Accepted
	C_T	170	116	0	7	31	324	

Source: Field work, 2019

Using statistical formula of Chi-square (x^2) to measure statistical disposition discrepancies between Ho (disagree) and Hi (agreed) on the decision rule that, a statement is considered positive if x^2 calculated > x^2 tabulated where the level of significance is 0.05. Meaning that, if x^2*(calculated)* are greater than x^2(*tabulated)*, the result is considered "accepted"; if otherwise, it

would be regarded as "rejected". To test cognitive existence of graphic design problems on LED Adverts in objective 2 (two) from the motorist's perception, x^2 tests were adopted where:

$$x^2 = \sum_{i=0}^{n} \frac{(Oi - Ei)^2}{Ei}$$

To compute x^2 test of expected frequency: $\sum_{i=0}^{n} = \frac{(Observed\ (freq) - Expected\ freq)^2}{Expected\ freq}$ where

$$Ei = \frac{\text{Column Total (CT) x Roll TotaL (RT)}}{\text{Grant Total (GT)}} \text{ i.e. } Ei = \frac{\text{(CT x RT)}}{\text{GT}}$$

For example i, ii, iii and iv:

i. $E\ (23) = \frac{36\ x\ 170}{324} = 18.89$ (expected value)

ii. $E\ (13) = \frac{36\ x\ 113}{324} = 12.89$ (expected value)

iii. $E\ (0) = \frac{36\ x\ 0}{324} = 0$ (expected value)

iv. $E\ (0) = \frac{36\ x\ 7}{324} = 0.78$ (expected value)

Table 4.4(*aii*): Calculated Table: x^2 (*cal*) for **Motorists** on Research Question Two (4.4)

S/N	***Oi*** (observed value)	***Ei*** (expected value)	***(Oi - Ei)***	***(Oi - Ei)^2***	***(Oi - Ei)^2/Ei***
1.	23	18.89	4.11	16.89	0.89
2.	13	12.89	0.11	0.1	0.0008
3.	0	0	0	0	0
4.	0	0.78	0.78	-0.61	0.78
5.	0	3.44	-3.44	11.83	3.44
6.	22	18.89	3.11	9.67	0.51
7.	14	12.89	1.11	1.23	0.10
8.	0	0	0	0	0
9.	0	0.78	-0.78	**0.61**	0.78
10.	0	3.44	-3.44	11.83	3.44
11.	13	18.89	-5.89	34.69	1.84
12.	20	12.89	7.11	50.55	3.92
13.	0	0	0	0	0
14.	0	0.78	-0.78	0.61	0.78
15.	3	3.44	-0.44	0.19	0.05

16.	3	18.89	-15.89	252.49	13.37
17.	12	12.89	-0.89	0.79	0.06
18.	0	0	0	0	0
19.	7	0.78	6.22	38.69	49.60
20.	14	3.44	10.56	111.51	32.42
21.	22	18.89	3.11	9.67	0.51
22.	14	12.89	1.11	1.23	0.10
23.	0	0	0	0	0
24.	0	0.78	-0.78	0.61	0.78
25.	0	3.44	-3.44	11.83	3.44
26.	10	18.89	-8.89	79.03	4.18
27	12	12.89	-0.89	0.79	0.06
28	0	0	0	0	0
29	0	0.78	- 0.78	0.61	0.78
30.	14	3.44	10.56	111.51	32.42
31.	27	18.89	8.11	65.77	3.48
32.	9	12.89	-3.89	15.13	1.17
33.	0	0	0	0	0
34.	0	0.78	-0.78	0.61	0.78
35.	0	3.44	-3.44	11.83	3.44
36.	21	18.89	2.11	4.45	0.24
37.	15	12.89	2.11	4.45	0.35
38.	0	0	0	0	0
39.	0	0.78	-0.78	0.61	0.78
40.	0	3.44	-3.44	11.83	3.44
41.	29	18.89	10.11	102.21	5.41
42.	7	12.89	-5.89	34.69	2.69
43.	0	0	0	0	0
44.	0	0.78	-0.78	0.61	0.78
45.	0	3.44	-3.44	11.83	3.44
Total					180.25

$$Ei = \frac{(\text{CT x RT})}{\text{GT}} \text{ where}$$

$$x^2 = \sum_{i=1}^{45} \frac{(Oi - Ei)^2}{Ei}$$

$$\boldsymbol{x}^2_{cal} = \underline{180.25}$$

Critical Value

$x^2_{tab} = x^2$ (r - 1) (c - 1)

$= x^2$ (9 - 1) (5 -1), 0.05

x^2_{tab} (8) (4) = 32, 0.05

x^2_{tab} = <u>43.77</u>

Findings from Research Question 2 (4.4a): Table 4.4(*ai and aii*): Motorists

<u>Decision rule</u>: Reject Ho if $x^2_{cal} > x^2_{tab}$ otherwise do not reject.

Decision: Since x^2_{cal} (180.25) > x^2_{tab} (43.77), reject Null hypothesis Ho.

Hypothetical interpretation: Since x^2_{cal} (180.25) > x^2_{tab} (43.77), we reject Null hypothesis Ho. Hi therefore is accepted and conclude that respondents have agreed that there really exist graphic design problems on LED advertising billboards on our roads that have safety implications to motorists. This implies that, the LED advertisement thus has detrimental influence to safe driving on the road. This negates the stands of Ho.

Summation of Table 4.4(*ai and aii*): Research Question 2 (4.4a): Motorists

Out of the nine (9) questionnaire items, eight (8) got the highest status from the respondents (motorists) representing statistical value $\boldsymbol{x^2_{cal}}$ (<u>180.25</u>) on statistical mode of $x^2 = \sum_{i=0}^{n} \frac{(Oi - Ei)^2}{Ei}$ as against one questionnaire item that represents x^2_{tab} (<u>43.77</u>). This implies that, motorists agree that there really exist graphic design problems on LED advertisement on our roads against the few respondents who disagree. It also means that, statistical value of respondent motorists is greater than those that disagree. The finding confirms Shenzhen (2011) studies on perception that, a movie (graphic imagery) playing mechanism on the highway will attract attention which may constitute grossly unsafe on the road.

- **Graphic Designers:**

4.4(b): WHAT ARE GRAPHIC DESIGN PROBLEMS ON THE LED ADVERTISEMENT?

In order to investigate the existence of the identified graphic design problems on LED advertising in objective 2, a copy of research statements (questions) with seven (7) items was equally generated for twelve (12) graphic designers to show the level of acceptability by ticking (✓) their choice. Table 4.4(*bi*) below shows questionnaire (information) items and GT scores (x^2) for graphic designers. The graphic designers were used as respondents because of their profession as graphic designers.

Table 4.4(*bi*): Distribution of graphic designers (respondents) on Graphic Design Problems on LED advertisement

G_T =84

S/N	QUESTIONNAIRE ITEMS	SA	A	SD	D	U	R_T	REMARK
1.	Graphic design factors of some LED adverts have design problems that could distract motorists while driving.	03	09	00	00	00	12	Accepted
2.	Overloading images on LED adverts constitute a design problem which may lead to various forms of behavioral and visual complexities.	05	07	00	00	00	12	Accepted
3.	Colour(s) of similar value with pale background on LED ad are design problems that create perception complexity to motorists.	06	06	00	00	00	12	Accepted
4.	Poor legible text messages on LED ads are design problems which can cause visual puzzle to motorists with time and distance.	02	10	00	00	00	12	Accepted
5	Design elements of equal colour weight on LED ads have the tendency to emit more light therefore distracting motorists.	00	02	02	02	06	12	Uncertain
6.	Poor design background LED ads emits excessive intense light that impact negatively on the vision of the motorists.	00	00	01	04	07	12	Uncertain
7.	Decoding problematic messages on LED advert while in transit constitute a risk.	10	02	00	00	00	12	Accepted
	C_T	26	36	3	6	13	84	

Source: Field work, 2019

Using statistical formula Chi- square (x^2) where:

$$x^2 = \sum_{i=0}^{n} \frac{(Oi - Ei)2)}{Ei}.$$

For example: to obtain expected frequency: $Ei = \frac{(CT) \times (RT)}{(GT)} =$

$$E\ (3) = \frac{12\ x\ 26}{84} = 3.71 \text{ (expected value)}$$

Table 4.4(*bii*): Calculated Table: x^2 (*cal*) for Graphic Designers on Research Question Two (4.4)

S/N	***Oi*** (observed value)	***Ei*** (expected value)	***(Oi - Ei)***	***(Oi - Ei)^2***	***(Oi - Ei)^2/Ei***
1.	3	3.71	- 0.71	0.51	0.14
2.	9	5.14	3.86	14.88	2.89
3.	0	0.43	- 0.43	0.18	0.43
4.	0	0.86	- 0.86	0.73	0.86
5.	0	1.86	- 1.86	3.45	1.86
6.	5	3.71	1.29	1.65	0.45
7.	7	5.14	1.86	3.45	0.67
8.	0	0.43	- 0.43	0.18	0.43
9.	0	0.86	- 0.86	0.73	0.86
10.	0	1.86	- 1.86	0.73	0.40
11.	6	3.71	2.29	5.22	1.41
12.	6	5.14	0.86	0.73	0.14
13.	0	0.43	- 0.43	0.18	0.43
14.	0	0.86	- 0.86	0.73	0.86
15.	0	1.86	- 186	3.45	1.86
16.	2	3.71	- 1.71	2.94	0.79
17.	10	5.14	4.86	23.59	4.59
18.	0	0.43	- 0.43	0.18	0.43
19.	0	0.86	- 0.86	0.73	0.86
20	0	1.86	- 1.86	3.45	1.86
21.	0	3.71	-3.71	13.80	3.71
22	2	5.14	-3.14	9.88	1.92
23.	2	0.43	1.57	0.47	5.76
24.	2	0.86	1.14	1.31	1.52
25.	6	1.86	4.14	17.17	9.24
26.	0	3.71	- 3.71	13.80	7.43
27.	0	5.14	- 5.14	26.45	5.14
28	1	0.43	0.57	0.33	0.76
29	4	0.86	3.14	0.88	11.52
30	7	1.86	5.14	26.45	14.24
31	10	3.71	6.29	39.51	10.64

32	2	5.14	- 3.14	9.88	1.92
33.	0	0.43	- 0.43	0.18	0.43
34	0	0.86	- 86	0.73	0.86
35	0	1.86	- 86	3.45	1.86
Total					99.15

$$Ei = \frac{(\text{CT } x\ RT)}{\text{GT}}$$

$$x^2 = \sum_{i=1}^{35} \frac{(Oi - Ei)^2}{Ei}$$

$$\boldsymbol{x^2}_{cal} = \underline{\mathbf{99.15}}$$

Critical value:

$\mathbf{x^2}_{tab}$ (r-1) (c -1) 0.05

(7- 1) (5 -1) 0.05

$\boldsymbol{x^2}_{tab}$ = (6) x (4)

$\boldsymbol{x^2}$ = 24, 0.05

$\boldsymbol{x^2}_{tab}$ = **<u>48.60</u>**

Findings from Research Question 2 (4.4b): Tables 4.4*bi and 4.4bii*: Graphic Designers

<u>Decision rule</u>: Reject Ho if $x^2_{cal} > x^2_{tab}$ Otherwise do not reject.

Decision: Since x^2_{cal} (99.15) > x^2_{tab} (48.60), therefore reject Ho.

Hypothetical Interpretation: Hi is accepted conclude that there is existence of graphic design problems on LED advertising billboards that creates perception complexity to motorists on motion.

Summation of Table 4.4*bi and bii*): on Research Question 2 (4.4b): Graphic Designers

Out of the seven (7) questionnaire items, five (5) got the highest value from graphic designers representing statistical value $\boldsymbol{x^2}_{cal}$ (<u>99.15</u>) on statistical mode of $x^2 = \sum_{i=0}^{n} \frac{(Oi - Ei)^2}{Ei}$ as against two questionnaire items that represents x^2_{tab} (<u>48.60</u>). It implies that, statistical value of respondent of

graphic designers is greater than those that disagree. Meaning that, graphic designers confirm that, there really exist graphic design problems on LED advertisement on our roads compared to those who are not certain. This confirms Dakyes (2018) observation that, some LED advertisement on the roadsides is domicile of graphic design flaws. It also implies that, attempt by motorists to force their glare to seek the information may have detrimental effect to safe driving.

OBJECTIVE 3: Examine how the physical structure and placement of LED advertisement along the roads affect perception of motorists.

In order to obtain information on physical structure and placement of LED advertising along the roads based on objective 3, questionnaire items were structured for FRSC personnel to show their level of agreement or disagreement by ticking(✓) their choice.

Research Question Three

Q4.5: IN WHAT WAYS CAN THE PHYSICAL STRUCTURE AND PLACEMENT OF LED ADVERTISEMENT AFFECT THE PERCEPTION OF MOTORISTS BE EXAMINED?

A copy of research statements with seven (7) items was provided for seven (7) FRSC personnel to show the level of acceptability by ticking (✓) their choices. Table 4.6 (p. 113), shows questionnaire items and statistical formula of Chi- square (x^2). The FRSC personnel were used as respondents because of their profession as road safety managers.

Table 4.5(*i*): **Distribution of respondents on physical structure and placement of LED advertisement along the road are examined on FRSC Personnel**

G_T =49

S/N	QUESTIONNAIRE ITEMS	SA	A	SD	D	U	R_T	REMARK
1.	Wrong placement of LED advertising obstructs traffic and motorists' view in some cases.	05	02	00	00	00	7	Accepted
2.	Mega size (structure) LED advert placed within the city roads have a tendency to distract motorists on transit.	07	00	00	00	00	7	Accepted
3.	The characterised brightness of design elements on LED advert is not suitable for social interaction.	00	02	00	05	00	7	Unaccepted
4.	The placement of LED advert within an environment is a genuine risk to road users as a result of maximum attention it draws unto itself.	02	05	00	00	00	7	Accepted
5.	Regulating the face value and placement of LED ads within the city roads should be in collaboration with lead agency of FRSC in traffic management and administration.	02	05	00	00	00	7	Accepted
6.	In the absence of effective control/ management of LED ads, safety risk on the road will exist.	07	00	00	00	00	7	Accepted
7.	LED ads with effective graphic design factors that ensure safety should be placed on the road.	06	01	00	00	00	7	Accepted
	C_T	29	15	0	5	0	49	

Source: Field work, 2019

Using statistical formula of Chi-square (x^2) to measure statistical disposition discrepancies between Ho (disagree) and Hi (agree) on the decision rule that, if x^2*(calculated)* is greater than x^2(*tabulated),* the result is considered/regarded as "agreed"; if otherwise, it would be regarded as "disagreed".

To obtain information on physical structure and placement of LED advertising along the road in objective three (3) from the FRSC personnel, Chi-square (x^2) formula was adopted where.

$$x^2 = \sum_{i=1}^{n} \frac{(Oi - Ei)^2}{Ei} \text{ where}$$

For example: To obtain expected frequency: $$Ei = \frac{(\text{CT } x \ RT)}{\text{GT}}$$

$$E\ (5) = \frac{7\ x\ 29}{49} = 4.14 \text{ (expected frequency)}$$

Table 4.5 (*ii*): Calculated Table: x^2 (*cal*) for FRSC Personnel on Research Question Three (4.5)

S/N	***Oi*** (observed value)	***Ei*** (expected value)	***(Oi - Ei)***	$(Oi - Ei)^2$	$(Oi - Ei)^2/Ei$
1.	5	4.14	0.86	0.73	0.18
2.	7	4.14	2.86	8.16	1.97
3.	0	4.14	-4.14	17.16	4.14
4.	2	4.14	-2.14	4.59	1.11
5.	2	4.14	-2.14	4.59	1.11
6.	7	4.14	2.86	8.16	1.97
7.	6	4.14	1.86	0.45	0.83
8.	2	2.14	-0.14	0.02	0.01
9.	0	2.14	-2.14	4.59	2.14
10.	2	2.14	-0.14	0.02	0.01
11	5	2.14	2.86	8.16	3.81
12.	5	2.14	2.86	8.16	3.81
13.	0	2.14	-2.14	4.59	2.14
14	1	2.14	-1.14	1.31	0.61
15.	0	0	0	0	0
16.	0	0	0	0	0
17	0	0	0	0	0
18	0	0	0	0	0
19	0	0	0	0	0
20.	0	0	0	0	0
21.	0	0	0	0	0
22.	0	0.71	-0.71	0.51	0.71
23	0	0.71	-0.71	0.51	0.71
24	0	0.71	-0.71	0.51	0.71
25.	0	0.71	-0.71	0.51	0.71
26	0	0.71	-0.71	0.51	0.71
27.	0	0.71	-0.71	0.51	0.71
28.	0	0.71	-0.71	0.51	0.71
29	0	0	0	0	0
30	0	0	0	0	0
31.	0	0	0	0	0
32	0	0	0	0	0
33	0	0	0	0	0
34.	0	0	0	0	0
35.	0	0	0	0	0
Total					51.69

$$Ei = \frac{(\text{CT x RT})}{\text{GT}} \text{ where}$$

$$x^2 = \sum_{i=1}^{35} \frac{(Oi - Ei)^2}{Ei}$$

$$\boldsymbol{x^2}_{cal} = \underline{\mathbf{51.69}}$$

Critical Value

$x^2_{tab} = x^2$ (r - 1) (c - 1)

$= x^2$ (7 - 1) (5 -1), 0.05

x^2_{tab} = (6) (4) = 24, 0.05

x^2_{tab} = **36.42**

Findings from Research Question 3(4.5): Table 4.5(*i and ii*): FRSC Personnel

Decision rule: Reject Ho if $x^2_{cal} > x^2_{tab}$ otherwise do not reject.

Decision: Since x^2_{cal} (51.69) > x^2_{tab} (36.42), therefore reject Ho.

Hypothetical Interpretation: Hypothetically, Hi is accepted and conclude that there is significance relationship between physical structure and placement of LED advertising billboards that poses safety risk to road users and motorists to safe driving.

Summation of Table 4.5(*i and ii*): Research Question 3(4.5): FRSC Personnel

Out of the seven (7) questionnaire items, six (6) got the highest status from the respondents (FRSC Personnel) representing statistical value x^2_{cal} (51.69) on statistical standing of $x^2 = \sum_{i=0}^{n} \frac{(Oi - Ei)^2}{Ei}$ as against one (1) questionnaire item that represents x^2_{tab} (36.42). This implies that, FRSC personnel agree that there is significance relationship between physical structure and placement of LED advertising billboards that poses safety risk to road users on our roads against those that disagrees. Meaning that, statistical value of respondents is greater than those that disagree. It also implies that, aside the visual impact, arbitrary and cluster display of billboard can cause visual and environmental pollution.

OBJECTIVE 4: Evaluate the perception of motorists on commuter safety in the use of roadside LED advertisement

In order to obtain information about objective four (4), motorists' perception was sought on commuter safety in the use of roadside LED advertisement.

Research Question Four

Q4.6: WHAT ARE PERCEPTIONS OF MOTORISTS ON COMMUTER SAFETY IN THE USE OF ROADSIDE LED ADVERTISEMENT?

A copy of research statements with eight (8) items was provided for motorists to show the level of acceptability by ticking (✓) their choices. Table 4.6 below (p. 116) shows questionnaire items (information) and Chi- square (x^2) formula. The motorists are the target audience in this study because their job as motorists makes them target of the test materials.

Table 4.6 (*i*): **Distribution of motorists perception on commuter safety in the use of roadside LED advertisement**

G_T=288

SN	QUESTIONNAIRE ITEMS	SA	A	SD	D	U	R_T	REMARK
1.	The use of LED ads takes away motorists' view off the road, thus increasing chances of road crash.	07	26	00	00	03	36	Accepted
2.	The use of LED ad on the road draws more attention of everyone's view due to its accompanied lighting system, thus increasing the chances of road crash.	09	26	00	00	01	36	Accepted
3.	The use of LED ads compete for attention of the viewer creating bigger, higher and closer to displaying brighter colours than the existing ads and creates a snowball effect that may get out of hand.	04	28	00	01	03	36	Accepted
4.	The characteristic lighting system of LED ad on the road causes vibration to a moving car, thus increasing the chances of road crash.	02	14	00	12	08	36	Unaccepted
5.	The viewing of rapid transitional display of message deliveries of roadside LED ads creates a snowball effect that may get out of hand.	09	27	00	00	00	36	Accepted
6.	Motorists have been operating in an increasing complex visual environment as a result of the use of roadside LED adverts, thus creating chances for eventual consequences.	32	04	00	00	00	36	Accepted
7.	Commuter's safety seems to be endangered in the use of LED adverts as it takes more time in assessing the message deliveries by motorists.	16	20	00	00	00	36	Accepted
8.	The use of roadside LED adverts even during the night puts motorists at high risk as they perform their driving tasks.	00	11	09	16	00	36	Unaccepted
C_T		79	156	9	29	15	288	

Source: Field work, 2019

Using statistical formula of Chi-square (x^2) to measure statistical disposition discrepancies between Ho (disagreed) and Hi (agreed) on the decision rule that, if x^2*(calculated)* is greater than x^2(*tabulated),* the result is considered/regarded as "agreed"; if otherwise, it will be regarded as "disagreed".

To obtain information of motorist's perception on commuter safety in the use of roadside LED advertisement, Chi-square (x^2) formula was adopted.

$$x^2 = \sum_{i=1}^{n} \frac{(Oi - Ei)^2}{Ei}$$

For example: $Ei = \frac{(\text{CT } x \ RT)}{\text{GT}}$ where

$$E\ (7) = \frac{79\ x\ 36}{288} = 9.88 \text{ (expected value)}$$

Table 4.6(*ii*): Calculated Table: x^2 (*cal*) for Motorists on Research Question Four (4.6)

S/N	***Oi*** (observed value)	***Ei*** (expected value)	***(Oi - Ei)***	***(Oi - Ei)^2***	***(Oi - Ei)^2/Ei***
1.	7	9.88	-2.88	8.29	0.83
2	26	19.5	6.5	42.25	2.16
3.	0	1.13	-1.13	1.28	1.13
4.	0	3.63	-3.63	13.14	3.63
5.	3	1.88	1.12	1.26	0.67
6.	9	9.87	-0.87	0.76	0.07
7.	26	19.5	6.5	42.25	2.16
8.	0	1.12	-1.12	1.26	1.12
9.	0	3.62	-3.62	13.14	3.62
10.	1	1.87	-0.87	0.76	0.40
11.	4	9.87	-5.87	34.51	3.49
12.	28	19.5	8.5	72.25	3.70
13.	0	1.12	-1.12	1.26	1.12
14.	1	3.62	-2.62	6.89	1.90
15.	3	1.87	1.12	1.26	6.67
16.	2	9.87	-7.87	62.01	6.28
17.	14	19.5	-5.5	30..25	1.55
18.	0	1.12	-1.12	1.26	1.12
19.	12	3.62	8.38	70.14	19.37

20.	8	1.87	6.12	37.51	20.05
21.	9	9.87	-0.87	0.76	0.07
22.	27	19.5	7.5	56.25	2.88
23.	0	1.12	1.12	1.26	1.12
24.	0	3.62	-3.62	13.14	3.62
25.	0	1.87	-1.87	3.51	1.87
26.	32	9.87	22.12	489.51	49.57
27.	4	19.5	-15.5	240.25	12.32
28.	0	1.12	-1.12	1.26	1.12
29.	0	3.62	-3.62	13.14	3.62
30.	0	1.87	-1.87	3.51	1.87
31.	16	9.87	6.12	37.51	3.79
32.	20	19.5	0.5	0.25	0.01
33.	0	1.12	-1.12	1.26	1.12
34.	0	3.62	-3.62	13.14	3.62
35.	0	1.87	-1.87	3.51	1.87
36.	0	9.87	-9.87	97.51	9.87
37.	11	19.5	-8.5	72.25	3.70
38.	9	1.12	7.87	62.01	55.12
39.	16	3.62	12.37	153.14	32.24
40.	0	1.87	1.87	3.51	1.87
Total					276.41

$$Ei=\frac{(\text{CT x RT})}{\text{GT}}$$

$$x^2 = \sum_{i=1}^{40} \frac{(Oi - Ei)^2}{Ei}$$

x^2_{cal} = 276.41

Critical value

$x^2_{tab} = x^2$ (r - 1) (c - 1)

$= x^2$ (8 - 1) (5 -1), 0.05

x^2_{tab} x^2 tab = (7) (4) = 28, 0.05

x^2_{tab} x^2 tab = 41.34

Findings from Research Question 4(4.6): Table 4.6 (*i and ii*): Motorists

Decision rule: Reject Ho if $x^2_{cal} > x^2_{tab}$ otherwise do not reject.

Decision: Since x^2_{cal} (276.41) > x^2_{tab} (41.34), reject Null hypothesis Ho.

Hypothetical Interpretation: Hypothetically, we accept Hi and conclude that respondents agree that, the use of LED ad on the road draws more attention of motorists' view off the road, thus increasing chances of road crash. This implies that, motorists' safety seems to be at risk or endangered in the use of LED adverts as it takes more time in accessing the message deliveries.

Summation of Table 4.6(*i and ii*): Research Question 4(4.6): Motorists

Out of the eight (8) questionnaire items, six (6) got the highest status from the respondent motorists representing statistical value $\boldsymbol{x^2}_{cal}$ (276.41) on statistical mode of $x^2 = \sum_{i=0}^{n} \frac{(Oi - Ei)^2}{Ei}$ as against one (1) questionnaire item that represents x^2_{tab} (41.34). From the statistical value of the findings, motorists agree that they have been operating in an increasing complex visual environment that endangers commuter's safety in the use of roadside LED advertisement. This implies that, motorists who agree to the use of LED advertising are comparably less to those who disagree. Meaning that, roadside LED advertising is actually not safety friendly. This claim confirms Signlink (2017) inference that, roadside billboard advertising along the roadsides sometimes falls foul, because the plan of the layout does not accommodate the eye. Jordan (2015) posits that, roadside billboard advert must be safety friendly asides the attraction friendly, to create memorable impression to the target audience. It requires that, illustration demands bold lines, good contrast, and minimal number of imageries and clarity of message delivery. Chandler (2001) recommends that, the deeper a designer understands the principle and vocabulary of graphic design factors in advertising design and knows their target audience, the better the

control over the success of the product created. It is also healthier to infer that, Committee of Advertising Practice (CAF) indemnity clause (punishment) be applied to billboard advertising product owners that flouts the rules that governs advertising content and placement of outdoor advertising billboard(s).

OBJECTIVE 5: Create alternative graphic design content for LED advertisements in which safety issues are considered.

In order to obtain information from graphic designers on creating alternative graphic content to enhance readability of LED advertisement in view of commuter safety in objective 5, questions were structured.

Research Question Five

Q4.7: WHAT IS THE ALTERNATIVE GRAPHIC DESIGN CONTENTS FOR LED ADVERTISEMENT IN WHICH SAFETY ISSUES ARE CONSIDERED?

A copy of the research questions (statements) with six (6) items was provided for graphic designers to show the level of acceptability by ticking (✓) their choices. Table 4.8 (p. 119) below shows represented statement, data collected and the observed frequency $\boldsymbol{x^2}$ scores from respondents on the research.

To compute expected frequency for $\boldsymbol{x^2}$ (chi-square):

$$x^2 = \sum_{i=1}^{n} \frac{(Oi - Ei)^2}{Ei}$$

was adopted. The graphic designers are used for this study because of their profession as graphic designers.

Table 4.7(*i*): Distribution of respondents (Designers) on creating alternative graphic content for LED advertisement in which safety issues are considered.

No=72

S/N	QUESTIONNAIRE ITEMS	SA	A	SD	D	U	R_T	REMARK
1.	Good advert is a product of a seasoned graphic artist that project graphic elements that are readable and legible within a time frame and distance.	09	03	00	00	00	12	Accepted
2.	Developing a good prototype LED ads to engage motorists visually is for safety on the road.	10	02	00	00	00	12	Accepted
3.	Developing prototype LED ads to engage responsibly is for safety on the road.	10	02	00	00	00	12	Accepted
4.	Improving readability of LED ads is solving graphic design problems on LED's display.	04	08	00	00	00	12	Accepted
5.	Effective graphic design factors on LED ads ensure readability and legibility of the message deliveries.	10	02	00	00	00	12	Accepted
6.	Developing a prototype LED ads is eliminating design problems on LED ads.	12	00	00	00	00	12	Accepted
C_T		55	17	0	0	0	72	

Source: Field work, 2019

Using statistical formula of Chi- square (x^2) to measure statistical disposition discrepancies between Ho (disagreed) and Hi (agreed) on the decision rule that, if x^2*(calculated)* is greater than x^2(*tabulated),* the result is considered/regarded as "agree"; if otherwise, it will be regarded as "disagree".

To obtain information on development of prototype LED advertisement in which safety issues are considered, Chi-square (x^2) formula was adopted where:

$$x^2 = \sum_{i=1}^{n} \frac{(Oi - Ei)^2}{Ei}$$

For example: $Ei = \frac{(\mathrm{CT}\ x\ RT)}{\mathrm{GT}}$ where

$$E\ (9) = \frac{55\ x\ 12}{72} = 9.16 \text{ (expected value}$$

Table 4.7(*ii*): Calculated Table: x^2 (*cal*) for Graphic Designers on Research Question Five (4.7)

S/N	***Oi*** (observed value)	***Ei*** (expected value)	***(Oi - Ei)***	***(Oi - Ei)^2***	***(Oi - Ei)^2/Ei***
1	9	9.16	-0.16	0.0256	0.003
2..	3	2.83	0.17	0.0289	0.002
3.	0	0	0	0	
4.	0	0	0	0	
5.	0	0	0	0	
6.	10	9.17	0.83	0.6889	0.075
7.	2	2.83	-0.83	0.6889	0.243
8.	0	0	0	0	0
9.	0	0	0	0	0
10.	0	0	0	0	0
11.	10	9.17	0.83	0.6889	0.075
12.	2	2.83	-0.83	0.6889	0.243
13.	0	0	0	0	0
14.	0	0	0	0	0
15.	0	0	0	0	0
16.	4	9.16	-5.16	26.6256	2.906
17.	8	2.83	5.17	26.7289	9.444
18.	0	0	0	0	0
19.	0	0	0	0	0
20.	0	0	0	0	0
21.	10	9.17	0.83	0.6889	0.075
22.	2	2.83	-0.83	0.6889	0.243
23.	0	0	0	0	0
24.	0	**0**	0	0	0
25.	0	0	0	0	0
26.	12	2.83	9.17	84.0889	29.818
27.	0	0	0	0	0
28.	0	0	0	0	0
29.	0	0	0	0	0
30.	0	0	0	0	0
Total					43.28

$$Ei=\frac{(\text{CT x RT})}{\text{GT}}$$

$$x^2 = \sum_{i=1}^{30} \frac{(Oi - Ei)^2}{Ei} =$$

$$x^2_{cal} = \underline{43.28}$$

Critical value

$x^2_{tab} = x^2$ (r - 1) (c - 1), 0.05

$= x^2$ (6 - 1) (5 -1), 0.05

x^2_{tab} x^2 tab = (5) (4) = x^2 20, 0.05

x^2_{tab} x^2 tab = 10.85

Findings from Research Question 5: Table 4.7(*i and ii*): Graphic Designers

Decision rule: Reject Ho if $x^2_{cal} > x^2_{tab}$ otherwise do not reject.

Decision: Since x^2_{cal} (43.28) > x^2_{tab} (10.85), reject Null hypothesis Ho.

Hypothetical Interpretation: Hypothetically, Hi is accepted and conclude that respondents agree on improvement of the sampled test materials to engage motorists responsibly to ensure commuter safety. This implies that, respondents agree to a redesign graphic design content to enhance readability of LED advertisements.

Summation of Table 4.7(*i and ii*): Research Question 5: Graphic Designers

Six (6) questionnaire items were structured for designers to show their level of acceptance or otherwise by ticking. The six questionnaire items received acceptability status from the population of seven designers. Statistical value of x^2_{cal} (43.28) representing strongly agree on statistical mode $x^2 = \sum_{i=0}^{n} \frac{(Oi - Ei)^2}{Ei}$ is though greater than x^2_{tab} (10.85); agree. Findings indicate that there is no significant difference between the two responding views of the agreement variables of the graphic design respondents. The discrepancies between x^2_{cal} and x^2_{tab} emanates from the standing view of the respondents on the rating scale between agree and strongly (see figure 4.7(i). This implies that, respondents concur to the creation of alternative graphic design content for the sampled LED advertisements in which safety issues are considered.

The overall findings confirm that, sampled test materials (LED advertising devices) are characterised by graphic design flaws. In view of commuter safety, the graphical contents were

redesigned (encoded) using the simplicity hallmark of graphic design theorists based on the global best design practice of Broadbent 1988, Vassinen 2012, Hardenbrook 2013, Bradley 2014, Morones 2017, Blue Line Media 2017 and Sugget 2017) to suit Nigeria unique local circumstance. The redesign of graphical contents of the sampled test materials was based on previous observation and studies of some graphic theorists. Among them is Douglass (2009) that reveals that, two goals are uppermost in the mind of a graphic designer to communicate quickly as in mobile and to find proper match between words and images to communicate effectively. This assertion is in tandem with the previous studies by Lauer and Pentak (2008) findings on efficacy of finished work that, effective graphic communication is determined by ingenuity of creative exercise of a designer whose success is characterised in his finished work. Buttressing the above, Obisessan (2008) postulates that, designers must understand the vocabulary of graphic design, know their target audience, and should be aware of the constraint that affects graphic communication in other to create effective communication materials using creativity to illustrate the message.

Based on this findings, the researcher created alternative graphic design contents for the five sampled test materials in consonance with the current global best practices in digital design process using the principles of graphic designs and communication theories which include but not limited to getting your story/information straight, bold, large, thick and legible texts; colourful, high contrast images, bright colours, and loud with simplicity in all aspects of the design in a manner to communicate with the target audience in an effective manner in plate 1, 2, 3, 4 and 5 on pages 132, 133, 135, 135 and 136 respectively to suit Nigeria unique local environment. This implies that the norm of global best practices in digital design process was adhered to in enhancing visual accessibility and readability of LED advertisement.

1. The number of communication variables has been confined to three to give readers quick optical accessibility, thereby giving the reader a taste/feeling of what the content is all within the context of time and distance. See plate 1, 2 3 and 5. Poppy (2006) describe organised graphic treatment as conceptual-driven; an idea that create visual interest to draw potential readers that should both be responsible, meaningful and easy to read to avoid visual complexities.
2. Message deliveries have been enhanced from graphic communication point of view to ease optical accessibility by embolden and eliminating graphic design factors deem defective.
3. Attention value of pictorials (texts and imageries) to demystify perception complexity has been enhanced by adapting single product imagery and highly contrasted colour(s) backgrounds. See plate 1, 2, 3 and 4.
4. Distraction backgrounds of advertising copies have been eliminated for effective message deliveries to avoid distraction. See plate 2, 3, 4 and 5.
5. Introducing bold texts and single product/service imageries to complement each other to attract perception devoid of any complexity to make the advertising or message deliveries easily visually accessible. See plate 1, 2, 3, 4 and 5. This is in tandem with Netherton (2009) findings on impact of poor legibility on drivers. In his words; *"*when a driver passes a sign where the text has poor legibility, distraction could occur, and if the information is of sufficient interest, the driver may try to read all the text. Such decision could take time away from the driver's task, thus increasing crash risk. If on the other hand, the information had text that met legibility standards, less effort would be required

to read since the situation is a more subtle distraction than that due to perceived emotion in a sign; it still could present potential for crash risk".

6. Highly contrasted colour(s) of making advertisement communicable was adopted to ease visual accessibility and readability at a distance and time. This is in consonance with the global best practices in digital design process. These could be noticed in all the redesigned test materials in Plate 1, 2, 3, 4 and 5.
7. In order for motorists to recognise the advert from a distance and time, peculiar colours identified with the service providers was introduced at the background of the new generated visual content of their adverts. This should go a long way at saving time at knowing the advertisers. See plates 4 and 5.
8. Introducing dark background colour to reduce the high intensity lighting system of LED advertisement to engage motorists responsibly at night (see plate 1, 2 and 3). Scientifically, colour is light and practically visible in spectrum of light. Graphic designers (artist) see light as palette or hue. This implies that, when two light of equal intensity meets (light and colour), the two (variables) reflect an optically high density light to create visual stress. Graphically, colour is viewed as a means to an end; a tool of artistic expression on surfaces. Qualified graphic designers are groomed to understand that contrast colours reduce radiation intensity of the natural light to create a subtle and mild optically active scene on visual plane.
9. The theoretical principle of optical emphases on the physical arrangement of texts and imagery to literally engage the reader responsibly in swiftly sequential pattern on motion to ease visual stress (see plate 1, 2, 3, 4 and 5). Below are the redesigned graphic designs

contents (alternative) sampled test materials for the research. They are plates 1, 2, 3, 4 and 5.



Plate 1: Lagelu 96.3FM ad.**:** ***Best New Radio Station*** - (Redesigned Copy)



Figure I: LED Electronic Billboard Advertising –Original Lagelu Radio Station ad characterised by overloaded imageries and letter forms. (Source: Iwo-Road/Highway, Ibadan - 28th January, 2018

Plate 1:*"Lagelu 96.3FM Radio ad"* is a redesign template from the original sampled test material Figure. 1, characterized by overloaded message deliveries with poor legible texts that could take time away from the driver's task by any attempt to read thereby creating crash risk.

The template is an improved graphic design factors with simple, bold, horizontal format (written) letter forms (texts) with a classical bold "eureka imagery" positioned at the extreme right to suggest persuasive and consumption impart of the message to be visually accessed within the contest of time and distance. The Lagelu FM *logo* is positioned at the extreme down left to form a design pattern whole for easy visual accessibility. The familiarity with the format of

paralleled use of both words and image in advertising ensures greater receptivity to the message not to create visual complexity. Limiting the number of design elements, with bold texts, sharp contrast colours are a hallmark of global best practice in digital design process for effective message delivery.



Plate 2: Ibadan City Marathon Race 2018: ***Stay Fit with Three Crown Milk*** and ***Splash FM*****:** (Redesigned Copy)

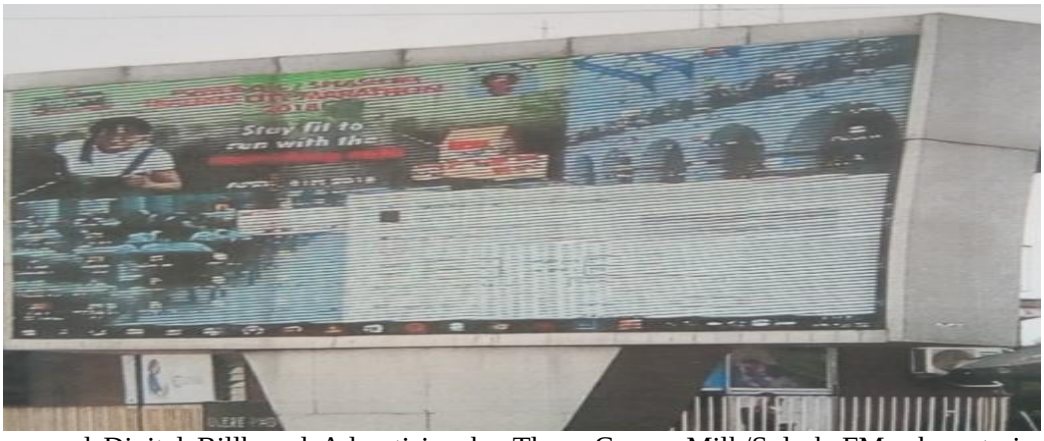


Figure 2: Sponsored Digital Billboard Advertising by Three Crown Milk/Splash FM: characterised by overloaded imageries and poor text messages. (Source: Elewure access road, Ibadan – 10th January, 2018)

Plate 2, *"Stay Fit with Three Crown Milk* and *Splash FM"* is an alternative design template from the original sampled test material in fig. 2. The copy (plate 2) is an improved graphic design factors with simple, bold, horizontally arranged written letter format (texts) with a classical "athlete imagery" positioned at the extreme left to suggest persuasive and consumption intent of the message of an advert. This was designed on highly contrasted colour background to break all

communication barriers for easy visual accessibility. Giving the reader (motorist) a taste of what the content is all about. The sponsors of the "*Stay Fit Race"* Three Crown Milk products are boldly positioned at the extreme down right of the copy while Splash FM (co-sponsor) forms part of the message delivery at the centre. The original copy that is hitherto characterised by riotous (interference background) with overloaded information (fig. 2) has been eliminated to communicate successfully across time and distance to be decoded by transit audiences (motorists) with ease.



Plate 3: Coca-Cola ad: **"*Taste the Feelings*"** - (A Redesigned Copy)



Figure 3: LED Electronic Billboard Advertising: Original *Coca-Cola* ad characterised by Overloaded imageries, poor text/poor colour background (Source: Iwo-Road/Highway, Ibadan - 28th January, 2018)

Plate 3, **"**Coca-Cola advert - *Taste the Feelings"* is a redesigned copy of *Coca-Cola* ad, from the original sampled test material fig. 3. The copy is an improved graphic design factors

with simplified dominant large single product imagery of Coca-Cola on a highly contrasted colour background; so positioned with a hand immerging from above to wrestle the Coke bottle from the smiling beholder. Large information reduces perception complexity into some recognisable pattern (Hardenbrook, 2013). The adopted imagery is to break all communication barriers for quick readability thereby giving the reader on motion (motorist) a taste of what the content is all about within the context of time and distance. The original copy (fig. 3) is characterised by overloaded symbolisms, poor legible texts and beige (poor) colour background. Black colour is introduced at the background to create sharp contrast to ease readability or avoid visual complexity and distraction. Single imagery and sharp contrast colours are a hallmark for effective message delivery on digital design process



Plate 4: AirTel Smart SPEEDO ad*:* **Dial *141# for FREE INTERNET** - Redesigned Copy



Figure 4: Digital Electronic Billboard Advertising- Airtel Original ad with similar colour values and beige (poor) colour background with poor legibility text (Source: Iwo-Road/Highway Ibadan - 28th January, 2018)

Plate 4 is a redesigned template of ***"****AirTel Communication"* ad for free internet services. The copy is an improved graphic design factors so illustrated to eliminate complexities or problems (colours with similar values and beige (poor) colour background and texts that are not legible that may cause visual complexity or distraction by any attempt to read;characterizing the original copy in fig. 4 to communicate successfully across time and distance. The graphic design factors were improved by bolding the texts, eliminating the beige (poor) background, reducing the number of the element to three, and also created sharp contrasted colour red background to ease readability and visual accessibility within the context of time and distance.



Plate 5: MTN ad.: ***Get Double Instagram Data now-now: Dial *131*3#*** - (Redesigned Copy)



Figure 5: Digital Billboard Advertising: Original (MTN) ad: characterised by overloaded and profusion background images (Source: Makola round-about access road Ibadan – 10th January, 2018

Plate 5 is a redesigned copy of MTN advert *on electronic billboard* "Get *Double Instagram Data now-now*" from the original sampled test material figure 5. The copy is an improved graphic design factors with simple, bold images and texts, eliminating background distraction (interference) to deliver brief and apt information (ad) for easy decoding while on motion; giving the reader (motorist) a taste of what the content is all about by getting rid of those flaws that characterised the original copy (fig. 5) – congested and interference (distraction) background information. Corporate colour of the service provider is adopted at the background to create sharp colour contrast for easy visual accessibility. Few images, bold and legible texts devoid of background distractions, with sharp contrast colours are hallmark for global best practices in digital design process for effective message delivery for swift glance/grasp on motion.

The efficacy of the redesigned templates could not be tested on the physical channel (LED billboard), since there is no such contemplation to do so. According to Denning (2005) a message requires a physical channel between addresser and addressee to enable both of them to enter and stay in communication. The only channel to illicit a feedback for these redesign (alternative graphic design contents) templates is through electronically manipulated device (LED advertising medium). Ejembi (1989) in Obisesan (2008) confirms the above when he theorised that, effective outdoor advertisement must illicit a feedback through a channel. McQuarie and Babara (2005) opine that, fundamental principle governing process of testing is derived from mathematical theory of information that established that, communication always take place between those units that transmit the information and those who receives it. Ironically, this "channel" is out of reach of the researcher because of financial constraints and time. However, the researcher is of the view that, the redesigned graphical contents of the LED advertisement will go a long way to communicate effectively to break every barrier of

communication for easy visual accessibility or readability when stakeholders in electronic billboard advertising business choose to adopt them. The view of the researcher represents expected feedback in respect of the created alternative graphic design contents for LED advertising billboards.

4.8. INTERVIEWS

4.8(a): Interview Responses from motorists on the use of Light-Emitting Diode (LED) adverts in the Night.

The complimentary collected data by interview from the motorists was to find out the usability of the light-emitting diode advertising even during the night. When motorists were asked if it will be appropriate to ban the use of LED advertising devices on the roadside because of the intensity of the light during the night, 6 respondents were interviewed, sixty-five (65%), as against 35% respondents noted that, the lighting-system serve as security for road users at night. They suggest that, the medium must be used more often in the night for security purposes. Thirty-five (35%) agree that, the intensity of the accompanying lighting system during the night time could lead to visual stress of the driver. Motorists were asked whether the use of LED advertisement on the roadside is not distraction. All the respondents agreed that the medium is distraction both day and night because of the illumination images. When they were asked how often are they tempted to look at the adverts in their collective performance on the road? Ninety percent (90%) respondents agree that they can hardly avoid the sight. To them it has become a regular sightseeing in their daily routine on the road. They are conscious of it on the road. They were asked whether they are able to read the messages at night with the intensity of the light. Some of the motorist responded sarcastically with nostalgia saying, one should not even attempt to read the information because you may not finished reading it when you loses control. This

observation tallies with Wallace (2008) description of electronic billboards advertising on our roads as genuine risk.

4.8(b): Interview Responses by FRSC on collaboration with lead agency in traffic management and administration of FRSC on placement and face value LED Advertisement

Four FRSC personnel's were asked to give their standing/view on the general placement of LED advert on our roads. The respondents agreed that display of some LED adverts devices obstruct perception of motorists. A respondent specifically proffered as a precautionary measure that, LED advertising should be raised or placed on very high pedestrian structure above direct eye-level of motorists to discourage them from reading the messages neither would it create obstruction. The respondents' suggestion justifies the lenient or stricter advertising control proffered by Signkick (2017) in a bid to conserve the visual amenity (sanity) of the environment. The assertion tallies with the basic assumption 3 (page 17) that, some physical structure and wrong placement of electronic billboards poses safety risk to road users. This assertion also tallies with the motorists stand that, drivers can hardly avoid the sight of LED advertising on their driving task. Opinion was sought from FRSC collaboration of lead agency in traffic management and administration of FRSC as regard lenient control of placement and face value of LED adverts within the city roads with other management agencies of billboards. The stand of the four (4, 100%) respondents revealed that, FRSC responsibilities as traffic/road management is outside the managerial and control of placement and face value of billboards. The respondents however strongly agree that, provided the collaboration of lenient control will ensure safety on the roads. This assertion tallies with the FRSC report of 2008, that road crashes in Nigeria emanate from action and reactions (human factor) often dictated among other things, by attempt to seek, look and react to environmental information. The South African Manual for Outdoor

advertising control and management (DEAT, 2008) refer to environmental factors as competitive variables.

Discussion of the Findings

The specific objectives are:

Objective 1: Analyze the graphic design factors of LED advertisement.

Analysis of LED ads indicates that, Light-Emitting Diodes (LED) advertising are characterised by graphic design problems based on the findings of the researcher. This implies that, motorists have been operating in an endangered visual environment. This is also to infer that, the illumination piloted graphical images have impact on motorists' driving tasks.

Objective 2: Investigate graphic design problems on LED advertisement on the perception of the motorists.

Findings indicate that, the two respondents (motorists and graphic designers') agree that, LED advertising devices on the roadside are characterised by graphic design problems. This is indicated in their responses to the statements. Findings from the motorists and the graphic designers collaborate with the findings of the researcher. This was translated when the value of Chi- square (x^2) was measured in terms of disposition discrepancies between Null hypotheses. One hundred and eighty point two-five (180.25) motorist's and ninety-nine point one-five (99.15) graphic designers agreed to the existence of graphic design problems on the sampled test materials.

Objective 3: Examine how the physical structure and placement of LED advertisement along the roads affect perception of motorists.

In examining the physical structure and placement of LED advertising along the roads and how it affect perception of motorists, respondents (FRSC) collectively agree that, structure

and wrong placement of LED ads within city roads or environment draws maximum attention onto itself. Chi- square (x^2) value 51.69 as against 36.42 accepts that, LED advertising devices distract and have the tendency to obstruct respectively. There is however a collective agreement that, effective management of LED advertising's face value, and placement will ensure safety on the road with collaboration of other agencies. Advertising Standards Panel (ASP) is conglomeration of agencies whose duty is to monitor and regulate billboards. Some of the FRSC personnel's however did not accept the notion that, brightness of design elements on LED advert is suitable for social interaction. This translates that, LED advertising have both negative and positive sides.

Objective 4: Evaluate the perception of motorists on commuter safety in the use of roadside LED advertisement.

In evaluating the perception of motorists on commuter safety in the use of roadside LED advertising, the respondents accept that, the use of LED advertisement poses safety risks on the road. This is indicated when all the motorist's respondents agree that, road user's safety seems to be at risk in the use of roadside LED adverts. Motorists accept that, not only does it takes more time in assessing the message deliveries, it increases visual stress thereby increasing chances of road mishap. Motorist stand buttresses the findings of Wallace (2008) that, LED advertising is a genuine risk to motorists as it draws maximum attention onto itself from the road. The two respondents that did not accept the questionnaire items are those that relate to the assumed vibration of LED advertisement to a moving car. This assertion was clearly clarified by few interviewee when seventy-five (75%) as against 25% percent noted that, the lighting-system serve as security for road users at night and that, they might suggest that the medium is used more often in the night.

Objective 5: Create alternative graphic design content of LED advertisement in which safety issues are considered.

Alternative graphic design content for the sampled LED advertisement was created in which safety issues were considered. The efficacy of the redesigned could not be tested, since there is no such contemplation to do so. However, the researcher is of the view that, the redesigned graphical contents of the LED advertisement will communicate effectively to break every communication barriers for easy visual accessibility or readability when adopted by the stakeholders on electronic billboard devices.

Redesigned of advertising materials were however based on the respondent's confirmation to the graphic design flaws. Creating a good alternative representation of communication on LED advertisement to be legible and read within a time frame and distance will engage motorists responsibly. This was achieved by eliminating design flaws to ensure safety on the road. The researcher used the criteria of graphic communication norms/rules in line with global practices in digital design process in encoding the adverts or the message deliveries.

The encoding of good, quality finished work calls for seasoned or professional graphic artists (encoders) to develop a communication program that eases visual stress of motorist to ensuring safety on the road. This entails on the part of graphic designer to understand principles and theories of graphic communication to be able to encode or create optically legible information readable within a time frame and distance. This is to opine that, graphic designers should be aware that, target audiences (motorists) on motion seem to be often at risk in the use of LED advertisement characterized by what Helm (2003) describes as "wacky combination of drawings or message deliveries". Atoki (1980) describes such message deliveries as "horrible".

In other words, understanding the vocabulary of communication in design process is a tool for effective communication in advertising. It is believed that, graphic encoder's knowledge, attitude and communication skills will play a decisive role in the development programmes for LED ads.

According to Lewin (2009), perception of electronic billboard advertising is liken to perceiving a movie playing model which are controlled by the mind that can hardly be ignored; a phenomenon created by transitional/motion pictures to be processed visually by human mind. Wallace (2003) was right when he described LED advertising on our roads as genuine risk of urban myth. Communication theorist Galante (2003) reminded that, communication theorist have been moving more towards audience model, built on conceptual notion of effectiveness; a synopsis of symbiotic relationship between how a message is received or perceived and the channel that delivers it. This buttresses Heller and Marshal (2000) position that, a good illustration of advertising copy are those that are legible and effectively interact which when perceived would be grasped swiftly without visual complexity with understanding.

Summary

Findings revealed that:

- A glare from illumination imagery LED advertisement is detrimental to safe driving. This assertion tallies with America Medical Association warning on illumination that motorists are at a risk in the use of LED advertising on the roadside.
- LED advertising on the roadside is characterized by graphic design problems. On graphical point of view however, graphic design flaws on LED advertisement devices can be redesigned to reduce visual stress.

- The LED advertising constitutes a risk capable of causing road accident. This justifies the adoption of single imagery, short text sharp contrasting colours to engage motorists responsibly.
- Motorists have been operating in a complex visual environment that poses safety risk to commuter safety as it is capable of creating optical or visual stress to motorists on motion to cause road mishap on the road.
- Display of Mega structures of LED advertising distract and in some cases obstruct motorists view as it draws maximum attention onto itself. This assertion justifies FRSC view of lenient control of visual value of LED advertising as an ideal suggestion. The lenient control would have been likened to what obtains in other countries of the world where lenient fine are placed on LED adverts or removed if the medium is found to have flouted the visual amenity (sanity) of the environment.

Based on the findings, the researcher is of the opinion that, the research would be a transforming auxiliary regarding message deliveries of the light-emitting adverts in Nigeria and Diasporas from which all categories in electronic billboard business will take cue from. It is believed that, the gesture of adopting survey and experimental research technique has gone a long way at easing optical complexity of road users by redesigning the sampled test materials; thereby reducing whatever risk that may arise in an attempt to want to read or access electronic billboard which Wallace (2008) term, “genuine risk of urban myth”.

CHAPTER FIVE

Summary, Conclusion and Recommendations

5.0 Introduction

This chapter discusses the summary of the study, conclusion and recommendations.

5.1 Summary of the Findings

The age group of most of the motorist's respondents has been established as the youthful age ranges from 25-30 while majority of the practicing graphic designers are between the ages of 30 and 40 years. Pertaining to the level of education of respondents', findings indicated that greater number of both motorists and graphic designers have formal education. Results also showed that, most of the graphic designers have been practicing for over a period of 15 years and above. All the FRSC respondents have formal education from tertiary institutions and with over ten years of working experience. All the FRSC personnel belong to the age group that could be described as agile.

Careful analysis of the data collected from the respondents about the perceived graphical problems on LED advertising, graphic design factors constitute the flaws capable of creating visual/optical complexity, visual puzzle and reading complexity to motorists in the context of time and distance during their driving task. The researcher discover that, from the analysis of the graphic design factors indicated that the transmitted graphic design messages on LED advertising were not in consonance with the global best practice of digital design practices. The cardinal philosophy of global best practices is simplicity based on conceptual notion of effective message delivery with bold and single images, at most three imageries, and legible texts imageries with sharp contrasted colours devoid of distraction at the background (Monroes, 2018 and Signklic, 2017).

Findings from motorists indicate that, they have been operating in a complex visual environment in the use of roadside LED adverts characterized by readability and legibility defects capable of creating chances for eventual road mishap, so were graphic designers. Motorists and graphic designers recommended alternative visual contents for the sampled LED advertising devices. Findings from these two respondents led to redesign of the alternative LED advertising templates.

5.2 **Conclusion**

The investigation concludes thus:

The creation of alternative graphic design content (templates) for LED advertisement will ensure commuter safety. A visual content of any LED advertising is said to be effective when the target audience are able to visually access the message delivery and read without any optical stress or complexity, taking exception to conformity of the global best practice in graphic design practices. The research will be a transforming auxiliary regarding advertisement in Nigeria from which stakeholders in electronic billboard advertising businesses will adopt.

Big idea, bold images, sharp contrasted colours and bold texts are powerful design principles for effective graphic design on LED advertisement. They create effective communication platform for easy reading and visual accessibility for motorists. It also creates a platform for effective understanding of the advertisement.

5.3 **Recommendations**

Based on the findings, the study recommends that:

1. LED advertisement devices should not be placed where there is concentration of human traffic or road bends. LED advertisingdevices should be placed on very high pedestrian

structure above direct eye-level of motorists as it has become unavoidable sight to road users to discourage them from reading the messages neither would it create obstruction.

2. Services of qualified registered graphic designers should be engaged by Stake holders in billboard advertising business to engage motorists responsibly. It implies that, adoption of simplicity of and conceptualized LED advertising display along Nigerian roads should not be trivialized or compromised for whatever reasons. This implies that, qualified graphic designers with training possibly from high institutions should be engaged for design exercises. This is to say that, knowledgeable of graphic artist must be rooted in principles, theories and philosophies of graphics and communication design. should be engaged in the illustration or design process. This is also to proffer that advertisers, agencies and all stake holders in billboard business should ensure that they employ only qualified and registered designers.
3. Since all advertisements are consumer targeted, advertisers should always endeavour to research more into product/service advertisement for effective message delivery. This will enable designers to produce effective advertisement for target audiences' visual accessibility, readability and comprehension.
4. Billboard management agencies of LEDs advertising devices should align or work hand-in-hand with Federal Road Safety Core (FRSC) agency to ensure safety on our roads.

5.4 **Contribution to Knowledge**

1. The study has established that, for optimal encoding and decoding of Light Emitting Diode (LEDs) advertising, design content must light background LED advertising billboard for day time and dark background for the night. This is to reduce illumination intensity of the medium in the night for the message deliveries to be glared (read) without visual stress.

2. The study has created awareness for stakeholders in LED advertising business of the necessity to have different background LED advertising billboard in view of commuter safety even night..

3. The study has created awareness on issues of poor quality message deliveries of LED advertising display on Nigerian roads.

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APPENDIX A

MOTORISTS QUESTIONNAIRE ITEMS

I am a graduate student of the Ahmadu Bello University, Zaria, specializing in Industrial design (Graphics) in the Department of Industrial Design. The questionnaire is in part, fulfilment of a research towards the award of a PhD degree. The instrument is designed to assess the perception of motorists on graphic design factors in the use of light-emitting diode advertising on commuter safety in Nigeria.

ANALYZE GRAPHIC DESIGN FACTORS OF LIGHT-EMITTING DIODE ADVERTISEMENT

Section A: PERSONAL DATA

1. Sex: Male…….Female……..

2. Age: Circle as appropriate within your age
   a. 20 ……..30
   b. 30 ……..40
   c. 40 ……..50
   d. 50 and above

3. Level of education
   a. Illiterate
   b. Primary
   c. Secondary
   d. Tertiary

4. Nature of Job (Profession): ……
   a. Professional
   b. None Profession

5. Address: ……..

SECTION B: GUIDE LINE

Please respond to every item on this question with utmost sincerity. Tick ☑ item which correspond with your view.

a. Strongly agree
b. Agree
c. Strongly disagree
d. Disagree
e. Uncertain

QUESTIONNAIRE ITEMS:
On Graphic Design Problems on LED advertising on our Roads

S/N	QUESTIONNAIRE ITEMS	A SA	B A	C SD	D D	E U
6.	Light - emitting diodes advertising along the roads are unavoidable sight.					
7.	Some graphic design factors on LED ad have design problems which makes reading and legibility difficult.					
8.	Problem of overloaded design elements portends reading complexity when viewed in motion.					
9	Problems of colours of similar value on light-emitting diode create visual complexity on motion.					
10	Poor colour application on LED advert have the tendency of emitting more light to \distract motorists in motion.					
11.	Poor legible texts on light-emitting diode create visual puzzle and reading complexity within the context of time and distance.					
12	Poor backgrounds of LED ads emit excessive intense light that impact negatively on the vision of motorists in motion.					
13.	Decoding problematic messages on LED advert while in transit constitute a risk.					
14.	A motorist who tries to read poor legible text and information of sufficient interest could distract and take time from their driving task.					

APPENDIX B

GRAPHIC DESIGNER'S QUESTIONNAIRE ITEMS

I am a graduate student of the Ahmadu Bello University, Zaria, specializing in Industrial design (Graphics) in the Department of Industrial Design. The questionnaire is in part, fulfillment of a research towards the award of a PhD degree. The instrument is designed to assessthe perception of motorists on graphic design factors in the use of light-emitting diode advertising on commuter safety in Nigeria.

INVESTIGATE GRAPHIC DESIGN PROBLEMS IN LIGHT-EMITTING DIODE ADVERTISEMENT ON PERCEPTION OF THE MOTORISTS

Section A: PERSONAL DATA

1. Sex: Male…….Female……..

2. Age: Circle as appropriate within your age
   e. 20 ……..30
   f. 30 ……..40
   g. 40 ……..50
   h. 50 and above
3. Level of education
   e. Illiterate
   f. Primary
   g. Secondary
   h. Tertiary
4. Job Description: ……
   c. Professional
   d. None Profession

5. Address: ……..

SECTION B: GUIDE LINE

Please respond to every item on this question with utmost sincerity. Tick ☑ item which correspond with your view.

a. Strongly agree
b. Agree

c. Strongly disagree
d. Disagree
e. Uncertain

QUESTIONNAIRE ITEMS:

Graphic Design Problems on LED advertising on our Roads.

S/N	QUESTIONNAIRE ITEMS	A SA	B A	C SD	D D	E U
6.	Graphic design factors of some LED adverts have design problems that could distract motorists while driving.					
7.	Overloading imageries on LED adverts constitute a design problem which may lead to various forms of behavioral and visual complexities.					
8.	Colour(s) of similar value with pale background on LED ad are design problems that create perception complexity to motorists.					
9.	Poor legible text messages on LED ads are design problems which can cause visual puzzle to motorists with time and distance.					
10	Design elements of equal colour weight on LED ads have the tendency to emit more light therefore distracting motorists.					
11.	Poor design background LED ads emits excessive intense light that impact negatively on the vision of the motorists.					
12.	Decoding problematic messages on LED advert while in transit constitute a risk.					

APPENDIX C

FRSC PERSONNEL'S QUESTIONNAIRE ITEMS

I am a graduate student of the Ahmadu Bello University, Zaria, specializing in Industrial design (Graphics) in the Department of Industrial Design. The questionnaire is in part, fulfilment of a research towards the award of a PhD degree. The instrument is designed to assess the perception of motorists on graphic design factors in the use of light-emitting diode advertising on commuter safety in Nigeria.

EXAMINE HOW THE PHYSICAL STRUCTURE AND PLACEMENT OF LED ADVERTISING ALONG THE ROADS AFFECT PERCEPTION OF MOTORISTS

SECTION A:

PERSONAL DATA

1. Sex: Male…….Female……..

2. Age: Circle as appropriate within your age
   a. 20 ……..30
   b. 30 ……..40
   c. 40 ……..50
   d. 50 and above
3. Level of education
   a. Secondary
   b. Polytechnic
   c. NCE
   d. University
4. Job Description: ……
   a. Professional
   b. None Profession

5. Address: ……..

SECTION B: GUIDE LINE

Please respond to every item on this question with utmost sincerity. Tick ☑ item which correspond with your view.

a. Strongly agree
b. Agree

c. Strongly disagree
d. Disagree
e. Uncertain

QUESTIONNAIRE ITEMS

On physical structure and placement of LED advertising along the road

S/N	QUESTIONNAIRE ITEMS	A SA	B A	C SD	D D	E U
6.	Wrong placement of LED advertising obstructs traffic and motorists' view in some cases.					
7.	Mega size (structure) LED advert placed within the city roads have a tendency to distract motorists on transit.					
8.	The characterised brightness of design elements on LED advert is not suitable for social interaction.					
9.	The placement of LED advert within an environment is a genuine risk to road users as a result of maximum attention it draws unto itself.					
10.	Regulating the face value and placement of LED ads within the city roads should be in collaboration with lead agency of FRSC in traffic management and administration.					
11.	In the absence of effective control/ management of LED ads, safety risk on the road will exist.					
12.	LED ads with effective graphic design factors that ensure safety should be placed on the road.					

APPENDIX D
MOTORISTS QUESTIONNAIRE ITEMS

I am a graduate student of the Ahmadu Bello University, Zaria, specializing in Industrial design (Graphics) in the Department of Industrial Design. The questionnaire is in part, fulfilment of a research towards the award of a PhD degree. The instrument is designed to assess the perception of motorists on graphic design factors in the use of light-emitting diodes advertising on commuter safety in Nigeria.

EVALUATE THE PERCEPTION OF MOTORISTS ON CMMUTER SAFETY IN THE USE OF ROADSIDE LED ADVERTISEMENT.

SECTION A: GUIDE LINE

PERSONAL DATA

1. Sex: Male…….Female……..

2. Age: Circle as appropriate within your age
   i. 20 ……..30
   j. 30 ……..40
   k. 40 ……..50
   l. 50 and above

3. Level of education
   i. Illiterate
   j. Primary
   k. Secondary
   l. Tertiary

4. Nature of Job (Profession): ……
   e. Professional
   f. None Profession

5. Address: ……..

SECTION B: GUIDE LINE

Please respond to every item on this question with utmost sincerity. Tick ☑ item which correspond with your view.

a. Strongly agree
b. Agree
c. Strongly disagree
d. Disagree
e. Uncertain

QUESTIONNAIRE ITEMS:

On perception in the use of roadside LED advertising in view of commuter safety

SN	QUESTIONNAIRE ITEMS A	A SA	B A	C SD	D D	E U
1.	The use of LED ads takes away motorists' view off the road, thus increasing chances of road crash.					
2.	The use of LED ad on the road draws more attention of everyone's view due to its accompanied lighting system, thus increasing the chances of road crash.					
3.	The use of LED ads compete for attention of the viewer creating bigger, higher and closer to displaying brighter colours than the existing ads and creates a snowball effect that may get out of hand.					
4.	The characteristic lighting system of LED ad on the road causes vibration to a moving car, thus increasing the chances of road crash.					
5.	The viewing of rapid transitional display of message deliveries of roadside LED ads creates a snowball effect that may get out of hand.					
6.	Motorists have been operating in an increasing complex visual environment as a result of the use of roadside LED adverts, thus creating chances for eventual consequences.					
7.	Motorist's safety seems to be endangered in the use of LED adverts as it takes more time in assessing the message deliveries.					
8.	The use of roadside LED adverts even during the night puts motorists at high risk as they perform their driving tasks.					

APPENDIX E

GRAPHIC DESIGNER'S QUESTIONNAIRE ITEMS

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CREATE ALTERNATIVE GRAPHIC DESIGN CONTENT OF LED ADVERTISEMENT IN WHICH SAFETY ISSUES ARE CONSIDERED

Section A: PERSONAL DATA

1. Sex: Male…….Female……..

2. Age: Circle as appropriate within your age

m. 20 ……..30
n. 30 ……..40
o. 40 ……..50
p. 50 and above

3. Level of education

m. Illiterate
n. Primary
o. Secondary
p. Tertiary

4. Job Description: ……

g. Professional
h. None Profession

5. Address: ……..

SECTION B: GUIDE LINE

Please respond to every item on this question with utmost sincerity. Tick ☑ item which correspond with your view.

a. Strongly agree

b. Agree
c. Strongly disagree
d. Disagree
e. Uncertain

SECTION B: GUIDE LINE

GRAPHIC DESIGNER'S QUESTIONNAIRE ITEMS:

Distribution of respondents (Designers) on developing of template LED advertisement in which safety issues are considered

No=72

S/N	QUESTIONNAIRE ITEMS	SA	A	SD	D	U	R_T	REMARK
1.	Good advert is a product of a seasoned graphic artist that project graphic elements that are readable and legible within a time frame and distance.	09	03	00	00	00	12	Accepted
2.	Developing a good prototype LED ads to engage motorists visually is for safety on the road.	10	02	00	00	00	12	Accepted
3.	Developing prototype LED ads to engage responsibly is for safety on the road.	10	02	00	00	00	12	Accepted
4.	Improving readability of LED ads is solving graphic design problems on LED's display.	04	08	00	00	00	12	Accepted
5.	Effective graphic design factors on LED ads ensure readability and legibility of the message deliveries.	10	02	00	00	00	12	Accepted
6.	Developing a prototype LED ads is eliminating design problems on LED ads.	12	00	00	00	00	12	Accepted
C_T		55	17	0	0	0	72	

APPENDIX F

INTERVIEW QUESTIONS FOR MOTORISTS

INTERVIEW QUESTIONS FOR MOTORISTS SEEKING THEIR VIEWS ON THE USE OF LIGHT-EMITTING DIODE ADVERTISEMENT IN THE NIGHT.

I am a graduate student of the Ahmadu Bello University, Zaria, specializing in Industrial design (Graphics) in the Department of Industrial Design. The questionnaire is in part, fulfilment of a research towards the award of a PhD degree. The instrument is designed to assess the perception of motorists on graphic design factors in the use of light-emitting diode advertising on commuter safety in Nigeria.

COMPLIMENTARY DATA COLLECTED BY INTERVIEW FROM THE MOTORISTS TO FIND OUT THEUSABILITY OF THE LIGHT-EMITTING DIODE ADVERTISEMENT DURING THE NIGHT

I will appreciate your cooperation in responding to the interview questions relating to the use of light-emitting diode advertising during the night.

1. Will it be appropriate to ban the use of light-emitting diode ads on the roadside during the night because of the accompanying lightening system?……

2. The use of LED ad was actually not distraction after all? ……..

3. How often are you tempted to look at the adverts in your collective performance on the road? …….

4. Are you able to read the messages at night with the intensity of the light while on motion? ……

5. Are the illumination imageries from the LED advertising devices detrimental to safe driving at night? …….

APPENDIX G
INTERVIEW QUESTIONS FOR FRSC

INTERVIEW QUESTIONS FOR FRSC ON BILLBORD MANAGEMENTS' COLLABORATION WITH FRSC IN BILLBOARD MANAGEMENT AND CONTROL

I am a graduate student of the Ahmadu Bello University, Zaria, specializing in Industrial design (Graphics) in the Department of Industrial Design. The questionnaire is in part, fulfilment of a research towards the award of a PhD degree. The instrument is designed to assess the perception of motorists on graphic design factors in the use of light-emitting diode advertising on commuter safety in Nigeria.

COMPLIMENTARY DATA COLLECTED FROM FRSC BY INTERVIEW ON THE BILLBORD MANAGEMENTS' COLLABORATION WITH FRSC ON PLACEMENT AND FACE VALUE OF LIGHT-EMITTING DIODE ADVERTISING MANAGEMENT AND CONTROL

1. Some LED adverts seem to obstruct perception of motorists: ……
2. As a precautionary measure, LED advertising billboards should be raised or placed on very high pedestrian structure above the direct eye-level of motorists to dissuade motorists from accessing the message deliveries.……
3. In a bid to conserve the visual amenity (sanity) of the environment, lenient or stricter advertising edict/law should be enacted to serve as deterrent to stake-holders in LED advertising business: ……
4. Some physical structure and wrong placement of electronic billboards poses safety risk to road user..:……
5. As a precautionary measure on billboard management, there should be a sort of collaboration between billboard management administrators and FRSC on management of the face value and placement of LED advertising on our roads. :……