EXAMINING THE NATURE OF GLOBAL POSITIONING SYSTEM (GPS) TECHNOLOGY AND ITS USAGE IN CRIMINAL INVESTIGATION AND LEGAL PROCEEDINGS*

Abstract
This paper examined the nature of GPS technology and its usage in criminal investigation and legal proceedings. In order to achieve the aim and objectives of this research, the meaning and types of GPS were briefly explained. The main aim of the research is to critically examine the nature of the GPS technology in order to appreciate its uses in criminal investigations and legal proceedings. The paper adopted a doctrinal method of research by conducting an in-depth analysis of primary and secondary sources of legal research. The paper revealed that the use of GPS technology is one of the effective means of criminal investigations which can be done through tracking a criminal suspect. The paper found that GPS can be used for navigation as well as for tracking purposes. The writer's major finding is that there is no a single provision permitting or directing the use of GPS technology in criminal investigation and legal proceedings in all our statutes in Nigeria. The paper recommended the use of GPS technology in Nigeria to enable our law enforcement agencies utilize it in their criminal investigations and to combat the waves of insecurity and insurgency bedeviling the nation.

Keywords: GPS Technology, Criminal Investigation, Tracking Device, Satellite, Legal proceedings, Warrant

1. Introduction

Global Positioning System (GPS) is a new advanced technology designed for a satellite navigation system used to multi-purposes in several fields of life.[1] At the beginning, it was utilized only for marital purposes in the United States and then later became available for civil use by States, companies and even individuals.[2] All the GPS enabled devices are available in global markets not only for the official use by States, companies and organizations, but, also for personal purposes.[3] GPS data takes the form of signals sent by satellites, such signals are basically radio waves.[4] The equation of accounting time by GPS is done through the comparison of the time of signals sent out by satellite and it's receiving by the device.[5] The GPS devices and unites are capable to calculate the user's coordinates and position or the route to some specific destinations, as well as they have a capacity for storage of information that may be retrieved later.[6]

As the technology continues to advance, its tools and aspects have many dimensions in today's life, where its use became more necessary not only in commerce and industry, but, also in criminal justice system.[7] The GPS technology witnessed a wide application over the world, not only on the individual sides, but, also on official and governmental levels.[8] The use of such technology may include information from the providers of internet and telecommunication service that permits a real-time tracking of the directions, speed and locations of monitored object.[9] GPS technology uses information and communication technology (ICT) gadgets for its functions, hence, it is considered as an aspect of ICT. Due to its many possibilities, ICT constitutes veritable tools for socio-economic development of countries and parastatals.[10]

In present, GPS-enabled devices and units are used hugely for several purposes in the civil field; they are used for management, navigation, detection of stolen property's items and tracking purposes.[11] Recently, GPS units became

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[1] Defense Science Board (DSB), Defense Science Board Task Force on the Future of the Global Positioning System, Office of the Secretary of Defense for Acquisition, October, 2005 25-26 at www.acq.osd.mil/dsb/reports/ADA443573.pdf (assessed on 18th May, 2022).

[2] Mary Bellis, 'History of the Global Positioning System-GPS', 2013 at http://inventors.about.com/od/gstartinventions/9/gps.htm (assessed on 24th May, 2022).

[3] Charles Assaf, 'The Development of a GPS Enabled Tracking System Implementation on a Web Services Architecture', Master Dissertation, Massachusetts Institute of Technology, June, 2003, 7.

[4] Raed S. A. Faqir, 'The Use of Technology of Global Positioning System (GPS) in Criminal Investigation and Right to Privacy under the Constitution and Criminal Legislations in Jordan: Legal Analysis Study'. Available at: https://www.caivainfo/revv-internationale-de-droid-penal-2013-3-page-433.htm accessed on 21st April, 2023, 2:40 p.m.

[5] Ibid.

[6] Guy Lecky Thompson, 'GPS Tracking and its Applications' An Article available at www.gmat.unsw.edu.au/snap/gps/pdf/gps-article3.pdf assessed 15 October, 2023.

[7] Raed S. A. Faqir, (n 4).

[8] Ibid.

[9] Ibid.

[10] A. S. Abubakar and T. O. Adebajo, 'Analysis of Electronic Transaction Bills in Nigeria: Issues and Prospects'; *Mediterranean Journal of Social Sciences*, (5), No. (2), (4). Available at http://www.sosodipo.com/seminars.2.htm. accessed 22nd May, 2023 at 3.30 p.m.

[11] Raed S. A. Faqir, (n 4) 440.

one of the most effective tools of criminal investigation,[12] they are used in criminal proceedings application, as part of crime control to help criminal investigators and public prosecutors track behaviorism models and by which judicial police can spoor suspect's movement.[13] In fact, in the last decade, the industry of Global Positioning Devices (GPS) occupied the attention of criminal justice system and law enforcement agencies as it became one of the effective means of criminal investigation.

The paper seeks to discuss the nature of Global Positioning System (GPS) Technology. In discussing this, the paper will briefly explain the meaning and types of Global Positioning System (GPS) technology. The paper will take a critical look at the use of Global Positioning System (GPS) Technology in criminal investigation and legal proceedings with a view to enhancing effective criminal justice system and combating the wave of insecurity in Nigeria. The paper concludes with suggestions and necessary recommendations.

2. Understanding the Meaning of GPS Technology

Various definitions of the GPS technology have been proffered by different authors and experts on the field. Some of these definitions are as follows: GPS is a system that uses signals from satellites to find out the position of an object.[14] It has also been defined as space-based radio-navigation system that broadcasts highly accurate navigation pulses to users on or near earth.[15] It is also a navigational system using satellite signals to fix the location of a radio receiver on or above the earth's surface.[16] According to Faqir, it is a satellite based technique that reveals the site of a given location.[17] The technology is used in cars and phone mobiles which help in determining directions and locations of an object.[18] Lauth described GPS technology as a device which receives signals from satellites orbiting the earth and provide precise positioning using the earth's longitude and latitude.[19] A working definition which shows that GPS technology can assist in tracking or determining the directions and locations of an offender with a view to apprehending and investigating him is the one given by Edmundson thus: It is a device that can determine the location of a person anywhere in the world instantly and precisely.[20] It is understood from various definitions above that GPS technology is a device which is primarily meant to discover and accurately identify the directions and locations of an object with certain degree of precision, through the use of satellites which orbit the earth.

3. Understanding the Nature of GPS Technology

Originally conceived for the military in 1970s, the GPS is now a ubiquitous technology that is used in a variety of customer applications such as car navigation systems, sport devices, freight tracking, child tracking and mobile map applications. The technology hinges on data transmitted from a number of satellites which, when combined, work together to pinpoint one's location on a device.[21] There is a total of 29 satellites that circle the earth twice a day, but a GPS only needs information from 3 to recognize one's location.[22] GPS can calculate the position, time and velocity of any GPS receiver. It does so use a process known as triangulation which works on the premise that one can find any position if the distance from three other location is also known.[23]

The Global Positioning System can best be described in three components: the space component, the receiver/user component, and the control component. The space component consists of a constellation of twenty-four satellites orbiting the earth,[24] each with its own atomic clock, broadcasting positioning signals over a broad area as it circles the earth.[25] The receiver segment consists of GPS receivers and antennas on ships, planes, or any other platform that receive signals from multiple GPS satellites and convert these signals into geographic positions. Although, the

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[12] Ibid.
[13] Ibid.
[14] Available at https://www.collinsdictionary.com accessed on 17th May, 2023.
[15] Available at https://www.britannica.com.GPS Accessed on 17th May, 2023.
[16] Available at https://www.meriam-webster.com
[17] Raed S. A. Faqir (n 4) 433.
[18] Ibid.
[19] T. Lauth, 'When is GPS a Legal Tool to Use in Private Investigations?' Available at https://www.suthinvestigations.and/2016/07/13gps-legal-tool. Accessed on 17th May, 2023 at 2.33 p.m.
[20] K. E. Edmunson, 'Global Positioning System Implants: Must Consumer Privacy be Lost in Order for People to be Found?' *Indiana Law Review*, vol. 38, No. 1, 2005, 207. Available at: https://www.mckinneylaw.in.edu/i/r/pdf/vol/138p.207. Accessed on 19th June, 2023, 12:50 p.m.
[21] Etratech, 'The Evolution of GPS' 3. Available at: https://www.etratech.com/theevolution-of-GPS-technology/. Accessed on 14th March, 2023.
[22] J. L. Akinode et al, 'Improving National Technology Security Using GPS Tracking System Technology' Proceedings of the 1st International Technology, Education and Environment Convenience (African Society for Scientific Research (ASSR), 637. Available at: www.hermers.com/admin/pics/269.pdf. Accessed on 22nd May, 2023, 2.20 p.m.
[23] Ibid.
[24] These satellite orbit at an altitude of approximately 11,000 miles and thus are not in geosynchronous orbit, as are many communication satellites.
[25] JOINT DoD/DoT REPORT, (n 38) at 2.

technical aspects of the system are difficult to understand, the basic theory is simple. The earth-based control segment consists of monitoring and satellite control facilities run by the DoD. This segment is crucial for monitoring the 'integrity' of the system, connecting the position of satellites, generating time signals and procuring and launching new satellites to replace older satellites.[26] There are several government tracking and uploading facilities distributed around the world. These facilities not only monitor the signal from the GPS satellite and update their navigation messages, but also track the satellite's health, their maneuvers, and even battery recharging.[27] Taken together, these facilities are known as the control segment.

Another segment of the GPS technology is the GPS user segment which includes military and GPS receivers. A receiver determines a user's position by calculating the distance from four or more satellites using the navigation message on the satellites to triangulate its location.[28] Military GPS receivers are designed to utilize the encrypted military GPS signals that are only available to authorized users, including military and allied forces commercial receivers use the civil GPS signal, which is publicly available worldwide.[29] The GPS receiver must know two things for it to do its job. It must know where the satellites are (location) and how far away they are (distance).[30] The GPS receiver picks up two to kinds of coded information from the satellites. One type of information, called 'almanac' data, contains the appropriate positions of the satellites. This data is continuously transmitted and stored in the memory of GPS receiver, so, it knows the orbits of satellites and where each satellite is supposed to be. The almanac data is periodically updated with new information as satellites move around.[31] Any satellite can travel slightly out of orbits, so, the ground monitor stations keep track of the satellite orbits, altitude, location and speed. The ground station sends the orbital data to master control station, which in turns sends the corrected data up to the satellites. The corrected and exact position data is called the 'ephemeris' data and is transmitted in the coded information to the GPS receiver.[32]

Another nature of GPS technology is that it can be utilized for tracking purposes. GPS tracking is basically a system of determining the exact location of something or someone. A GPS tracker can be placed on a loved one, a pet, a vehicle and even baggage to be able to trace where they are in case they get lost or are misplaced.[33] These devices also have their use in the commercial, industrial and military fields. Overall, GPS tracking is an efficient and versatile technology that can be used for different purposes.

4. GPS/Electronic Tracking Devices

Modern devices are inexpensive, as small as the palm of a hand, can be attached to a vehicle quickly, and have a long battery life.[34] An electronic tracking device (also called transponder) is a one-way radio communication device that emits a signal on a specific radio frequency. This signal can be received by special tracking equipment, and allows the user to track the geographical location of the transponder. Electronic tracking can be distinguished from electronic surveillance equipment in that the location of the subject is the primary goal of tracking. Surveillance involves actually seeing or hearing the subject. Prior to electronics, tracking meant following the trail of evidence left behind by the subject: his or her scent, fingerprints, footprints, etc.[35] The Active Tracking System, is also known as a Real-Time System. They are designed to collect data and information about the movements and locations of the suspect's automobiles, but, they differ from passive system as regard the transmission of information and data via phone mobiles or satellite networks to a computer for further evaluation.[36] In fact, active systems necessitate the human being to dress in a transmitter, habitually in the form of an ankle bangle, which incessantly produces a signal to a receiver unit linked to his or her wire telephone.[37] The passive tracking systems are technically designed to determine the movements, speed and location of the monitored vehicle, and it is capable to store also a 'trigger event,' such as the switch off or switch on situations. Passive tracking devices are always linked with a computer, by which all data and information collected will be stored and downloaded to it. Moreover, data and information collected through

[26] See JOINT DoD/DoT REPORT, (n 38) at 3. The control segment consists of a Master Control Station at Falcon Air Force Base in Colorado, five monitoring stations and three uplink antennas located around the globe.Id. at 2. The annual cost of maintaining the system is estimated at $400 million per year, with all but, approximately $30 million of that used for acquisition and launch of new satellites. Id.

[27] M. Praveena, Global Positioning System-Amin; Review, 2. Available at http://www.academic.edu/global-positioning-system-A-mini-review. Accessed on 20th May, 2023, 12:59 p.m.

[28] G A O, (n 53).

[29] Ibid.

[30] M. Praveena, (n 51).

[31] Ibid.

[32] Ibid.

[33] Trackimo, Everything You Need to know about GPS Trackers; Functions Features and Kinds, 3. Available at" https://trackimo.com/different.GPStrackers/. Accessed on 25th May, 2023, 2:55 p.m.

[34] Raed S. A. Faqir, (n 4).

[35] Ibid.

[36] Ibid.

[37] Ibid.

passive electronic tracking devices are transmitted and transferred to the computer via wireless download.[38] On this context, the aim of passive electronic tracking devices is to monitor suspect or offender's presence at a specific single place; such devices were normally able to check out the attendance of monitored persons at their residence.[39]

5. The Use of GPS Technology in the Legal Proceedings

The increasing integration of GPS into today's globally integrated atmosphere encourages an environment that is dependent on accurate information for guidance. Based on the impact of this information, it is hypothesized that the use of GPS evidence in court proceedings, has increased during the past two decades and has increasingly played a critical role in court rulings.[40] Technology has advanced considerably since the framers of U.S. Constitution established the constitutional parameters for searches and seizures in the fourth amendment.[41] As criminal enterprises harness new technologies to commit crime and evade police protection, the police seek to avail themselves of the same technologies in an effort to effectively investigate and prosecute criminal activities.[42] The GPS industry has occupied the attention of criminal justice system and law enforcement agencies, as it became one of the effective means of criminal investigation. This can be done through tracking a criminal suspect. Faqir also gave an insight to this thus:

> Recently, GPS units became one of the most effective tools of criminal investigation, they are used in criminal proceedings application, as part of crime control to help criminal investigators and public prosecutors track behaviorism models, and by which judicial police can spoor suspect's movement.[43]

An electronic tracking device, otherwise known as a transponder, is a one-way radio communication device that emits a signal on a specific radio frequency.[44] This signal can be received by special tracking equipment, and allows the user to track the geographical location of the transponder.[45] GPS serves as a tool of criminal investigation and evidence generated therefrom are admissible before the court of law against an accused person. The only grey is whether a warrant is required when using GPS technology as a means of criminal investigation. In some instances, tracking using GPS is considered as a search, hence requires a warrant before it can be conducted, and while in other instance, it is not regarded as a search within contemplation of fourth amendment, and no warrant is required before the investigation can be embarked upon.[46] There is a plethora of cases where GPS is used as a means of criminal investigation and evidence gathered from such investigation are used against an accused person before a court of law. In *People v Weaver,*[47] police in New York used evidence acquired from a GPS device that had been attached to a burglary suspect's car a year earlier. The device, which monitored the suspect's movement without interruption for more than two months, showed that the suspect had driven by a buglarised store. This evidence was used to corroborate a witness testimony that the suspect had been observing the store to determine of vulnerable points. It is submitted that this kind of evidence gathered or acquired from a GPS device will remain sacrosanct, pure, and believable as long as same has not been humanly, technically or mechanically interrupted or interfered with. Once the human or technical interruption, interference, or intervention has been successfully proved, such evidence has been corrupted and same will not be accepted to corroborate the testimony of the witness. In *United States v Garcia*,[48] Wisconsin Police, acting on a tip about a former methamphetamine manufacturer, attached a GPS device to the suspect's car without first obtaining a warrant. Information recorded as the device led them to a large tract of land visited by the suspect. With the consent of the land owner, they searched the property and found paraphernalia used to manufacture methamphetamines. The suspect was subsequently arrested and the evidence used against him in court. In *United States v Knotts,*[49] Minnesota law enforcement officers placed, with the seller's consent, a beeper in a chloroform container, believing that the defendant buyer was engaging in the production of illicit drugs. Officers subsequently followed the vehicle carrying the container, maintaining both a visual surveillance and monitor receiving the beeper signals. Based on the beeper signals, the officers tracked the container to the defendant's secluded

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[38] Ibid.
[39] Ibid.
[40] K. J. Berman, et al, 'Investigating the Impact of Global Positioning System Evidence' 1, Available at: http://arxiv.org/ftp/arxiv/papers/1503.00364.pdf. Accessed 22nd May, 2023, 2:39 p.m.
[41] Sanni Rabiu Bello, 'An Appraisal of the Nature of Global Positioning System (GPS) Technology and its Usage in Legal Proceedings: A Case for Nigeria' being the First Mphil/PhD Seminar Paper Presented at the Faculty of Law, Usman Danfodiyo University, Sokoto in December 2019, 16.
[42] R. M. Thompson, 'Governmental Tracking of Cell Phone and Vehicles: The Confluence of Privacy, Technology and Law', 2, Available at: https://fas.org/sgp/ers/intel/r42109.pdf. Accessed on 21st May, 2023, 1.30 p.m.
[43] Raed S. A. Faqir (n 4) 440.
[44] Ibid.
[45] Ibid.
[46] A. M. Smith, 'Law Enforcement Use of Global Positioning (GPS) Devices to Monitor Motor Vehicles: Four Amendment Considerations. Available at: https://fas.org/sgb/ers/misc/R41663.pdf. Accessed on 25th May, 2023, 2:49 p.m.
[47] 909 N. E. 2d 1195, 1195-96 (N.Y. 2009).
[48] 474F.3d 994, 995 (7th cir. 2007).
[49] 460 U.S. 276, 281 – 84 (1983).

cabin. After a three-day visual surveillance of the cabin, the officers obtained and executed a search warrant and found the container and a drug laboratory in the cabin. The defendant sought to have the evidence suppressed, arguing that the warrantless monitoring of the beeper violated the fourth amendment. The court disagreed and held that the officers' action did not constitute a search and seizure, as the defendant did not have a legitimate expectation of privacy, because the beeper signal was not used to monitor movement of the container within a private residence. Instead, it was used to monitor movement along public highways and other areas visible to the naked eye. In *United States v Pineda-Moreno,*[50] without a warrant, Drug Enforcement Administration (DEA) agents attached a GPS device to a jeep owned by a man suspected of drug activity. The device was attached on several occasions over a four-month period. Four times, agents attached the device while the jeep was parked on a public street; one time while it was parked at a public parking lot; and while two times while it was parked on his property. Eventually, the GPS device alerted agents that the suspect's vehicle was leaving suspected Marijuana grow site. The suspect was then arrested and officers found marijuana in the jeep. The court held that the DEA's actions did not constitute a search, because a person does not have reasonable expectation of privacy in a car's exterior, even when the car is parked on the person's driveway. The evidence was admitted against the suspect.

In *State v. Johnson,*[51] a Butler County Deputy Sheriff secretly attached a GPS-tracking device to Mr. Johnson's vehicle while it was parked on the street across from Johnson's home. The officer did not have a warrant or contact a judge to seek authorization. The Sheriff's department suspected Johnson of drug trafficking and decided to use GPS tracking device after concluding that round-the-clock visual surveillance was impractical. The officers tracked Johnson's van for six days as it traveled through at least three States. Their tracking comes to an end at a 'traffic stop'. No contraband was found in Johnson's vehicle, but contraband was found in his associate's vehicle, which has also been stopped. Johnson was arrested and charged. Prior to his trial, he filed a motion to suppress all evidence obtained or resulting from the warrantless GPS tracking. The trial court overruled the motion. He appealed his conviction, but the appeal court affirmed his conviction. He then appealed to Ohio Supreme Court. On November 13, 2014, the Supreme Court of Ohio handed down its decision. The court found out that, the officers who placed the GPS device on Johnson's car without a warrant acted reasonably and in good faith in believing their actions were lawful. Therefore, the court held that the evidence the officers obtained from GPS device was admissible. In *State v Jackson,*[52] in October 1999, William Jackson of Spokane County, Washington, claimed his daughter, Valiree, had been kidnapped on her way to school. Police found bloodstains on the missing child's bed and on her father, Jackson's shoes. Mr. Jackson was an immediate suspect in the police investigation. Police obtained warrant to search Jackson's vehicle and placed a hidden GPS device on the vehicle. Police then monitored Jackson for the next eighteen days. In November, when police went to the GPS coordinates that had tracked Jackson's every move, they discovered two grave sites. At one location, they found an empty gravesite approximately 10 miles from the family's residence. The second location, approximately 50 miles northwest of Spokane, they found a second gravesite containing Valiree's remains. By utilizing GPS surveillance, police were able to provide information to the prosecution indicating Jackson had murdered Valiree, buried her at one location, then exhumed her body and reburied her in a remote site further away. Police charged Jackson with first-degree murder of his daughter.

It is observed from the above decided cases that the police officers with or without obtaining warrant may attach or install GPS tracking devices to a suspect's automobiles or movable thing such as cars with a view to monitoring the suspect's movement or maintaining visual surveillance, or tracking vehicle's movement on a public street and obtaining information/ evidence to be used in court. It has also been observed from the above cases that some of the suspects during or prior the trial argued that the warrantless monitoring of the beeper violated the law, therefore, evidence resulting therefrom should be suppressed.

In fact, in *State v Johnson*[53] and *United States v Knotts*[54], the suspects argued that evidence obtained or resulting from the warrantless GPS tracking should be suppressed, but, the court rejected the argument and on appeal to the Supreme Court, the later found that those officers who placed GPS device on Johnson's car without warrant acted reasonably and in good faith, their action was lawful and the evidence obtained was admissible in law. However, this writer's humble view is that a warrant should be obtained prior to installation of any type of GPS devices into suspect's vehicle. It is also observed from the above decided cases that the court rejected all the suspects' arguments that their privacy has been breached/violated and held that the officers' actions did not constitute a search and seizure because a person does not have reasonable expectation of privacy in a car's exterior even when the car is parked in the person's driveway.[55]

[50] 591F. 3d 1212 (9th Cir. 2010).
[51] 591F. 3d 1212 (2014).
[52] No. 72799-b, -wash-2d-p.3d (Sept 11, 2003).
[53] (n 99).
[54] (n 96).
[55] See *United States v Pineda-Moreno*, 591F.3d1212 (9th civ. 2010). Also *United States v. Knotts,* 460 U.S. 276, 281-84 (1983).

Notwithstanding the above observations, the above considered cases have proved that GPS can be a very veritable tool at the hand of police as it effectively enhances them at tracking of crimes. It enables them to have information and gather evidences that are almost impossible to get without its usage.

6. GPS Technology and Criminal Investigation in Nigeria

Investigation of crime is no doubt very important and crucial to successful criminal prosecution and at large, to an effective criminal justice system.[56] This is because criminal prosecution is an offshoot of investigation of crime. The quantum or quality of evidence required by the prosecution to successfully prosecute and sustain charges preferred against persons accused of committing crime is usually the product of proper and thorough investigation.[57] Therefore, it is not exaggerated to assert that investigation of crime is the foundation of a successful criminal prosecution. The duty to carry out the proper investigation of a crime is however placed on the police. By virtue of the provision of section 4 of the Police Act, the police are *inter alia* charged with the duty of preventing and detecting crime. The section provides as follows:

> The police shall be employed for the prevention and detection of crime, the apprehension of offenders, the preservation of law and order; the protection of life and property and the due enforcement of all laws and regulations with which they are directly charged…[58]

Although, there is no specific mention of investigation as one of the duties imposed on the police in the above provision of law, the power and duty of the police to investigate crime is implicit in the power to detect crime. This is because the only major and constant means of detecting crime is investigation. This observation is in line with the reasoning of the Court of Appeal in *Fawehinmi v. IGP*.[59] In this case, Oguntade, J.C.A. (as he then was) confirmed this position thus: 'There is no doubt that under section 4 of the Police Act reproduced above, the Respondents have the duty to detect crime. Implicit in that duty is the duty to investigate complaints on the commission of crime'.[60] Aderemi J.C.A also espoused explicitly in the same case as follows:

> Under the provision of section 4 of the Police Act, the police have, *inter alia,* the duty to detect crime. In the performance of that all-important duty, the police are trying to discover whether or by whom an offence has been committed, he is entitled to question any person, whether suspected or not from whom, he thinks that useful information may be obtained. That very act of the police is called investigation.[61]

It is therefore clear from the above that notwithstanding the absence of specific mention of the word 'investigation' in section 4 of the Police Act, any police officer has the power and duty to prevent, detect and investigate any crime or allegation of crime.[62] It is observed that this power of the police to detect and investigate crime is unfettered and suffers no limitation. The police have to ensure that the investigation of a crime is not merely conducted but, conducted in a thorough, proper and conclusive manner.[63]

It has been observed that one of the major problems faced by investigating police officers in investigating crime today in Nigeria is the absence and neglect of scientific means of investigating crime, especially where there are no eye witnesses to pin down the actual culprits. At present, apart from the one at Alagbon Close, Ikoyi, Lagos, it seems there are no functional forensic laboratories in Nigeria.[64] This has culminated into the dearth of trained and competent experts in forensic criminal investigation. Crime scene investigation is now a strange phenomenon in police investigation in Nigeria because there is glaring lack of manpower for crime scene investigation.[65] Akin to the lack of functional forensic laboratories in Nigeria is the total absence of the use of GPS technology in criminal investigation in Nigeria. In spite of huge advantages of the use of GPS technology in the criminal investigation, no mention or recognition is given to its usage in any of our substantive and procedural laws in Nigeria. Combing through Nigerian Constitution, Administration of Criminal Justice Act, 2015, Criminal Procedure Act, Criminal Procedure Code, Police Act, National Drug Law Enforcement Agency Act, Economic and Financial Crime Commission Act and many other statutes, there is no a single provision permitting, authorizing, directing or suggesting the use of GPS tracking devices technology in criminal investigation in Nigeria.

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[56] A. O. Muheeb, *The Police in Criminal Justice Administration in Nigeria,* Rahmat Publishing Company, Lagos, 2014, 83.
[57] Ibid.
[58] Police Act, Cap p19, 2014.
[59] (2000) 7 NWLR (pt. 665) 481.
[60] See particularly page 519.
[61] A. O. Muheeb, (n 104) 84 – 85.
[62] At page 500. See also section 123 (1)(2) and (3) of Criminal Procedure Code.
[63] *Cosmos Ona v Desmond Okenwa & 2* Ors (2012) NWLR – CA/L 1646/06 and *Fajemirokun v CB(C.L.) Nigeria Ltd* (2002) 10 NWLR (Pt. 774) 95. See also sections 117, 118 (1) (b), 120, 121 of Criminal Procedure Code.
[64] A. O. Muheeb. (n 104). 89
[65] This assertion can be corroborated by the importation of experts in crime scene investigation from the London Metropolitan Police in 2006 to solve the riddles behind the brutal assassination of Engineer Funso Williams, Bola Ige and many other Nigerians by using the trace evidence.

Therefore, as far as Nigerian laws are concerned, the police have no authority to use and install GPS tracking devices into suspect's vehicle for monitoring his movement with a view to tracking him and obtaining information and evidence which will assist the police in their investigation. This procedure is alien to our criminal justice system. The use of GPS devices in criminal investigation will definitely assist the police to gather evidences that can be relied on by the competent court. Thus, it differs from other physical techniques used by the police officer for tracking defendants. The use of GPS device technology will assist the police to track down the movements, speed, location and directions of the suspect being monitored. There is no doubt, in order to improve the quality of investigation by the police and other law enforcement agencies in Nigeria, there is a great need to adopt and include in our laws the use of scientific means of investigating crimes which include the use of GPS technology. The adoption of scientific means of investigating crime and the use of GPS technology in investigating crime will assist this country to combat the waves of insecurity which bedeviled the nation. The use of GPS device technology will definitely assist the police, military, other security agencies and Nigeria government to track the movement, locations, speed, and directions of bandits, armed robbers, Boko Haram insurgents, kidnappers and other insurgents and bring them to justice.

7. Conclusion and Recommendations

The paper carefully examined the meaning of Global Positioning Systems. Various definitions have been proffered by different authors and experts on the field. It is a device which is primarily meant to discover and accurately identify directions and locations of an object with certain degree of precision, through the use of satellites which orbit the earth. The paper critically examined the nature of GPS technology. It was stated that the technology hinges on data transmitted from a number of satellites which, when combined, work together to pinpoint one's location on a device. GPS can calculate the position, time and velocity of any GPS receiver. It does so by using a process known as triangulation which works on the premise that one can find any position if the distance from three other locations is also known. It has been pointed out that another nature of GPS technology is that it can be utilized for tracking purposes. GPS tracking is basically a system of determining the exact location of an object or person. A GPS tracker can be placed on a vehicle, a pet and even baggage to be able to trace where they are in case they get lost or misplaced. It has also been pointed out that these devices can be used in the commercial, industrial and military fields.

The paper found that in line with U.S. Constitution, fourth amendment, GPS is used as a means of criminal investigation and evidence gathered from such investigation are used against an accused person before a court of law. It also found that the kind of evidence acquired/obtained from a GPS will remain sacrosanct and believable if no technical error or human intervention or interruption has tainted/dented it. Based on the U.S. Constitution, fourth amendment, the paper found that the police officer with or without obtaining warrant may attach or install GPS tracking devices to a suspect's automobiles or movable things such as vehicles with a view to monitoring the suspect's movement. The writer's major finding is that there is no a single provision permitting, authorizing, directing or suggesting the use of GPS technology in criminal investigation and legal proceedings in all our statutes in Nigeria.

On the strength of the foregoing, the paper recommended the use of GPS technology to Nigerian government to combat insecurity which bedeviled the nation. The primary reason for the introduction of GPS technology was to use it in precision weapon delivery. This can be utilized in targeting the hideout of the dreaded insurgents like Boko Haram terrorists and bandits in the country. The use of GPS technology in Nigeria can also help to avoid loss of civilian lives as the technology can give a precise location of the targeted enemy(ies). It can also assist Nigerian military in navigating different routes to the hideout of terrorists. Tracking is one of the functions of GPS technology. Nigerian government can utilize this function of GPS by tracking the movements, locations, hideouts and directions of suspected criminals or terrorists in the country. This will help it in being proactive in the fight against insurgency in Nigeria. It is further recommended that the Police Act, Administration of Criminal Justice Act, Criminal Procedure Act, Criminal Procedure Code, EFCC Act, NDLEA Act and other relevant laws be amended in a manner that they will incorporate and permit the use of GPS technology in their investigations of crimes with a view to tracking the movements, locations and directions of the suspects and the illegal objects/substances in their possession. No doubt, if these recommendations are utilized, it will go a long way to improve the quality of criminal investigation conducted by the police and other government agencies and will also rid our country of the insurgents and make Nigeria a peaceful and livable country, devoid of terrorists and insurgents.