International Journal of Geography and Regional Planning Research
Vol.7, No.2, pp.14-26, 2022
Print ISSN: 2059-2418 (Print),
Online ISSN: 2059-2426 (Online)

Challenges and Prospects Associated with Paradigm Shift in Land Administration and Surveying among Private Practitioners in Nigeria

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Citation: Adewale Akingbade (2022) Challenges and Prospects Associated with Paradigm Shift in Land Administration andSurveying among Private Practitioners in Nigeria, *International Journal of Geography and Regional Planning Research*, Vol.7, No.2, pp.14-26

ABSTRACT: *The quest for land administration that is efficient and fit-for-purpose has brought about the paradigm shift in land administration in Nigeria. This paradigm shift has led to the introduction of modern approaches of land administration that every land-related profession should key into. This paper thus assesses the challenges and prospects associated with paradigm shift in land administration and surveying among private practitioners in Nigeria. The qualitative method of analysis based on review of literature was applied in this paper. The findings reveal that Nigeria's Government has been taking steps towards a shift from sporadic method of land registration to systematic land titling and registration. This paper concludes that Nigeria as a nation is gradually moving towards the new trend in land surveying through initiation and piloting of Systematic Land Titling and Registration (SLTR) in some of the Nigeria's states. Any practicing surveyor that will be relevant in this growing present dispensation in land administration should reposition his/herself through improvement of knowledge in modern techniques of land administration with reference to land surveying. This paper thus recommends regular training and retraining on modern surveying methods for private surveyors; and organization of workshops on applicability of modern survey techniques for their members.*

KEYWORDS: Land Administration, SLTR, Private Surveyors, modern techniques, Nigeria

INTRODUCTION

In the last few decades, an efficient and fit-for-purpose land administration has been a persistent issue of concern in the world, as it has been enshrined in Sustainable Development Goals (SDGs). Land administration involves the 'how', the 'what', the 'who', the 'when' and the 'where' of land tenure, land use, land value, and land development. An estimated seventy percent of people in the world lack secure land and property rights (Enemark, 2006; AUC-ECA-AfDB, 2012; Akingbade, Ajala, Olabamiji & Adzande, 2021). One of the professions that has a significant role in solving insecurity in land and property right is surveying. Thus, surveying as a discipline that deals with determining the size, dimension, location of a parcel of land in relation to an adjacent land has an indispensable responsibility in ensuring an efficient and fit-for-purpose land administration in any part of the world. This shows how important private surveyors are in land administration of Nigeria.

The surveying as a profession in 21st century is a technologically based and driven by knowledge that every surveyor that want to be relevant in land administration should key into. Prior to this time, in many developing countries, especially Africa as a continent and Nigeria as a country, land administration is based on conventional method in which people access or occupy land through local systems of land tenure. In Africa, about 90% of people own land in an illegal way.Only 3% of total land area was registered in Nigeria through sporadic means (Byamugisha, 2016; Zakout, 2019; and Benjemin, 2020). Therefore, the questions about how land can be legally registered and secured become a subject of concerns to many countries of Africa, especially Nigeria (Akingbade, *et al.,* 2022). For instance, many African countries such as Rwanda, Ethiopia, Kenya, Mozambique, Ghana, and Uganda have revised their land administration in a way that enhance land titling or registration of rights of their citizens. These countries aimed to achieve contemporary land administration that ensures the security of land tenure (Benjamin, 2020; Thontteh & Omirin, 2015; Taingauan, Mao and Nut, 2016; Oluwadare & Kufoniyi, 2019; Kanji *et al.,* 2005; Akingbade, *et al*., 2021).

In response to this shift in land administration, Nigeria government initiated Systematic Land Titling and Registration (SLTR) pilot in 2009 with a focus of replacing the sporadic method of land titling and registration in Nigeria. This has led to paradigm shift in land titling and registration through the introduction and application of new techniques to land titling and registration in Nigeria, in which surveying plays a significant role. Though many surveyors are still practicing the old version of surveying in which the most of the activities were done sporadically and manually, this cannot deny the fact there are newly emerging modern techniques in which surveying is now going more digital through application of different geospatial information instruments and techniques, such as Total Station, Global Navigation Satellite System (GNSS), Drone, Computer Aided Design (CAD), Geographic Information System (GIS), Solution for Open Land Administration (SOLA), and Social Tenure Domain Model (STDM). The advancement in geospatial technological instrument couple with the needs for mass land registration, and a change from sporadic land registration to systematic land titling and registration has called for surveyors, especially private practitioners to reposition themselves and get set for the paradigm shift in land administration system, that is Systematic Land Titling and Registration in Nigeria. The concerned questions to private surveyors now should be: how adequate is their capacity in handling the new instrument and techniques? And how ready are they in term of their relevance in SLTR in Nigeria.

In providing solutions to these questions, this paper makes a recap of paradigm shift of land administration in Nigeria, and the new modern technology and approaches in land administration as pertaining to surveying, and how private surveyors can reposition themselves to paradigm shift in land administration in Nigeria.

Paradigm Shift in Land Administration in Nigeria

The land administration system in Nigeria could be traced as far back as pre-colonial era when land administration was majorly based on customary land tenure. The account of paradigm shift in land administration in Nigeria was summarized by Olabamiji and Ajala (2021) as:

"*Land administration in Nigeria has passed through different stages from the Pre-Colonial Era, through the Colonial to the Post-Colonial Era. Though the precise date to the end of the pre-colonial era in land administration is difficult to be ascertained; it could be traced to 1861 when traditional rulers signed the Treaty of Cession with the colonial masters by which the independent right of land administration was transferred to colonial authority. In 1900, colonial masters proclaimed the first ordinance called Land Proclamation. The colonial era in land administration then dominated till 1960 when Nigeria gained independence. No new law was enacted in the first year of independence until 1962 when Land Tenure Law in Northern Nigeria was enacted and later 1978 Land Use Decree Various laws were enacted during each era as the noticeable among them are shown in Figure 1".*

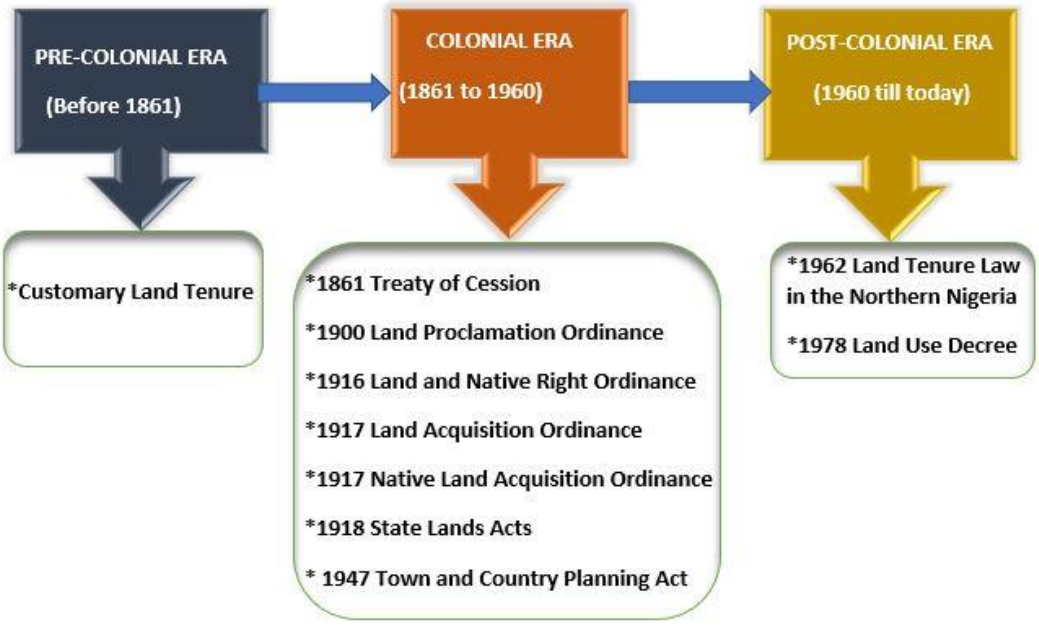

Figure 1: Eras of Land Administration and Laws in Nigeria (Source: Olabamiji & Ajala Concept, 2021)

Despite changes from one era to another, this has not brought a land administration system to the level of efficient and fit-for-purpose land administration system in Nigeria. In an attempt to improve the land administration, the Presidential Technical Committee on Land Reform (PTCLR) was inaugurated in April, 2009 under the administration of Late President Umaru Musa Yar'adua was later reconstituted with the same mandate in November, 2011 under the former President Goodluck Ebele Jonathan. In addressing its terms of reference, the Committee noted the following as some of the land governance situation in Nigeria:

" *(i) the lack of knowledge of who owns or has interests in property, what those interests are and where the property is located; (ii) the difficulty of registering property resulting in only 3% of land in Nigeria is registered and documented utilizing the current sporadic*

registration system; (iii) unavailability of authoritative information to support effective and efficient land administration; (iv) the difficulty to gain access to available land records; (v) the existence of inadequate data and information for effective and efficient land valuation in both urban and rural areas; and (vi) the lack of basic infrastructure such as geodetic stations, land use and township maps, land use plans etc., as well as lack of functional land registries", (PTCLR 2015; Nwadu & Nuru, 2018; Akingbade, *et al.*, 2021).

In the light of this, the PTLCR made the approval, design and pilot implementation of a Systemic Land Titling and Registration (SLTR) as its flagship programme in Kano State (Savannah area) and Ondo State (Forest area), (PTCLR, 2014; Oluwadare & Kufoniyi, 2019; Akingbade & Adzandeh, 2021). This is to plan for the future and full-scale implementation of SLTR in the whole country. Since nationwide SLTR is yet to be carried out in Nigeria, there is a need for private surveyors to prepare ahead in order to be relevantly positioned in Systematic Land Titling and Registration in Nigeria.

Challenges and Prospects Associated with Paradigm Shift in Land Administration and Surveying among Private Practitioners

The perceptions of practitioners in surveying are that survey works using traditional equipment like the theodolite and chains, under the hot weather is appealing to many practitioners in Africa. While technological advancements in land administration and allied professions like remote sensing, space technology, GIS among others have minimized the rigorous activities associated with conventional surveying, and has expanded the roles of surveyors in the 21st century, many in Africa still associate surveying and surveyors only with physically demanding land measurement tasks. The application of conventional surveying equipment connotes that private surveyor have to spend several hours or days in field carrying measurement and other data collection. This at time, ensued with cases of boundary/land disputes among surveyors of different land owners in the name of unimpressive renumeration package and attendant rigours cum risks (Balogun *et al.*, 2013).

Though many surveyors have already been aware of modern method in land administration and surveying; they presume that shifting from conventional method to modern method of land administration is associated with some challenges. These presumed challenges are more of technological and methodological issue that are associated with newly emerging system of land administration called Systematic Land Titling and Registration (Akingbade & Ajala, 2021). This was previous noticed by Adeoye (2007) that a new paradigm shift created by technology and legislation in land administration would put more pressure on surveying practice in Nigeria. Conventional system of surveying might become less relevant or obsolete due to the rapid technological advancement and changes in surveying practice. As a result, the traditional method of surveying is gradually giving more space for new technology such as (Geographical Information System, Computed Aided Design among others) in surveying practices. The surveying practices is now quite different from how it was some decades ago, and more changes are yet to manifest in this regard. This may challenge only to those surveyors who fail to prepare for this change, but a

blessing for surveyors who reposition themselves to fit into this paradigm shift in land administration, and surveying as a profession. Through application of satellite Imagery; Total Station; Global Navigation Satellite System; SOLA, STDM, CAD, and GIS, new surveying methods and approaches have solved problems (rigorous activities, long time involved, high cost, high number of field assistants among others) associated with conventional method of surveying.
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The advancement in technology has greatly contributed to land administration and practice of surveying in many ways. Digital models are now replacing conventional survey techniques and instruments; angular and linear surveys are now supported by electronic distance measurement, satellite positioning, and photogrammetry (Kufoniyi & Bouloucos, 2000). It is quite unfair that many surveyors including private practitioners in Nigeria is yet to fully take advantages offered by modern survey. This may be due to the facts that a large number of private surveyors were trained in the conventional methods of surveying with little or no knowledge of geospatial information activities. Some practitioners, also felt adoption of new technology and techniques is a threat to their means of livelihood which is tied to land surveying. But to the contrary, SLTR coupled with other geospatial applications would only expand the scope of activities of surveyors and all stakeholders in the built environment. Fajemirokun, Nwilo, and Badejo (2002) observed that most of the them (Surveyors) are well grounded in the traditional survey techniques (old survey techniques like theodolite survey), but need to be retrained in the newly emerging geoinformation techniques in surveying (modern survey techniques like GPS-survey).

The advent of modern techniques and equipment like GNSS survey system (GIS/ GPS receivers), satellite photogrammetry, remote sensing (especially drone), total station, Computer Aided Design Software (CAD) such as AutoCAD, and GIS software such as ArcGIS and QGIS among others have made surveying an indispensable profession, not only in Nigeria but all over the world. To be relevant, private surveyors have to be familiar and proficient in these tools. The application of these tools will reduce time spent and rigorous activities experience in the conventional field work, and make the whole process of survey easy and fast. For government to accord the surveyors the position they deserve, and priority of their indispensability of their services in sustainable land administration in Nigeria, private surveyors should align themselves with new techniques and approaches in land administration. Some of the modern instruments and approaches relevant to land administration as related to surveying are subsequently discussed.

Modern Instruments and Approaches to Land Surveying and Administration

There many modern instruments and approaches to land administration as related to surveying, but due to limited time and space, few among most relevant ones would be discussed for better understanding. These instruments and approaches are grouped into three. These are:

A. **Modern instruments for data collection such as**

1. Global Navigation Satellite System (GNSS)
2. Drone
3. Photogrammetry
4. Total station

B. Modern software for making survey plan and maps such as

5. Computer Aided Design (CAD) Software such as AutoCAD
6. Geographic Information System (GIS) software such as ArcGIS and QGIS

C. Contemporary land administration tools as related to land surveying, such as

7. Solution for Open Land Administration (SOLA)

Global Navigation Satellite Systems (GNSS)

The first kind of Global Navigation Satellite Systems (GNSS) in land surveying is referred to as Global Positioning Systems (GPS) produced by United States, which at the time was the first constellation in operation and available to surveyors (Figure 2). It was later that Russia made another GNSS called Global Navigation Satellite System (GLONASS). Both GPS and GLONASS are three-dimensional measurement systems which operate through the observations of signals emitted by satellites in their respective constellations. The signals are recorded and used to determine positions. Apart from these two types, other GNSS systems are in development around the world such as Galileo System by Europe and COMPASS system by China. In the world, the application of GNSS in surveying is not new as it has been utilized since 1980s essentially for geodetic control networks by surveyors. But GNSS is being used for many functions surveying and mapping tasks. According to Royal Institution of Chartered Surveyors (RICS, 2010):

> *GNSS survey techniques can be separated into the following three methods: static surveys, dynamic surveys and real-time dynamic surveys. In a static GNSS survey, the antennas and receivers remain fixed during the period of observation. Dynamic GNSS surveys provide the highest production rate for all the GNSS methods. Whilst rapidly generating co-ordinates, the precision obtained is not as high as by static techniques. This is because in dynamic techniques, most random measurement and GNSS system errors are absorbed in the co-ordinates. This can be contrasted with static methods, in which they are absorbed in the residuals after a network adjustment. Dynamic surveys can be post-processed or carried out in real time, with the addition of a suitable communications link. With the addition of a suitable communications link, all the dynamic survey types detailed above can be carried out in real time. The actual dynamic GNSS technique is the same, however, the processing software is loaded into the rover receiver and coordinates can be output in real time. It is critical, therefore, when using this technique, that the GNSS receivers have the correct firmware loaded for the chosen real-time method. The precision for a single baseline is the same as for post-processed survey, but higher precision adjusted co-ordinates for control surveys cannot be produced in real time using this technique.*

Figure 2: Example of Global Navigation Satellite System (GNSS)

Drone

Drone is an unmanned Aerial Vehicle (UVA) used for overhead survey of an area (Figure 3). Developing regions are often characterized by large areas that are poorly reachable or explored. The mapping of these regions and the census of roaming populations in these areas are often difficult and sporadic (Montanari, et al., 2018). Drones enables reaching remote and dangerous areas without any risk to people. Drone surveying is more immediate as operations can be started easily with limited restrictions and thus can be carried out more frequently. It often constitutes a cheaper solution compared to traditional methods, such as helicopters or ground-based surveys. Drones are simpler to operate than other vehicles (i.e., full size airplanes or helicopters), but they still require someone with enough knowledge to pilot them and to process the generated data (Montanari, et al., 2018).

Figure 3: Example of Drone

Photogrammetry

Photogrammetry can be defined as the science of making reliable measurements using photographs or digital photo imagery to locate features on or above the surface of the earth. The end result produces the coordinate (X, Y, and Z) position of a particular point, planimetric feature, or 3-D graphic representation of the terrain (Figure 4). Output of photogrammetry is typically a map, diagram measurement, or a 3D model of some real-world object or scene. Photogrammetric surveying or photogrammetry is the branch of surveying in which maps are prepared from photographs taken from ground or air stations. Photogrammetry has evolved into a reliable substitution of ground surveying activities when large area mapping is necessary. It can relieve

survey crews of the most tedious, time-consuming tasks required to produce topographic maps and Digital Terrain Models (DTMs).

Figure 4: Products of Photogrammetry

Total Station

A Total Station is a modern surveying instrument that incorporates an electronic theodolite with an electronic distance meter. Total Stations utilize electronic transit theodolites in conjunction with a distance meter to read any slope distance from the instrument to any particular spot. The instrument can be used to measure horizontal and vertical angles as well as sloping distance of object to the instrument. Electronic distance measuring (EDM) instrument is a key part of total station. Its range varies from 2.8 km to 4.2 km. The accuracy of measurement varies from 5 mm to 10 mm per km measurement. The accuracy of angle measurement varies from 2 to 6 seconds. The total station instrument is mounted on a tripod and is levelled by operating levelling screws. The data stored a total station can be downloaded to computers. The point data downloaded to the computer can be used for further processing.

Figure 5: Example of Total Station

Computer Aided Design (CAD) Software such as AutoCAD

Computer-Aided Design (CAD) is the use of an application to create or enhance a design. CAD software permits surveyors to create precision drawings or technical illustrations in 2D or 3D. This category of software can augment productivity, improve quality, and maximize surveying as a profession by creating a database of a particular area. CAD software has a host of applications, including the design, electronic circuit boards, prototypes for 3D printers, and buildings. Normally, this software exploits either vector-based graphics or raster graphics which reveal how finished work will be. A common example of CAD is AutoCAD for plotting survey plan (Figure 6).

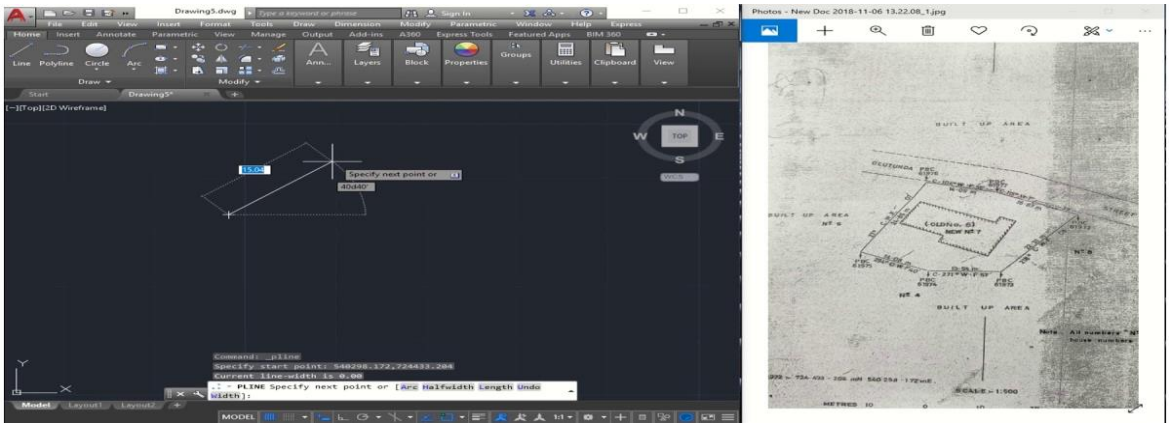

Figure 6: An Interface of AutoCAD for Plotting Survey Plan

Geographic Information System Software

According to Environmental Systems Research Institute (ESRI), "*A geographic information system (GIS) is a system that creates, manages, analyzes, and maps all types of data. GIS connects data to a map, integrating location data (where things are) with all types of descriptive information (what things are like there). This provides a foundation for mapping and analysis that is used in science and almost every industry. GIS helps users understand patterns, relationships, and geographic context. The benefits include improved communication and efficiency as well as better management and decision making*". The features are typically classified as points, lines, or areas. Geographic Information Systems store information using spatial indices that make it possible to identify the features located in any region of a map. For example, a GIS can quickly identify and map all the locations within a specified radius of a point, or all of the streets that run through a territory. It has many facilities and functions such as geoprocessing, mapping, modelling among others. Common software of GIS such as ArcGIS and QGIS are of relevance to surveying.

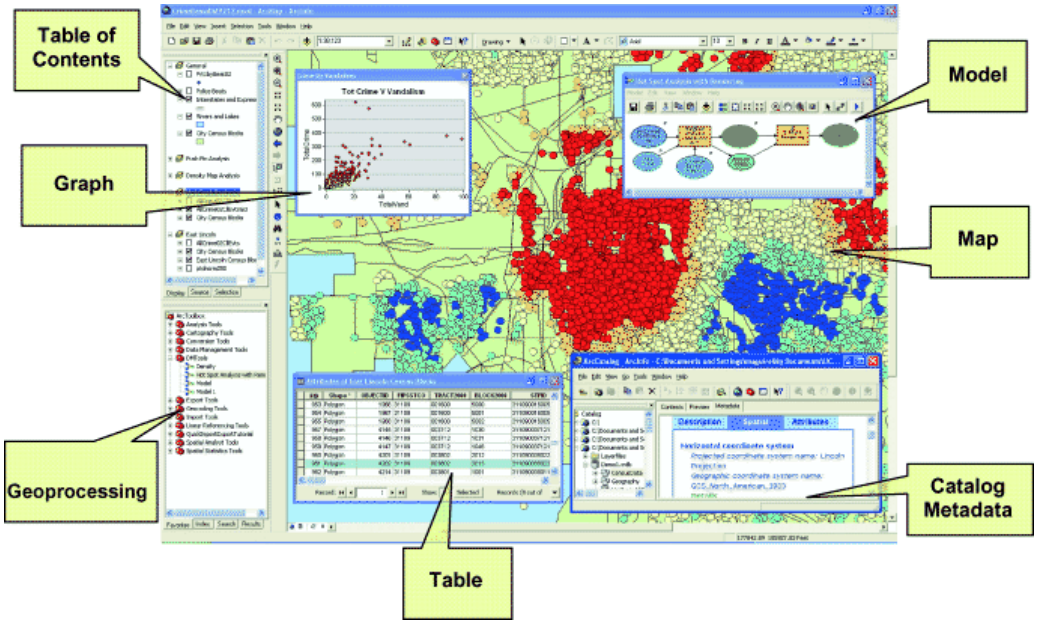

Figure 7: Interface of ArcGIS

Solution for Open Land Administration (SOLA)

The SOLA software architecture can be categorized into three different layers- presentation layer, web service layer and data layer. The presentation layer of the SOLA software consists of two Java swing desktop applications (SOLA Desktop and SOLA Admin). The SOLA Desktop assists in front and back-office tasks that are usually connected with cadastre and registration processes. SOLA was designed in a manner that could be customized to accommodate the differences in laws and practices that govern the land administration in different countries. SOLA has been applied in different pilot project in Africa such as in Ghana, Nepal, Lesotho, and Nigeria (Pullar *et al.*, 2013; Ajala and Akingbade, 2021). During the pilot project of the Systematic Land Titling and Registration (SLTR) in Nigeria, SOLA was applied in the digitization of property records to streamline land registration processes (Adeniyi, Akingbade and Akande, 2015). Example of a part of survey plan generated for Akure South LGA, Ondo State during the SLTR Pilot project in the state is shown in Figure 8.

Figure 8: AKURE SOUTH LGA: Each parcel has a unique alpha-numeric identification – State|LGA|Ward|Numeric number

CONCLUSION

The practicing surveyors cannot deny the fact that there is a paradigm shift in land administration especially as related to land surveying, which it is as result of emergence of new techniques and advancement in technology. This depicts that the whole world has shifted from conventional method of land surveying to digital method. The demand for geospatial data for planning and policy decision making is on the increase, this provides an ample opportunity for surveyors in Africa and particularly in Nigeria as there is a high demand to develop geospatial database which is anchored on surveying for effective land administration. Nigeria as a nation is gradually moving towards the new trend in land surveying through initiation and piloting of Systematic Land Titling and Registration (SLTR) in some of the Nigeria's states such as Ondo, Kano, Jigawa, Yobe, among others. Any practicing surveyors that will be relevant in this growing present dispensation in land administration should reposition his/herself through improvement of knowledge in modern techniques of land administration with reference to land surveying. In other words, Private surveyors need to acquaint themselves with knowledge of modern survey method for their appropriate positioning in the modern land administration system. This can be achieved through the regular training and retraining on modern surveying method for your members; and organization of workshop on applicability of modern survey techniques for their members.

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