ASSESSING THE USE OF SMART PHONES-BASED APPS, SOFTWARE AND GEOGRAPHIC INFORMATION SYSTEM (GIS) IN REAL ESTATE PRACTICE

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ABSTRACT: *The covid-19 pandemic ushered the world into what is seen or described as new normal. In addition, it aided what could be seen as increased or rapid adoption of the use of modern and improved technologies in real estate practice. The technologies even though many of them have been in existence, the increased patronage was made possible through the coming of the pandemic. This study however identified or studied the Estate Surveyors and Valuers (ESVs) response in the use of phones-based apps, software, smartphones, and GIS in real estate practice. The identified apps and software used by the practitioners include; Google Earth, QGIS, ArcGIS, MapIt, SW Maps, Map with Us, MapPt, Locus GIS, GCP/GPS among others. The findings indicated that practitioners are familiar with a good number of them adding that the majority has been using them at their own pace i.e., depending on the individual level of knowledge of same. There was also noticeably increased patronage of use of same since the coming covid-19 pandemic. It is expected that practitioners who are yet to key in should as a matter of necessity try to or adopt the same as the practice is going digitized and enhanced technologically.*

KEYWORDS: Apps, estate surveyor, GIS, real estate and smartphone

INTRODUCTION

The coming of pandemic created obvious and attendance challenges that followed whereby movement were limited through lockdown, these has obvious implications on real estate practice. The pandemic though came as some huge problems to real estate practice it however supports the need for a shift in the way real estate practice are done especially in the days of increase in sophistication of technologies and as well increasing sophistication in terms of knowledge and technological knowhow of the clients.

The health emergency caused by the COVID-19 pandemic has affected the entire world since the beginning of 2020, changing living and working conditions adding that the pandemic has generated a crisis that is having and will continue to have consequences on all sectors of the economy, including the real estate market, De Toro, Nocca, and Buglione (2021). According

to Oyedeji (2020), the global lockdown of all economic activities due to the COVID-19 pandemic have a consequential impact on all aspects of the economy including real estate.

Ankeli, etal (2021) noted that the coronavirus pandemic's consequential impact on the global economy is a bitter peal for many to swallow as it led to the lockdown of economic activities and every other aspect of human activities. They added that the worst-hit sector in Nigeria is the real estate/construction sector and has tremendously affected transactions in the property market. Ankeli etal (2021), further stated that the effect of the Covid-19 pandemic has been described in the literature as brutal. The study recommended the need for more investment in information and communication technology (ICT) development.

According to Karine and Gennady (2020) the economic situation associated with the spread of the COVID-19 virus has had a significant impact on all aspects of activities both in Russia and around the world, including the real estate market. According to them the study was specifically on consequences that the coronavirus pandemic has had on the real estate market and to find out new technologies used by market participants especially during the pandemic. The result of the study shows the real estate market has undergone major changes especially in the use of technologies. It further indicated that Virtual tours of objects and similar technologies will form the new digital infrastructure of the real estate market.

From the foregoing, it is imperative to state that real estate practice needs to be enhanced via the adoption of the right technology hence practitioners need to fully adapt to the technological improvement witnessed at this point or used during the pandemic and as well opportunities offered by the application geographic information system (GIS), phone-based apps, smart phones and related software in practice hence, there has been increasing awareness to adopt same. There is little doubt that growing awareness on GIS, increasing integration of GPS to smartphones, and the reducing cost of computer systems are important factors contributing to the growing use of geospatial technologies in real estate decision, Afolabi (2017).

With pandemic and as well the increased quest for application of technology in real estate practice, it becomes necessary to probe the response of the practitioners especially now there is dire need for paradigm shift from manual based practice to deployment of technology. This has been collaborated by the regulatory body, ESVARBON. According to Afolabi (2017), the Estate Surveyors and Valuers Registration Board of Nigeria (ESVARBON), in 2015 noted that, the national professional regulatory body for Estate Surveyors, stated in their Valuation Reporting Template document underlined the importance of geospatial which reads "Site description in a real estate appraisal document must show GPS coordinate, property size dimension, neighbourhood utility networks, aerial photographs, maps etc."

It against this backdrop that this research considered the assessment of the use of smart phones-based apps, software and Geographic Information System (GIS) by Estate Surveyors in for real estate practice within the study area with a view to finding out their level of compliant in the application (use) of the technologies available in practice.

REVIEW OF LITERATURE

In trying to define Smartphone, Litchfield (2010) examined the top five most accepted definitions of smart phone, and concluded that there was no single, accepted definition. He opined that due to the constantly evolving nature of mobile phone technology, the line between

"smart" and "dumb" phones are unclear. He argued that even "dumb" phones can have some "smart" phones' features, such as a touch screen and a proper operating system. He concluded that smart phones are phones that runs an open operating system and is permanently connected to the Internet. Litchfield noted that it is important to know the "smart features" on smart phone nowadays adding that today's smart phones, just like PCs, also incorporate operating systems which allow the add-on applications (or software) to run on top. Summarily smartphones are mobile phone that performs many of variety of functions of an operating system which is capable of running downloaded apps.

Apps also known as a mobile application and also commonly referred to as an app is a type of application software designed to run on a mobile device, such as a smartphone or tablet computer. They can be mobile and are seen as software applications that are developed for use on small, wireless computing devices which includes; smartphones and tablets other than personal computers – (Desktops, laptops and palmtops). Mobile applications provide users with similar services to those accessed on PCs. Also seen as an app, web app, online app, iPhone app or smartphone app, mobile apps can be categorized into web-based apps or native apps as well as hybrid apps which combines element of both native and Web apps.

Geographic Information System (GIS) according to USGS has been described as a computer system that analyzes and displays geographically referenced information uses data that is attached to a unique location. It is a computer system for capturing, storing, checking, and displaying data related to positions on Earth's surface which can show many different kinds of data on one map, such as streets, buildings, and vegetation, (National Geographic Society). GIS is helping everyone in every field with real estate inclusive and there are many more industries which are using GIS on a regular basis. Karine and Gennady (2020), noted that the real estate market has undergone major changes, both in the technologies used by market participants and from a legal point of view.

The positive result from the application of improved technologies such as the use of smart phone apps, GIS and as well related software has continued to attract commendations hence, approval by the professionals who attests to it accuracy. The regulatory body (ESVARBON) is aware of the need to enhance real estate reporting frameworks with locational intelligence which can only be facilitated by geospatial technologies and has fully incorporated same accordingly, there is little doubt that growing awareness on GIS, increasing integration of GPS to smartphones, and the reducing cost of computer systems are important factors contributing to the growing use of geospatial technologies in real estate decision making in developing countries such as Nigeria, Afolabi (2017).

Studies has shown that the use of these phone-based app which are GIS complaint is the way to go. Afolabi (2017), highlighted the impact of GIS or connection to real estate to include; GIS has a powerful ability to display land-based features in relation to subject properties, to assign data values to features on the map and to produce hard-copy property maps that can be embedded in valuation reports, brochures, and investment analysis reports.

GIS technology can be deployed as a mapping and organising tools to make real estate developments comparable with one another. It can also help to effectively reorganize property data into different spatial units, categorise them and colour according to preferences and criteria; in order to keep a record of how spatial data might affect property values such as

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topographical nature of land areas and to keep track of economic activities in a nearby neighbourhood or proximity to a commercial highway. This capability is useful in comparing real estate information across various locations.

The real estate sector no doubt is witnessing a great transformation in terms of the application of GIS technology of spatial analysis of real estate market drivers hence; a real estate market analyst can use GIS technology to measure the distance between one existing or proposed development in relation to another. It has been useful in identifying the property values patterns and how they can be influenced by nearby economic forces such shopping centres or offices etc. Since locational intelligence is very vital in real estate decision making, the application of GIS technologies in the real estate industry is indispensable. According to Afolabi (2017), Countries such as Nigeria are beginning to embrace the potential of geospatial technology and information in order to develop their economies. This according to him is particularly so in fields such as land administration and real estate development where relevant stakeholders are taking advantage of increasingly affordable software and ever-growing volumes of crowdsources and open data.

With the coming of the pandemic, there was increased quest to use GIS based technologies and apps in real estate practice hence, Real estate professionals in Nigeria were said to be adopting GIS based/geospatial technologies in their day-to-day decision-making operations and this includes identifying property location on Google maps, using GPS receivers in picking the coordinate of lands and buildings, and preparing property maps on GIS software, Afolabi (2017). According to Thontteh and Olanrele (2020) in the article, COVID-19 and the 'New Normal': implications for the Nigerian real estate sector, they opined that the coronavirus lockdown has created an intense need of ICT applications in real estate transactions in Nigeria. According to them the 'new normal' created by the lockdown has resulted in a shift whereby things which ordinarily require people coming together in a building space (property) have been shifted to virtual spaces using ICT. The application of ICT tools has supported the 'new normal' which has made possible virtual meetings of different shades – business, learning, religious, research etc. Ogunnowo, Oloke and Iroham (2021), identified remote sensing and GIS, property management software, facilities management information System, property marketing platforms amongst other, for remote real estate practice.

GIS, smart phones-based apps and ICT has been helpful in real estate practice and there has been calls to embrace same. Oyedeji (2020) recommended that Realtors should embrace usage of technology in conducting property inspection and marketing of real estate. Igwe, Emengini and Agbogu (2017) in the study; the role of Geographic Information Science in property rating administration in Nigeria opined that an important step government should adopt in raising revenue base is to make use of Geographic Information System (GIS) which can utilize spatial features of properties to produce digital maps and attribute data as tool for preparatory work and for or the property rate assessment. Olaniyi, Udoh and Oyedare (2006) in their study stated that queries are useful tools for the management of the Estate by the Local Government authority towards effective tax collection and provision of basic amenities. Otegbulu, Ukpong, and Umeh, (2015) carried out a study which aimed at investigating and implementing aspects of opportunities that exist for utilizing Geographic Information System (GIS) techniques in the real estate industry with emphasis in the retail submarket using geospatial data used geographic information system (G.I.S). This they dis by making use of the street map of the study area and

digitalized administrative boundary of local government areas of Lagos State. They linked same with the GPS (Global Positioning System) locations of some points of interest like hotels, schools and educational institutions. The Findings indicated the best route that has the lowest impendence that can aid the real estate analyst as to the most appropriate locations where retail outlets could be located for easy accessibility of prospective customers.

So, GIS has many related, functional apps and software which has helped and is still helping in real estate practice. A good number of these phone-based apps, software etc. has also been helping practitioners carry out their respective task with ease and they include; google earth, QGIS, ArcGIS, MapIt, SW Maps, Map-With-Us, MapPt, Locus GIS, GCP/GPS

MapIt – GIS mobile application

MapIt is a GIS application for android users. It is widely used and one of the popular mobile applications which are used for several purpose-like environmental surveys, woodland surveys, road constructions, land surveying, tree surveys, site surveys and soil samples gathering. It can be used for performing following functions: Direct export to Dropbox or FTP location, has possibility to record multiple points, lines and polygons on one layer, Import/export attributes from file and much more to discover, address and location search, create new polygon or line features measurement details like area or length are also available, possibility to group data into several layers, it also allows user to local export or remote export. MapIt has Clusters for point map markers, efficient way of having large number of points on the map without performance issues, support for WMS and ArcGIS. It has possibility to create and maintain sets of attributes and it provides base Map: Google Map, Bing Maps, Open street Maps, Mapbox.

SW Maps – GIS Mobile application

SW Maps is a free GIS application which helps users in collecting, sharing and representing Geographic information. This does not matter whether users are conducting full scale GNSS survey with high precision instruments, need to collect large amount of location-based data using phone, or just to view a few shapefiles with labels over a background map on the go. SW Maps is one of the useful GIS application have following features: conduct high accuracy GPS surveys using external RTK capable receivers over blue tooth, draw features on the map by adding markers and measure distance and area, online base maps are also available: Google Maps or open street view, support for mbtiles and KML over lays, it provides shape files layers, with categorized styling, it also allows users to connect with external GPS, draw point, line and polygons, label features based on attribute values, share and export the data in KMZ files.

Map with Us – GIS Mobile application

Map With us is one of the GIS applications which is freely available on the google play store. It provides following benefits to user; Geolocate and upload photos, videos and audio, collect and edit the data in the field using custom data collection templates, useful for business professionals, export the collected data to KML files or shape files and import your KML or shape files to MapWithUs system.

MapPt – GIS Mobile application

MapPt is one of the useful applications which is available in 130 countries and in industries spanning from education and agriculture. The app is widely used by the people from the following sectors: field mapping, land surveying, vegetation management, forestry planning, environmental management, incident reporting, farm mapping, mine management and government planning. The functions that they can perform with it are; it allows one to create, edit, store and share all types of geospatial information, geotagged photos and gridding, create points, polygons and polylines, import and export popular GIS formats such as shapefiles, JP2, and kml/kmz, drop down forms for faster data collection, Geofencing capabilities make sure you never breach a boundary and share the data between popular cloud storage like Google drive.

Locus GIS – Mobile Application

Locus GIS is built app for the GIS professionals and enthusiasts. It is one of the GIS applications for android and IOS users. This GIS application performs the following functions: create projects, export the collected data to SHP file is fully compatible with ArcGIS Software, select premium online and offline maps, provides advanced map tools like – map overlays, offsets, WMS sources support and forecast the worldwide weather 24*7.

GCP/GPS

Ground Control Points (GCPs) are defined as points on the surface of the earth of known location used to geo-reference Landsat Level-1 imagery. The Landsat Ground Control Point Search allows users to extract ground control point binary files over your area of interest. (U.S. Department of Interiors – USGS). One of the factors that can significantly improve the quality of the data products is the use of accurate and well-distributed Ground Control Points (GCPs) to tie down the model properly to the ground values, Villanueva and Blanco (2018). Ground Control Point (GCP), information about a property/real estate can be made known such as; building name, owner's name, date of construction, roof type, ward number, drawing number, contractor name, building type – residential, commercial, industrial etc.

Global Positioning System

GPS stands for Global Positioning System. It is a radio navigation system used in land, sea, and air to determine the exact location, time and velocity irrespective of weather conditions. GPS is a positioning system based on a network of satellites that continuously transmit coded information. USDA, Maryland NRCS (2007). The information transmitted from the satellites can be interpreted by receivers to precisely identify locations on earth by measuring distances from the satellites. GPS is funded by and controlled by the U.S. Department of Defense (DOD). The system is called NAVSTAR - Navigational satellite timing and ranging.

GPS is a system and it is made up of three parts: *satellites, ground stations,* and *receivers*.

Following are the functionalities of each of these parts:

Satellites act like the stars in constellations, and it's known that where they are, because they invariably send out signals.

The *ground stations* make use of the radar to make sure the satellites are actually where we think they are.

A *receiver* is a device that users might find in their phone or in one man's car and it constantly seeks for the signals from the satellites. The receiver figures out how far away they are from some of them. Once the receiver calculates its distance from four or more satellites, it knows exactly where you are.

Google earth

Google Earth is a geobrowser that accesses satellite and aerial imagery, topography, ocean bathymetry, and other geographic data over the internet to represent the Earth as a three-dimensional globe. Google Earth for Web is a browser-based version and Google Earth on (smart phone) mobile is an app; both are also free of charge, starting point, (2021). Information collection from Google earth is very crucial in real estate practice; this not only helps enhance the practice but it will earn practitioners' confidence in the same, Ifediora and Efobi (2022). They added that it has been helpful to users and it is still being helpful to users. With this application, Clients will be settled and assured of best global practice and service delivery. This is particularly true as information derived is authentic and pleasing. Practitioners who are into land deals can easily get longitude and latitude information of properties/real estate or land they wish to dispose of. Google earth can be used to get the exact location pictures for clients. To measure distances of certain geographical areas is also possible in Google earth even without visiting the place.

According to starting point, (2021), versions of Google Earth include;

Google Earth Pro - This current desktop version, free to us. It has many features, including displaying satellite and aerial imagery, a growing set of layers of mappable data, the ability to display third party data, tools for creating new data, and the ability to import GPS data. Additional capabilities include movie making, as well as importing ESRI shapefiles and MapInfo tab files, measuring areas of circles and polygons, and can print and save high-resolution images.

Google Earth for web - This is available for Chrome, Firefox, Edge, and Opera. It is an easy to use, browser-based version that provides ease of accessibility but is limited in terms of functionality. This version can load kml or kmz files, can be used to search for places, and has a Voyager option that, based on a user-selected subject such as **Travel** or **Nature**, can be used to follow a story from a collection contributed from various individuals and institutions.

Google Earth for mobile - This is an app with similar viewing capabilities as the Google Earth for Web, but one cannot build projects.

Earth Engine - Combines satellite imagery and geospatial data with many analysis tools including the ability of the user to add their own algorithms for real world applications.

Enterprise - This product makes imagery and other geospatial data available to employees within organizations such as corporations.

Each of these versions of Google Earth can be used to read and create data in KML (Keyhole Markup Language) format, which enables educators, students, and other users to share data.

RESEARCH METHODOLOGY

The method adopted for this research is more of review of related literatures as well descriptive statistics. Relevant literatures were sourced and obtained specifically via online search. The approach of the research features survey and its specifically where firsthand information was obtained via the use of online designed questionnaire. The primary data sources were obtained from the surveys which involved administration of questionnaire via the aid of social media platforms such Whatsapp (whatsapp groups) and Facebook inbox messaging as well as email invite. Google form was used to design questionnaires which were sent to respondent Questionnaire were sent to respondents. A total of 59 respondents drawn from Estate Surveyors and Valuers practicing or resident in Oyo State.

DATA PRESENTATION AND DISCUSSION

This part discusses the data from online survey using google form, a total of 59 respondents who are Estate Surveyors and graduates of Estate Management were involved. These respondents were members of the Oyo State chapter of the Nigerian Institution of Estate Surveyors and Valuers (NIESV).

Data presentation on Demographics of respondents
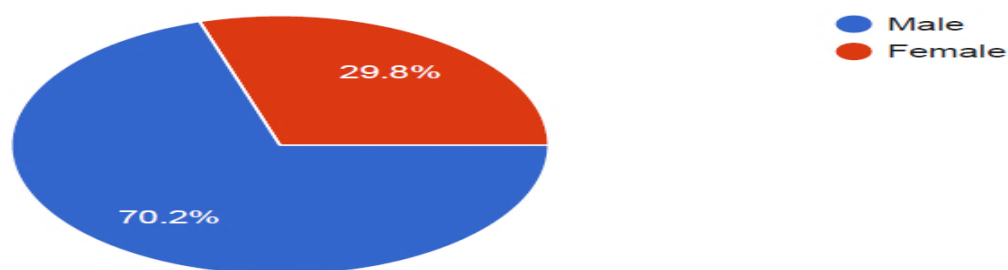
Figure 1: Data presentation on gender of respondents

From the figure 1 above it will be observed that out of the 59 respondents, 70.2% are male while 29.8% are female.
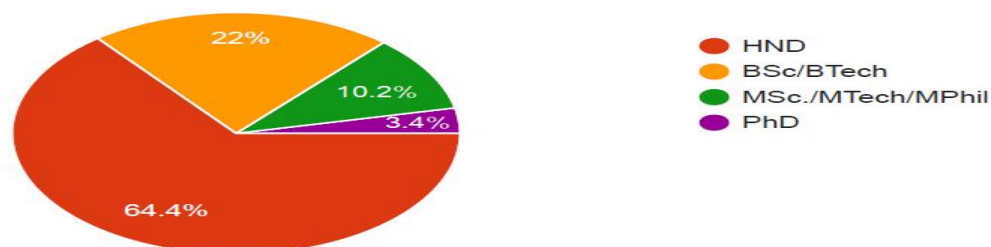

Figure 2: Data presentation on highest educational qualification of respondents

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From the figure 2 above it will be observed that out of the 59 respondents, 64.4% are HND holders, 22 % are BSc/BTech holders, 10.2% are MSc/MTech/MPhil holders while 3.4% PhD holders.
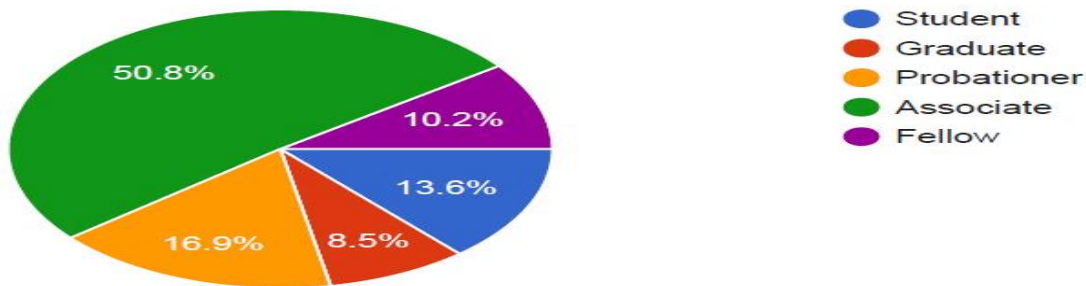

Figure 3: Data presentation on professional membership cadre of respondents

From the figure 3 above it will be observed that out of the 59 respondents, 10.2% are fellows of the Institution, 50.8% of the respondents were Associate members of the Institution, 16.9% were probationers, 8.5% were Graduate members while 13.6% were student members.

Data presentation on information about GIS, Smart phone-based apps and Software.
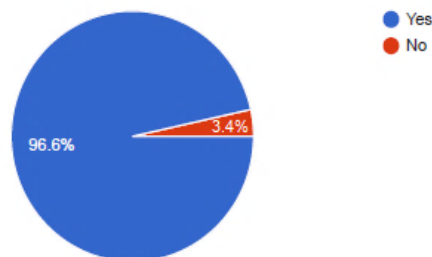
Figure 4: Data presentation on awareness on existence of GIS application for/on real estate practice

The figure 4 above explains the awareness on the existence of GIS, the options were simply Yes or No. It could be observed that 96.6% of the respondents went for Yes, hence they are aware of the existence of GIS and even its application on real estate whereas only 3.4% of the respondent's denied knowledge of the existence of GIS. The implication of this is that greater percentage if not almost all are aware of the existence of GIS.
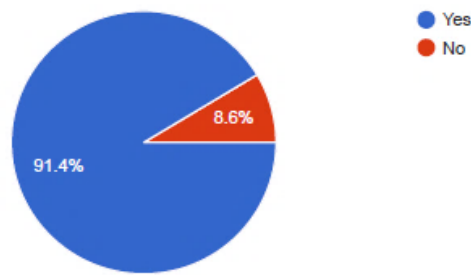
Figure 5: Data presentation on awareness that there are GIS based app which can be installed in smart phones

The figure 5 above shows how respondents are aware of the existence of GIS based apps which can be installed in smart for real estate practices. The respondents were required to vote only Yes or No to show their knowledge of the existence of the same. It was observed that greater percentage of the respondents went for Yes hence the 91.4% thus implying that greater number of the respondents are aware.
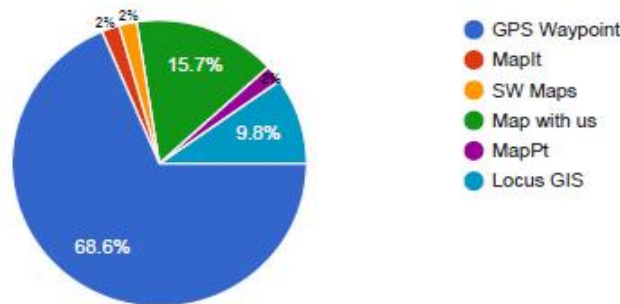

Figure 6: Data presentation on the type of GIS app respondents are familiar with

The figure 6 above shows information on the type of GIS based app respondents are familiar with. It could be observed that out of the five (5) listed apps. Majority of the respondents affirmed that they are familiar with GPS Waypoint hence the 68.6% shown in the figure. This is followed by Map With us accounting for 15.7%, Locus GIS is the next with 9.8% of the respondents whereas MapIt, SW Maps and MapPt has2% of the respondents each.
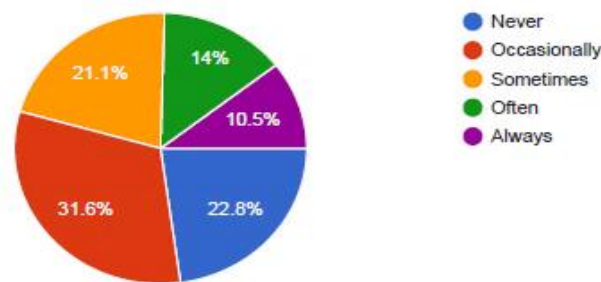
Figure 7: Data presentation on frequency of use of apps GIS by the respondents in practice

The figure 7 above shows the frequency of the use of the apps by the respondents. From the available options, one could observe that 22.8% said they never used the apps, 31.6% said they use them occasionally, 21.1% said they use the apps sometimes, 14% said they use the app often whereas 10.5% said they use the apps always in practice. The implication of the findings is that practitioners/respondents make use of these identified GIS apps in practice.
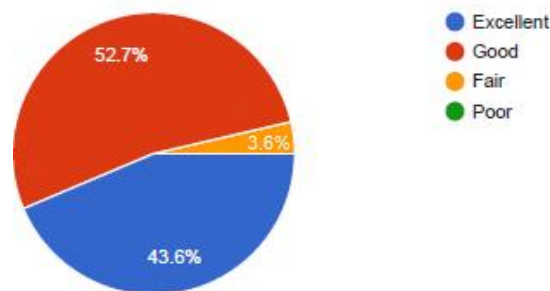
Figure 8: Data presentation on how effective the apps are in real estate practice in terms of location information and measurement between two points.

The figure 8 above shows the rating by the respondents on effectiveness of the apps in real estate practices. It could be seen that 43.6% were of the opinion that they offer excellent service delivery or can be rated excellent in terms of their effectiveness, 52.7% rated the app as good and 3.6% rated the app fair however none of the respondents rated the app as poor.
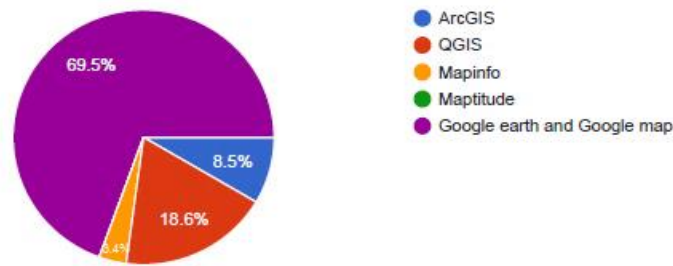
Figure 9: Data presentation on awareness of existing software and familiarity with available software.

The figure 9 above shows the percentage of the familiarity of respondents with the various software used for GIS related works. It could be observed that majority of the respondents are familiar/aware of the existence/use of the Google earth and Google maps hence it accounted for 69.6% of the total respondents, this is followed by QGIS with 18.6%, ArcGIS with 8.5%, MapInfo with 3.4% and none for maptitude.
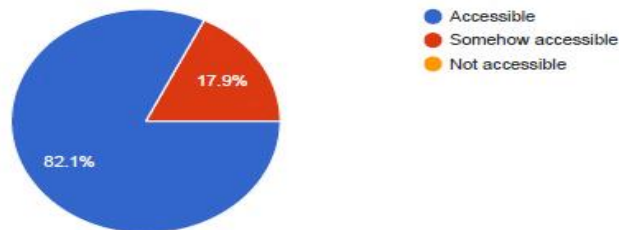

Figure 10: Data presentation on accessibility of the software or whether its free access.

The figure 10 above shows accessibility rating of the available software, out of the options greater percentage of the respondents representing 82.1% rated the software they are familiar as accessible, 17.9% rated same ad somehow accessible while none went for not accessible. The implication of the this is that the software available to the respondents are accessible.
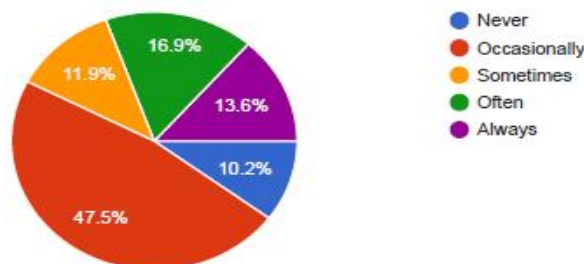

Figure 11: Data presentation frequency of use of the software

The figure 11 above shows the frequency of use of the available software by the respondents. It could be observed that 47.5% of the respondents says they occasionally uses the software they are familiar with, 16.9% says they use it often, 13.6% says they use it always, 11.9% says they use it sometimes whereas 10.2% says they never use any software. The implication of the result here is that respondents use the available software at one point or another.
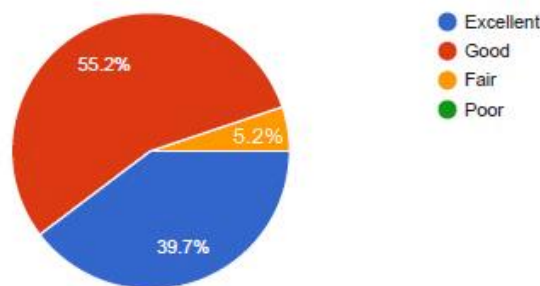

Figure 12: Data presentation the effectiveness or accuracy of the software in terms its application or enhancement of real estate practice.

Figure 12 above shows the rating on effectiveness or accuracy of the software used by respondents. The result shows that 39.7% rated the software they are familiar with as excellent, 55.2% rated the software as good, 5.2% rated the software as fair whereas none rated the software as poor. This implies that the software they use or familiar with are actually effectively in their application to real estate practice.
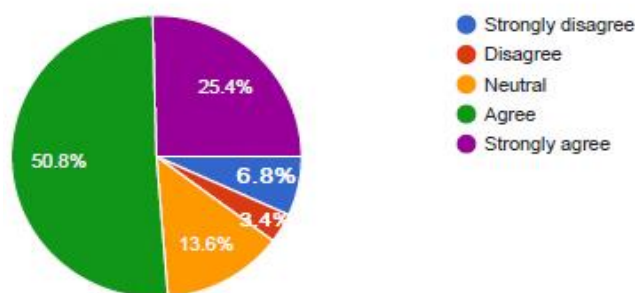

Figure 13: Data presentation the whether the smart phones apps and software has enhanced real estate practice

The figure 13 above shows respondents affirmation on the effectiveness/efficiency of smart phone GIS based apps and software has enhanced the real estate practice. It could be observed that 50.8% and 25.4% of the respondents went for agreed and strongly agree hence affirming that same has enhanced real estate practice hence their response was in affirmation. 13.6%,

3.4% and 6.8% neutral, disagreed and strongly disagreed respectively that same has enhanced real estate practice.

FINDINGS AND CONCLUSION

The Covid-19 pandemic has no doubt contributed to the new what may be seen as new normal, it has further confirmed the need to embrace the use of smart phones GIS based apps as well as other similar technologies. This study has no doubt made effort aimed at identifying the practitioners' level of compliance or adaptability of the new normal and has been able to find out their level of usage of the smart phone GIS based apps in enhancing real estate practice, hence this study has been able to find out the following;

1. That practitioners in the real estate sector which comprises of Estate Surveyors and Valuers are aware of existence of GIS technology and enabling apps that enhances real estate practice.
2. The apps and software identified which practitioners are familiar with includes; google earth, QGIS, ArcGIS, MapIt, SW Maps, Map With Us, MapPt, Locus GIS, GCP/GPS.
3. The result indicated that the rating on frequency of usage of the identified app and software was in affirmative hence, practitioners has been using those apps and software at their pace.
4. On rating on how effective the GIS apps and related software, it was discovered also that the response was affirmative hence it has actually enhanced their real estate practice.
5. The result also shows that users of the GIS related app and software strongly affirmed that smart phone-based apps, software and GIS in real estate practice has enhanced their real estate practice.

The above findings may be seen to be in line with that by Karine and Gennady (2020) which was among other things to find out new technologies used by market participants especially during the pandemic, this study however was also how the practitioners has improved their practices since the coming of pandemic especially as it relates to use of smart phone-based apps, software and GIS which are new technologies in real estate practice. The findings may not have confirmed or validated the findings of Karine and Gennady but still share similar thought on application of technology in improving real estate practice.

With the affirmation of these smart phone-based apps, software and GIS as critical and as well relevant/necessary in real estate practice it is expected that practitioners who are yet to key in are expected to key into these technologies in order to enhance their practice.

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