# Designing a Prototype of Geoinformatics Documentation System using Microsoft Access

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## ABSTRACT

*The purpose of this study is to design geoinformatics documentation system using Microsoft Access. It also identifies useful knowledge management tools and processes associated with geoinformatics documentation system. Geoinformatics documentation seeks to support high quality information management that is in compliance with survey rules and regulations. It ensures that all the geoinformatics/surveying processes are transparent, captured, reproduced and that the survey results are presented in an objective and accurate manner. A prototype content management system is being designed using Microsoft Access database tool to provide a systematic and comprehensive approach to documentation which offers an optimal and efficient approach. The efficiency of this system seeks to minimize costs, lost of information associated with storage, eliminate redundant information and maximize benefits of documentation in terms of quick and efficient storage, accessibility, editing, management, analyses and retrieval.*

***Keywords:*** *Geoinformatics Documentation, Survey Document, Surveying Processes, Microsoft Access, Database (dbase)*

## INTRODUCTION*

Geoinformatics is the science and technology dealing with the structure and character of spatial information, its capture, classification and qualification, storage, processing, portrayal and dissemination, including the infrastructure necessary to secure optimal use of this information (Wikipedia, 2015). It encompasses a collection of special techniques, technologies, and tools for the acquisition, processing, management, analysis and presentation of geospatial data. Geoinformatics is based on a range of synergetic activities including geospatial – modeling, analyses, databases, technologies, information systems, systems design, spatial cognition, human-computer interaction, mobile computing, etc. Today, numerous applications benefiting from geoinformatics techniques, include urban planning and land use management, in-car navigation systems, public health, local and national gazetteer management, environmental modeling and analysis, military, transport network planning and management, agriculture, meteorology and climate change, oceanography, telecommunications, criminology and crime simulation, aviation and maritime

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transport, etc. Geoinformatics has at its core, the technologies supporting the processes of acquiring, analyzing and visualizing spatial data. Both geomatics and geoinformatics include and rely heavily upon the theory and practical implications of surveying. Geoinformatics combines geospatial analysis and modeling, development of geospatial databases, information systems design, human-computer interaction, etc (Wikipedia, 2015). Some of the branches of geoinformatics include: Cartography, Geodesy, Geographic Information Systems (GIS), Global Navigation Satellite Systems, Photogrammetry, Remote Sensing, and Web Mapping. The above listed branches are equally some of the offshoots of the surveying. Similarly, surveying is the science of determining the position, in three dimensions, of natural and man-made features on or beneath the surface of the Earth. These features may be represented in analogue and digital form as a contoured map, plan or chart, or as digital ground model (DGM) or digital terrain model (DTM). This means that, surveying which is characterized as the entirety of all methods available to record the geometry of objects and topography, is already considered on one part as a documentation project (Boehler and Heinz, 2002). It is from the foregoing that this study will discuss the geoinformatics processes which are focused on surveying principles.

In this study, a comprehensive and systematic approach to geoinformatics documentation utilizing knowledge management tools, such as Microsoft Access is designed to maximize the benefits of documentation. In addition, this approach will promote a shared vision of the geoinformatics process and results, and will foster collaboration and communication between and amongst surveyors, clients, survey staff, contractors, and all users of survey information. The major aim of this study is to design a prototype of geoinformatics documentation system using Microsoft Access and subsequently identify useful knowledge management tools and processes associated with the process.

**Documentation and Its Principles**

Documentation is a set of documents provided on paper, or online, or on digital or analog media, such as audio tape or CDs (Wikipedia, 2015). Examples are user guides, white papers, on-line help, and quick-reference guides. It is becoming less common to see paper (hard-copy) documentation, but through websites, software products, and other on-line applications. Good documentation should be a sequence of logical steps that optimizes productivity and quality of output, outline where -, what -, how - different classes of information are stored and why (if appropriate), leave no room for sub-optimal interpretation, and minimize risk to an organization by providing adequate controls and security (Berger, 2008). The procedures of documentation vary from one sector, or one type, to another. In general, these may involve document drafting, formatting, submitting, reviewing, approving, distributing, repositing and tracking, etc. Documentation include such aspects as database creation, feasibility report, technical documentation, operational documentation and log book. There are many types of software and applications that can be used to create documentation. These include Oracle, Microsoft Access, Codasyl, Sybase, DB2, and dBase (for non-spatial objects), ArcGIS, AutoDesk World, QGIS, GRASS, ILWIS, etc. (for spatial objects). Geoinformatics documentation must ensure

compliance with survey rules and regulations. It will also ensure that the survey processes are transparent, captured and reproducible, and the survey results are presented in the most concise and accurate manner. Effective geoinformatics documentation procedures are vital in the sense that the benefit and worth of acquiring "Big Data" (geospatial information) are efficiently and effectively used within the organization. It is therefore critical for surveyors and all the stakeholders to work towards the actualization of these processes.

**Guiding Principles of Documentation:** The following are general guidelines for documentation processes as enumerated by Berger (2008).

i Make sure all processes (beginning from meeting with the clients) are captured and adequately documented in writing for the people who will or may be using the information. This is where Authority to Survey (A to S) Form comes into effective use;

ii Documentation should be easy to read and understand. If it is too long, too wordy, or written too formally, it may be misunderstood or ignored. Clear, short, familiar words should be used, to a maximum of 15 words to a sentence;

iii Writing style should be somewhat informal or personal where possible. Ask yourself, is this how I would explain it to someone sitting next to me?

iv Graphics (recce diagram), charts and tables should be employed wherever appropriate and useful;

v Cross-references should be used only to avoid repeating large amounts of text. For a few lines or words, it is better to restate the information;

vi Jargon and acronyms should be avoided;

vii Use bold or italic for emphasis. This is preferred over underlining or block capitals, but it should be used sparingly for maximum effect;

viii Procedures should be numbered when they are to be performed in a rigid sequence. Roman numerals or alphabetical sequences should be avoided;

ix The same terminology should be used throughout the document to avoid confusing the reader. For example, data can be described as "entered", "keyed" or "typed" into the computer. The term selected should be the one least likely to be misunderstood;

x Procedures should be properly organized (possibly by designing a database), that is, in a logical sequence starting with an overview;

xi The level of detail used in writing procedures should be sufficient for a new user to effectively do their job;

xii Manuals, whether paper-based or online, should have a title page, table of contents, glossary, and index. Tabs are a good way of grouping information for easy access;

xiii In terms of manual storage, proper filing system should be adopted with serial numbers (e.g. referenced to a particular year).

## THE SURVEYING PROCESSES

***Meeting with the client:*** This is the first step in the surveying process. In this meeting, it will be determined what kind of survey is necessary for the job at hand. After the discussion,

Authority to Survey (A to S) Form is filled by the client on agreement to proceed with the job.

***Reconnaissance:*** This is done to ascertain the project location, the logistics, equipment, method of survey that may be needed to execute it. Depending on the nature of the job, Government Agency, such as, the Office of the State Surveyor General where the project is situated may need to be contacted.

***Fieldwork:*** It commences after the reconnaissance is completed. This will involve monumentation, measurements to determine distances, positions of corner point, spots heights, other improvements on the property such as buildings, driveways, ponds, utilities, etc.

***Processing:*** After the completion of the fieldwork, the field notes or soft (electronic) data are brought back to the office for processing. If analogue approach was employed, the data in the field notes are extracted and used to calculate the existing job at hand. On the other hand, if digital data were acquired, the data are electronically transferred (downloaded) into the computer for processing. Data representation in analogue or digital form may now be carried out by conventional cartographic plotting or through a totally automated computer-based system leading to a paper- or screen-based plot.

***Confirmation*****:** In some cases, another trip may be made to the property to set any missing or newly established property corners or to ascertain the measurements already made.

***Request for Pillar Numbers*****:** After processing, request for issuance of SURCON Pillar Numbers is made through the Chairman of NIS to the Chairman of SSCE to be used on the Survey Plan. This is done on payment of prescribed fees for the particular application made.

***Certification:*** The final step is to have the survey plan signed "life" with "Green Coloured Ink" on all four copies and delivered to the client.

***Plan and Pillar Number Returns:*** All plans are submitted as prescribed by the regulatory body SURCON to the Surveyor General for the issuance of C of D. To do this, the original survey plan on clothe material (or tracing Paper), showing the values of all stations are listed on the plan, and submitted to the Office of the Surveyor General of the State where the survey was done as required by law.

## THE CONSEQUENCE OF GEOINFORMATICS DOCUMENTATION

Geoinformatics documentation ensures quick access, safety and security of acquired information in accordance with set standards, and guidelines. That is, quick access, safety and security of documentation of these processes and results are the primary benefits. Any loss of information on land can be disastrous and expensive to re-acquire, most especially, when litigation matters spring up in the future. Worst scenario is when the person who was involved at the initial stage is retired from service or is late. In such cases, the property under litigation could be lost to the opponent. Besides, what would happen to the integrity

of the Surveyor if he is still alive? Another major benefit of geoinformatics documentation is the transfer of knowledge from one survey staff to another. The documentation process is very critical during transition periods, especially in government establishments, such as the Office of the State Surveyor General. Thus, the existing documentation processes would serve as the basic orientation tool for new employees on the survey operations and systems. It reduces the effort of the organization in duplicating already done work (Exforsys Inc., 2011). The needed analysis and data, which was already procured, is often used to fasten the analysis process in future works. It may not only be the project whose data was documented that would use it for future reference, but also third party vendors and organizations can use the data as reference for their own projects.

**Survey Records that should be submitted to the State Surveyor General Office**

During submission of the diagrams, according to an online source, survey plans and other associated information from any survey operation, a surveyor is obliged also to lodge the records of that survey in the Office of the State Surveyor-General where the work was done *(http://csg.dla.gov.za/cadsurv5.htm)*. These records are used to support the examination process and are then preserved in the Surveyor-General's office. Surveyors later refer to these records when relocating or replacing lost beacons and when extending the earlier survey. The principal records kept by the Surveyor-General are:

i The field observations, which are the primary record of the survey,
ii A list of co-ordinates of the beacons and reference stations,
iii A working plan or town planning design,
iv A plan on which is shown the comparison between the original and the new survey data. and
v The land surveyor's technical report.

These records should also be captured in the document imaging system (DIS) or database system for easier access and to facilitate the supply of information to land surveyors.

## DATABASE SYSTEMS – USING MICROSOFT ACCESS

Microsoft Access is a database management program that allows one to store, organize and retrieve information (Steve, 2002). Access also allows you to query data and produce some nice looking reports. Many of us may be using Word or Excel to store data. In 'Word' you may be using a table to store data. Excel does have some limited database capability. The difference is that Access is a relational database. Excel does NOT have the functionality or power of a relational database like Access. The Objectives of Access Database Management System are enormous. In this segment, we will learn how to design and create a database, create tables and become familiar with the different objects in an Access database. When we have completed this segment, we will be able to:

i Be familiar with basic relational database concepts and database design;
ii Identify all the Access database objects;
iii Create tables;
iv Distinguish between table datasheet and design view;

v Create fields and set their data types and properties;
vi Define the primary key;
vii Modify table records - edit, add, and delete records;
viii Navigate in a table;
ix Modify table properties;

**Database Management System**

A database is a **collection of related data**. The database **stores** information. This information can be manipulated and viewed in many different ways. A Database Management program such as Access stores information in tables that are related to each other. It is primarily designed for two main purposes:

a. To store, add, delete, and update the data in the database.
b. To provide various ways to view the data in the database. For example, you can display data on your screen in a form or print out a report.

With the power of Access we can maintain and manipulate large amounts of data and create reports. Some examples where a database could be used in geoinformatics documentation process are:

a. Store and/or query information of client, (from Authority to Survey Form), coordinate register, financial transactions etc.
b. Query or extract information and produce reports.
c. Surveyors or Personnel database with separate but related tables for employees, departments and payroll information.

**Types of Databases in Access**

Flat Database and Relational Database are the types of Databases in Access focus in this study. Many of us have probably created a **flat database** which consists of only one table. What are the problems associated with a single flat database?

i. Unnecessary duplication of data. Wastes storage space.
ii. It is more difficult to update and maintain.
iii. It can be cumbersome to find or summarize information.
iv. Greater chance for data entry errors.

The main problem with a flat table is redundancy (Steve, 2002). The Plan Number, client's name, phone number and other related information are repeated. If a plan contain many beacon or pillar numbers, how many updates would you have to make? To avoid these problems, you need to break up the information into **separate related** tables. This is where the power and versatility of a relational database such as Access should be used. In a relational database, data are organized in related tables. In related tables, one or more fields are linked to fields in another table (Joseph and Kathleen, 2002). This link ensures that you can enter only those values that have corresponding entries in the other table.

A relational database can have multiple tables that contain data about various entities, such as clients, coordinate, transaction or finance etc. An entity is any object that has a distinct set of properties. **A relationship** is a connection between two or more tables based on common fields.

***How to Link tables together through common fields***

Tables are the building blocks of a database. From the tables you can generate forms, queries, macros, or reports. Relationships must be established between the tables before we can create queries using multiple tables. A **table** is a collection of related information that is organized in columns (fields) that describe an entity (record). In the most basic sense, an entity is a person, place, thing, or idea that exist. If it does not exist, then it is not an entity but a non-entity. A **Record** is a collection of information about a specific entity, such as a client, plan, or project. If we have pieces of information, on one subject, we have a **record**. For example, if Etim Ekong is a client, with Plan No. IUU/AK/3/2009/01, location of land in Ikot Oku, Uyo Local Government Area. We now have a record on Etim Ekong. Each of these pieces of information by itself (Plan No.) is data, but the information altogether makes a record. A **Field** is a category of information. A formal definition of field is that it is a column of data sharing properties and a data type. We organize this type of information into categories or **fields**. **Primary key**: The fields or set of fields that **uniquely identify** any given row. It ensures no two rows have the same value. Nulls are not allowed. Primary keys are an important concept because they provide the only way of exactly addressing a specific record in a table. In our Etim Ekong example, the Plan No. could be designated as the Primary Key.

**Database Design**

**Step 1:** *Identify the **purpose** of your database:* What type of information are you trying to **store** and **retrieve** from your database? Each database should be set up for a specific purpose. For example if you are keeping track of donations, you need to plan and design a database that can store related data.

**Step 2:** *Determine the **tables** you need:* Each table should focus on one topic and should store only the data related to that topic. For example, to track a job or project you may have separate tables for client, finance or transaction, etc. Remember our flat database example? You should separate fields into related tables for the following reasons:

i. To eliminate redundant information. For example part payment by client is much easier to implement if the data is stored only in the financial or transaction table. It is only necessary to make the change once, thereby reducing the amount of data entry required and potential for data-entry errors. It also saves storage space.

ii. To manage data easier. Large tables can be difficult to work with. It may be cumbersome to find or summarize information.

ii. To make future changes to the database design easier. Maintaining separate tables makes it easier to accommodate change. You can avoid having to frequently restructure the fields to accommodate new data.

iii. To join or relate the tables to one another to view information from multiple tables in a query.

Even if you choose a blank database, Microsoft Access offers Table Templates that you can use and modify for your own purposes. Just go to the 'Create' tab and select Table Templates. Contacts, Tasks, Issues, Events and Assets table templates are available.

**Step 3:** Breakdown the tables into **fields**

i. The fields in a table should relate to the subject of the table. For example, it is intuitive for a user to look in the Client Table for the address of a particular client.

ii. Avoid inconsistent dependencies that can occur when you add fields to a table that are not directly related to the table. For example, adding amount paid to a table with coordinate list.

iii. Consider the **type of data** that you plan to put in each field. Some common types are Text, Integer, Currency, and Date/Time.

iv. Store information in its **smallest logical part**. If you combine more than one kind of information in a field, it is difficult to search or sort the data. For example, create separate fields for first name and last name.

v. Do not create one field to store all the address information, break it down into street, city, state,

vi. Do not include calculated data. In most cases you do not want to store the result of a calculation in a table. Access should only perform the calculation when you want to see the result (in a form, query or report).

If you are repeating (the same) information in several tables, it is a clue that you have unnecessary fields in some tables.

**Step 4:** *Determine the **Relationships:*** Joining or relating the tables to one another will allow you to view information from multiple tables at the same time. After you define relationships between the tables, you have the flexibility to bring the data from multiple tables together in a query, form or report. Decide how each table will be related to the other tables in the database. If necessary, add fields to create relationships. To set up a relationship between two tables, add one table's primary key to the other table, so that the field appears in both tables. (Open the secondary table and add the field using the same name and data type.)* The field in the second table is called the **Foreign Key**.

***Exception:** If the primary key is an **Auto number**, the foreign key (the corresponding field) must have a data type of a **Long Integer.**

**Step 5:** ***Refine the Design:*** Create your tables, specify relationships between the tables, enter a few records and see if the database gives you the answers you want. Create rough drafts of your forms and reports and see if they show the data you expect. Look for unnecessary duplications of data and eliminate them.

i Did you forget any fields? Go back and add them.

ii The intersection of every column and record should contain one and only one value.

iii Did you choose a good primary key for each table? Can you search for specific records? Make sure that you will not need to enter a value in a primary key field that will result in a duplicate value.

iv Are you repeatedly entering duplicate information in one of your tables? If so you probably need to divide the table into two tables, with a one-to-many relationship as in figure 1.

v Do you have tables with many fields, a limited number of records and many empty fields in individual records? If so, think about redesigning the table so it has fewer fields and more records.

## CREATION OF FORMS

A form is an Access database object that allows you to view, edit, and add data to a table. The datasheet view of a table shows you a grid of fields and rows. A form typically shows just one record at a time. A form is a **graphical representation used to enter data into the tables** (Joseph and Kathleen, 2002). A form is simple a way to enter data all at once rather than in multiple tables. Data input from a form will enter data directly into the respective table/tables. You can build the form from a table or a query. To create a basic form, the following should be done.

i. In the navigation pane, select a table on which to base the form.
ii. Click on the Create tab
iii. In the forms group, click Form. This will create a columnar form that includes all the fields from the selected table.

The example shown in figure 2 is a job registration form, which can be used to view or add jobs. Once the data is entered in the form, the data is stored in the job table.

**Queries:** A query is a database object that retrieves and displays selective data from one or more tables or from other queries. You can use a query to retrieve data meeting specific conditions. For example, to retrieve all survey work done in Uyo in a specific month. Query results are similar to the results of a filter, but a query can be saved permanently, whereas a filter provides only a temporary view. When you run a query it displays the results in datasheet view. The result of the query is dynamic; hence the results are called a dynaset. The dynaset looks and acts like a table; it is a "live" view of one or more tables. If you make changes to the data in the query, the data in the table will also change. A query can be based on data from one or more tables. Queries usually connect two or more tables through a relationship between a common field in both tables, such as a key field (a field unique to each table) (Joseph and Kathleen, 2002). Queries allow you to perform calculations on the data; to create data sources for forms, reports, charts and other queries; to make changes to tables and create new tables.

***Select Query:*** This is the most common type of query; it selects information from one or more tables and returns only the records that meet the criteria.

### *Plan a Query*

1. Determine the tables from which you will extract the fields
2. Determine the fields that you want to see in the query result
3. Specify the conditions that you want the data to meet.

**Create a query in Design View**

1. In the navigation pane, select the Queries object.
2. On the Create tab, click Query Design.
3. In the show table dialog box, select the table you want to add to the query and click **Add**.
4. Click close to return to design view.
5. Select the fields that you want to display in the query result. Apply any sorts or criteria to the fields.
6. Click the Run button or switch to datasheet view to see the results.

**Paper Filing System**

Despite the current trends in using electronic gadgets to store information, there are still some information that need to be stored in hardcopies. In developing countries like Nigeria, where we are still grappling with this system of filing, the subject matter is - how do we document our own "Geospatial Data?" A **file system** (or filesystem) is used to control how data is stored and retrieved. Without a **file system**, information placed in a storage area would be one large body of data with no way to tell where one piece of information stops and the next begins. The importance of record-keeping and filing systems cannot be too highly stressed. A well-planned filing system contributes significantly to efficiency of the operation as well as to the company's image (Carol, 2015). Whether records are filed in a computer or in a steel/wooden cabinet, they have to be readily accessible. Figure 7 shows an efficient filing system, while figure 8 shows the contrary.

**Fig 7:** A properly indexed filing system helps to efficiently retrieve documents

**Fig 8:** Improper document filing systems affects productivity

Does your filing system shows any of the following symptoms:

i It is difficult to find the information you need to obtain due to your system;
ii You are repeatedly having to expand your file system capacity;
iii You are maintaining duplicate files of the same information;
iv You are using your filing system or equipment for non-records storage;
v Your file folders are too full for easy access;
vi Your filing drawers or shelves are too full for easy access.

Once you have completed your analysis, your records inventory reveals the strengths and weaknesses of your record-keeping system.Once you have analyzed your records inventory, you should determine:

i Best arrangement of the records;
ii Type of media to be filed (paper, microfilm etc);
iii Proper equipment for adequate storage and retrieval;
iv Proper systems to complement the equipment ;
v The required record retention schedule and facility.

**Systems of Filing**

Filing systems utilize one of the following methods:

i Alphabetical (e.g. Client's Name);
ii Alphanumeric or Alphameric (e.g. Plan Number);
iii Numeric (e.g. Serial Number)
iv Geographic (for example, Local Government Area or State);
v Subject (e.g. Property Surveys, Engineering Surveys);
vi Chronologic (e.g. 1st Quarter, Year).

All these methods have advantages and disadvantages and you must decide which one would be best for you.

**Electronic Filing System**

In a situation where we are not able to create a **functional database system** for our information storage, we may resort to organizing our data in an orderly manner in a computer system. Organization is *key* to business as well as personal use. No matter who you are, it is important to have good organizational skills, especially when dealing with documents - which all of us do at some points. In today's world, organization is made simple for us through the use of computers and electronic filing systems *(http://www.wikihow.com/Organize-an-Electronic-Filing-System)*. Although this tool is available to us, we may still need a little help using it to the greatest benefit. If this describes your relationship with electronic filing, the following guidelines might prove beneficial.

1. Create one main electronic folder that will hold all others related to the set of information you wish to organize (Figure 9).
2. Depending on the amount of information that you wish to organize, you may also need to create subfolders within the main folder.
3. Within the folders, it is best to include dates on all documents, and arrange them chronologically.

4. Be sure to continue backing up your files to an external disk, preferably every three to four weeks.
5. As your electronic filing system grows, you will need to keep it current by moving documents to a disk that are no longer accessed regularly (Figure 10).

Quick access to your important business records increases productivity (Carol, 2015). Two of the most important considerations for designing a system for documents in your filing cabinets are your daily and long-term information needs. At the same time, your document filing system should not be so complicated that hardly anyone in your office can use it properly.

**Types of Data Storage Devices**

Storage Device is any hardware capable of holding information either temporarily or permanently. It entails the techniques and methods employed in the preservation and archiving of data such that it can remain in a safe condition, and can be retrieved, updated, edited and deleted with ease. There are two types of storage devices used with computers: a primary storage device, such as RAM, and a secondary storage device, like a hard drive (Carey, 2011). Secondary storage can be removable, internal, or external storage. The following are some of the computer storage devices used for storage and backup.

Magnetic storage is one of the most common types of storage used with computers and is the technology that many computer hard drives use such as: floppy diskette, hard drive, super disk, tape cassette and zip diskette *(http://www.computerhope.com/jargon/m/magnmedi.htm)*.

**Magnetic Storage Devices**

***Source:*** *http://www.computerhope.com*

A hard drive is usually built inside your computer and holds anywhere from 1GB to 4TB of capacity. There are three types of internal hard drives are PATA (Parallel Attachment Technology Architecture), SATA (Serial Advanced Technology Attachment) and SCSI (Small Computer System Interface). External Hard Drives comes in USB, Firewire, SATA and SCSI. The advantages are that they are very good option for local backups of large amounts of data, the cheapest storage option; very reliable when handled with care. One of the disadvantages is that it can be very delicate; may be damaged if dropped or through electrical surge.

Optical Storage is another common storage device which uses lasers and lights as its method of reading and writing data such as: CD-ROM disc, CD-R and CD-RW disc, DVD-R, DVD+R, DVD-RW, and DVD+RW disc *(http://www.computerhope.com/*

*jargon/o/optidisc.htm)*. Low cost per disk is its major advantage. On the other hand, the disadvantages are: (i) relatively shorter life span than other storage options, and (ii) not as reliable as other storage options like external hard disk and SSD. One damaged disk in a backup set can make the whole backup unusable. Flash memory devices has started to replace magnetic media as it becomes cheaper as it is the more efficient and reliable solution. It is a compact and portable device used for storing data anywhere from 128MB up to 4GB such as: Memory card, Memory stick, Flash Drive and SSD. The advantages are that it is the most portable storage option. It can fit on a key chain making it an offsite backup when you bring it with you. It is much more robust than traditional magnetic hard drives. The Disadvantages include that it is relatively expensive per GB so can only be used for backing up a small amount of data


Network Attachment Storage (NAS) are one or more regular IDE or SATA hard drives plugged in an array storage enclosure and connected to a network Router of Hub through an Internet port. Some NAS have ventilating fans to protect the hard drive from overheating.

**NAS – Network Attachment Storage**

**Advantages:**

i Very good option for local backups especially for networks and small businesses.

ii As several hard drives can be plugged in, NAS can hold very large amounts of data

iii Can be setup with Redundancy (RAID) increasing the reliability and/ or read and write performance. Depending on the type of RAID level used, the NAS can still function even if one hard drive in the RAID set fails.

iv The drive is always connected and available to the network making the NAS a good option for implementing automated scheduled backups.

**Disadvantages:**

i Significantly more expensive than using single External Hard Drives

ii Difficult to bring offsite making it very much a local backup hence still susceptible to some events like theft, floods, and fire etc.

Storing data online and in cloud storage is becoming popular as people need to access their data from more than one device and from any location. These include: Cloud storage (Example – Dropbox) and Network media. Cloud storage is a space on commercial data center accessible from any computer with internet access. It is usually provided by the service provider such as Amazon S3, Google Drive, Sky Drivers. A limited storage space may be free with more space available for a subscription fee.

A Dropbox is a personal cloud storage service (sometimes referred to as an online backup service) that is frequently used for file sharing and collaboration. It works by keeping identical copies of selected files on your computer(s) and Dropbox's cloud-based storage system, and **automatically synchronizing** them over an encrypted Internet connection (Carey, 2011). The Dropbox application is available for Windows, Macintosh and Linux desktop operating systems. There are also apps for iPhone, iPad, Android, and BlackBerry devices. The advantage is that it is a very good offsite backup. Not affected by events and disasters such as theft, floods, fire etc.


**A Dropbox**

*(Can be accessed with Phones or Computers with Internet facilities)*

**Disadvantages**:

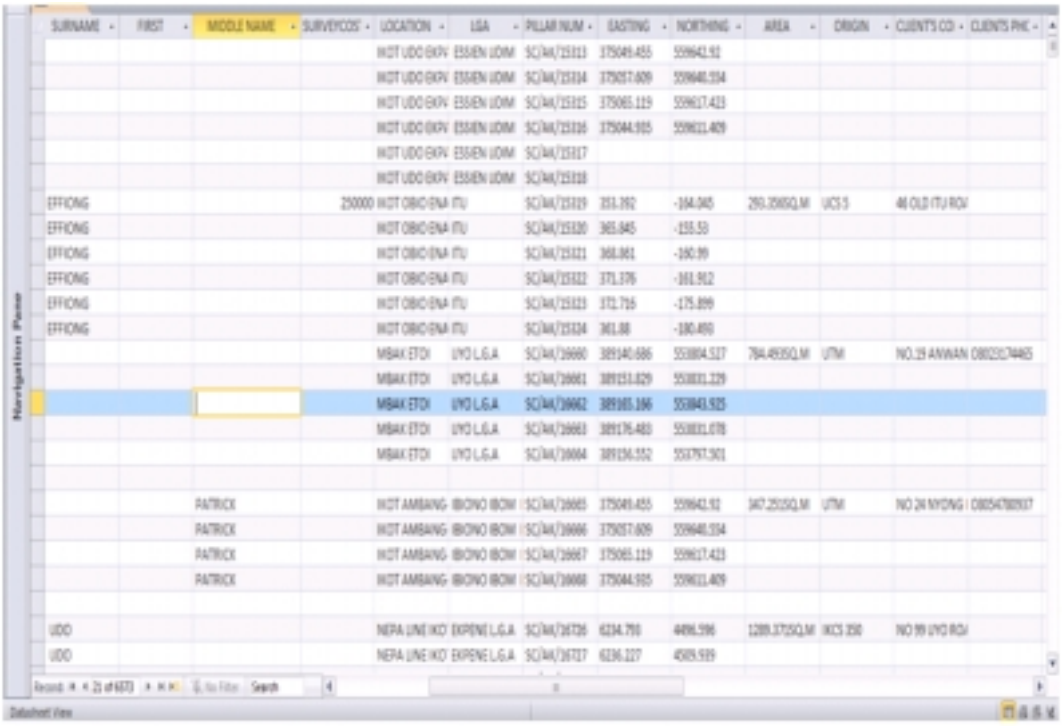
i More expensive than traditional external hard drives. Often requires an ongoing subscription.

ii Requires an Internet connection to access the cloud storage.

iii Much slower than other local backups

It must be noted that our information either in a database or electronic folders can all be stored in any of these systems for safety.

***Table 1:*** A Flat Database



| SURNAME | FIRST | MIDDLE NAME | SURVEYCOS | LOCATION | LGA | PILLAR NUM | EASTING | NORTHING | AREA | ORIGIN | CLIENT'S CO | CLIENT'S PHC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | IKOT UDO EKPO | ESSIEN UDIM | SC/AK/15313 | 375049.455 | 559642.92 | | | | |
| | | | | IKOT UDO EKPO | ESSIEN UDIM | SC/AK/15314 | 375057.609 | 559648.554 | | | | |
| | | | | IKOT UDO EKPO | ESSIEN UDIM | SC/AK/15315 | 375065.119 | 559617.423 | | | | |
| | | | | IKOT UDO EKPO | ESSIEN UDIM | SC/AK/15316 | 375044.935 | 559611.409 | | | | |
| | | | | IKOT UDO EKPO | ESSIEN UDIM | SC/AK/15317 | | | | | | |
| | | | | IKOT UDO EKPO | ESSIEN UDIM | SC/AK/15318 | | | | | | |
| EFFIONG | | | 250000 | IKOT OBIO ENA | ITU | SC/AK/15319 | 353.392 | -164.045 | 290.35695Q.M | UCS 5 | 46 OLD ITU ROA | |
| EFFIONG | | | | IKOT OBIO ENA | ITU | SC/AK/15320 | 365.845 | -155.53 | | | | |
| EFFIONG | | | | IKOT OBIO ENA | ITU | SC/AK/15321 | 368.861 | -160.99 | | | | |
| EFFIONG | | | | IKOT OBIO ENA | ITU | SC/AK/15322 | 371.376 | -161.912 | | | | |
| EFFIONG | | | | IKOT OBIO ENA | ITU | SC/AK/15323 | 372.716 | -175.899 | | | | |
| EFFIONG | | | | IKOT OBIO ENA | ITU | SC/AK/15324 | 361.88 | -180.493 | | | | |
| | | | | MBAK ETOI | UYO L.G.A | SC/AK/16660 | 389140.686 | 553804.527 | 784.49355Q.M | UTM | NO.19 ANWAN | 08023174465 |
| | | | | MBAK ETOI | UYO L.G.A | SC/AK/16661 | 389151.829 | 553831.229 | | | | |
| | | | | MBAK ETOI | UYO L.G.A | SC/AK/16662 | 389165.186 | 553843.925 | | | | |
| | | | | MBAK ETOI | UYO L.G.A | SC/AK/16663 | 389176.483 | 553831.078 | | | | |
| | | | | MBAK ETOI | UYO L.G.A | SC/AK/16664 | 389156.552 | 553797.501 | | | | |
| | | | | | | | | | | | | |
| | | PATRICK | | IKOT AMBANG | IBIONO IBOM | SC/AK/16665 | 375049.455 | 559642.92 | 367.2515Q.M | UTM | NO 24 NYONG | 08054780937 |
| | | PATRICK | | IKOT AMBANG | IBIONO IBOM | SC/AK/16666 | 375057.609 | 559648.554 | | | | |
| | | PATRICK | | IKOT AMBANG | IBIONO IBOM | SC/AK/16667 | 375065.119 | 559617.423 | | | | |
| | | PATRICK | | IKOT AMBANG | IBIONO IBOM | SC/AK/16668 | 375044.935 | 559611.409 | | | | |
| | | | | | | | | | | | | |
| UDO | | | | NEPA LINE IKO | EKPENE L.G.A | SC/AK/16726 | 6234.791 | 4496.596 | 1289.375SQ.M | IKCS 250 | NO 99 UYO ROA | |
| UDO | | | | NEPA LINE IKO | EKPENE L.G.A | SC/AK/16727 | 6236.127 | 4509.939 | | | | |

***Source:*** L'xx On Consult Int. Ltd.

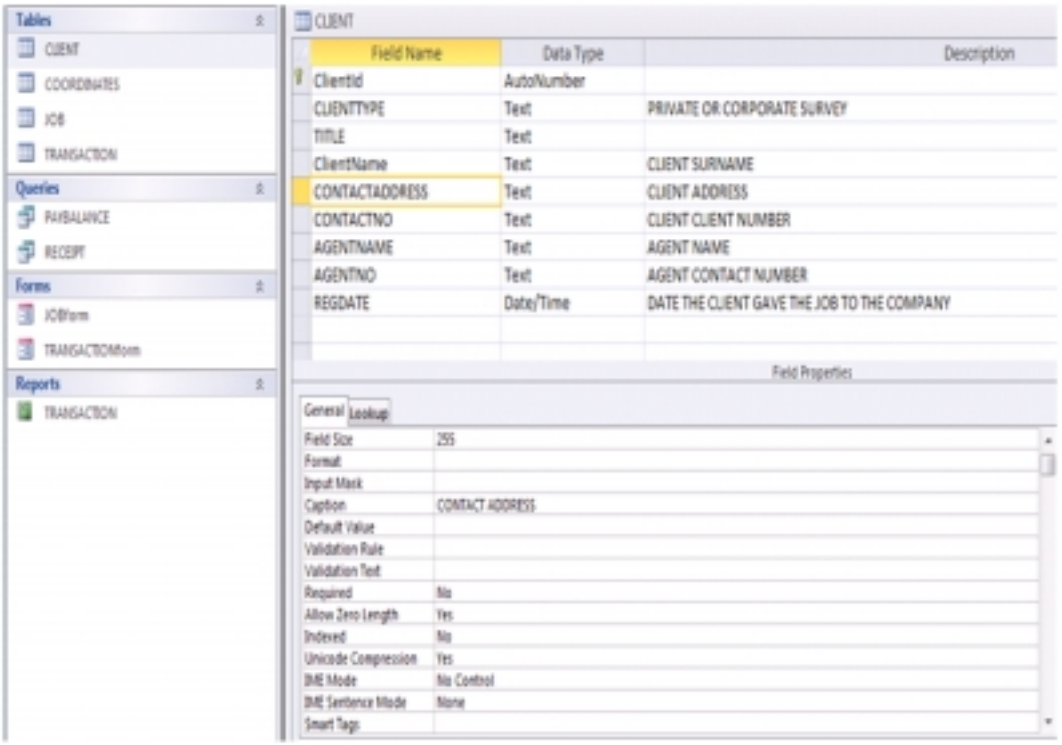



**Figure 1:** The Fields created and their Data Types ***Source:*** L'xx On Consult Int. Ltd.

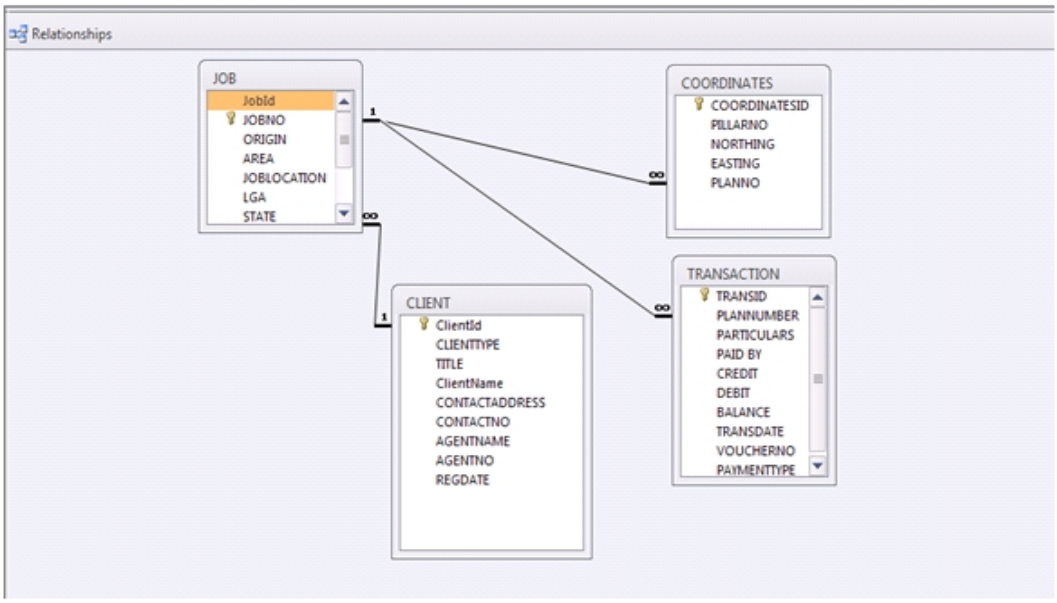



**Figure 2:** The Relationship between the Tables ***Source:*** L'xx On Consult Int. Ltd.

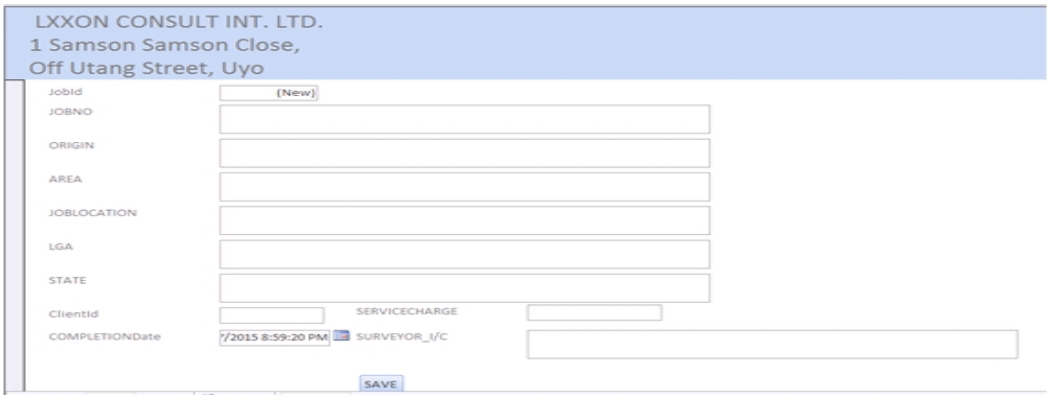



**Figure 3:** A Sample of a Design Form

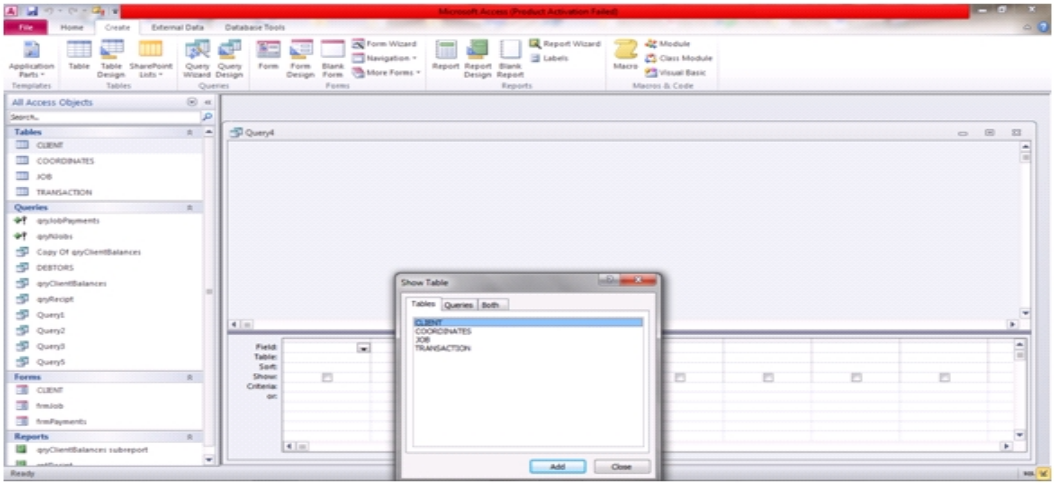


**Figure 4:** The Interface that Tables are added in the Database

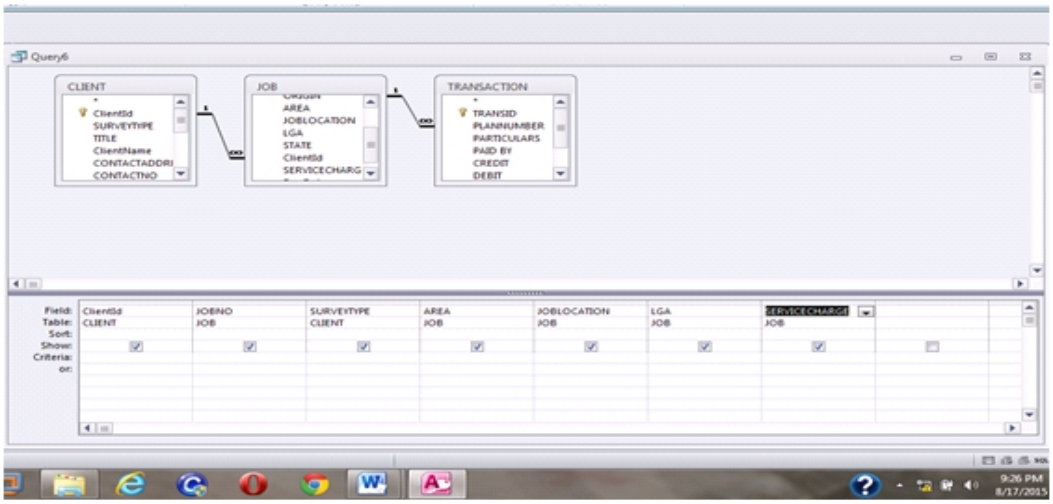



**Figure 5:** The Design View for Query

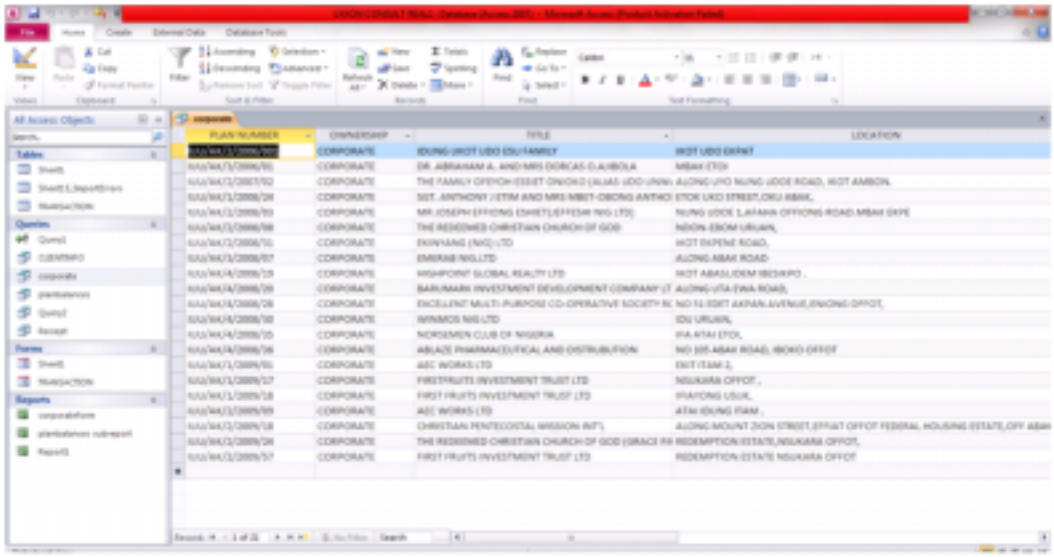


**Figure 6:** A Typical Query Result in the Database ***Source:*** L'xx On Consult Int. Ltd.

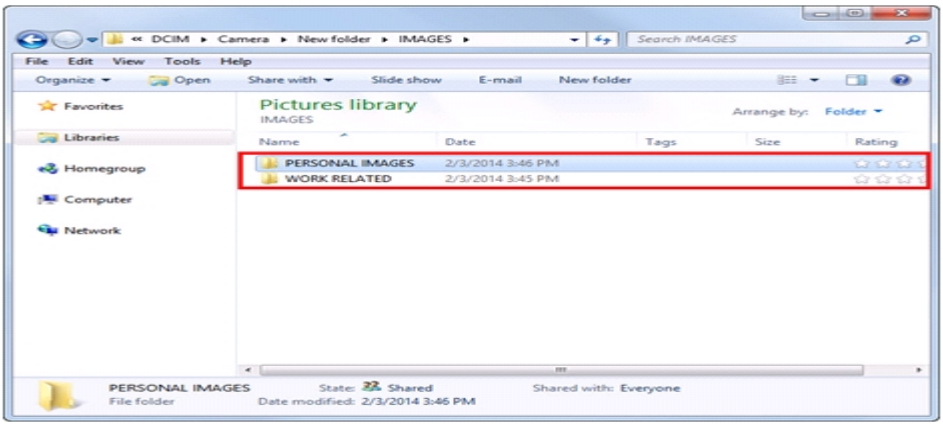



**Fig 9:** Creating Folders for related Sets of Data

***Source:*** http://www.wikihow.com/Organize-an-Electronic-Filing-System

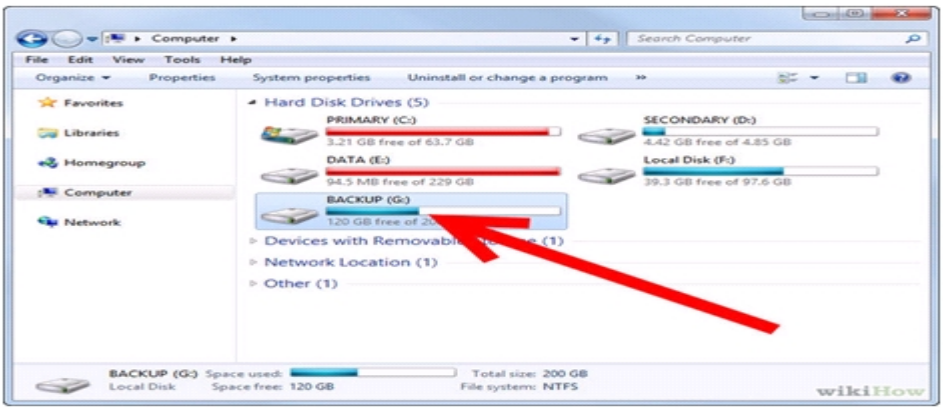



**Fig 10:** Fragmentation Disk Space

***Source:*** http://www.wikihow.com/Organize-an-Electronic-Filing-System

## CONCLUSION

Geoinformatics documentation ensures quick access, safety and security of acquired information in accordance with set standards, and guidelines. The quick access, safety and security of documentation of these processes and results are the primary benefits of the system. Microsoft Access database helps to quickly store, track and report information using a rich user interface and interactive design capabilities. The benefits are quite enormous. Particularly, in survey firms and offices, data and information can be managed properly. It is faster, easier and cheaper. In spite of the numerous benefits of database in information management, there are quite some challenges; ranging from computer illiteracy to static nature of professionals who are not willing to accept the current global trend. Rather, they are used to the obsolete ways of dealing with issues thereby bringing little or no result. It is expedient to conclude that Surveyors are the originators and custodians of all geospatial data needed by government, corporate and non-corporate bodies and private individuals to embark on developmental projects. Thus, there is absolutely a need to develop a functional and efficient documentation system, so as to enjoy the benefits that are associated with it.

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