GIS/LIS-Best Practices in Nigeria

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SUMMARY

GIS is frequently used for multidisciplinary management of authorities around the world. GIS enables us visualize, query, analyze, and understand data to reveal relationships, patterns, and trends. Authorities use GIS to improve operations and service to citizens. GIS provides a common platform for data sharing, which enhances workflow, decision making, and coordination across the state and with federal and local government. GIS can cover all aspects of the government: Land, transportation, agriculture, water, education, health, environment, electricity, oil, gas etc.

Sivan Design has a track record of 8 years implementing GIS solutions in Africa. We have completed several GIS projects in the following authorities in Nigeria: Office Of The Surveyor General, Federal Ministry of Works, Federal Ministry of Lands, Housing and Urban Development, Federal Capital Development Authority, Ministry of Lands and Survey in the following States: Benue, Kaduna, Plateau, Kwara, Niger and Bauchi.

During these years we have gained vast experience and knowledge about the Nigerian GIS market. In my paper we will discuss the main challenges we faced and the best practices we suggest implementing a GIS project in Nigeria, in Federal and State levels.

We will review and clarify the following challenges facing a GIS/LIS contractor in Nigeria:

- Implementation challenges
- Build citizens trust
- Internally Generated Revenue (IGR) - debt collection
- Mapping - source of revenue generating land plots is small
- Legal framework – Traditional rulers cooperation
- Infrastructure – Internet and electricity
- R&D – flexible design to fit Nigeria requirements
- Manpower and capacity building – Handing over to operations, Motivation plans!
- Long term contracts/ PPP model – Maintenance & support

GIS/LIS-BEST PRACTICES IN NIGERIA

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1. IMPLEMENTATION CHALLENGES

The first and main challenge we faced in Nigeria is to ensure full implementation of the new GIS in the daily use of the authority. It is well known to software companies that implementing a new software application is challenging in the whole world, especially when the new software is replacing manual procedures using files and paper documents.

We can break these challenges into the following:

1.1 Fear of change –

We found out that in many projects, public servants do not like to change the way they are used to work. The staff sees the new system as a hassle that might take a lot of their time and energy to implement. The fear-of-change goes along with fear of losing power and fear of losing the position and getting dismissed. We noticed that some staff members were afraid that the computerized system would make them redundant and they might lose their jobs once the system fully implemented. Those aspects should be handled by top management guaranteeing that the system would only make the staff work easier and faster without jeopardizing their position.

1.2 Acceptance of computerized systems –

The use of computers on a daily aspect is not yet fully accepted in Nigeria and in Africa at the level it is used in western countries. When we started training and capacity building we usually had to start from basic use of computers to MS-Office application till we got to the actual training on the LIS. There is a significant trend in Nigeria to use a computer as a daily tool especially by the younger staff filling up positions and moving up the rank level.

1.3 Changing of the existing workflows to the new ones –

Very often, during the project implementation there is a need to change workflows and procedures in order to meet the LIS process. We usually try our best to develop the system based on the existing workflows, so that the staff will not have to get used to new workflows, but sometimes it is necessary to change existing workflows. The change of workflows is done in the requirements survey and in the high level specification and design of the new GIS/LIS.

1.4 Definition of new roles –

During review of procedures and workflows, it is frequently necessary to define new roles and positions. A clear definition of the authority roles has to be done before coding and customizing the system. The challenge is to change the authority hierarchy and to create new roles and ranks as it is a bureaucracy procedure.

1.5 Taking ownership on the system and content –

Although it's the last item it is the most important one. In several projects we witnessed this challenge to be the biggest. The authority must fully accept the ownership on the LIS and the data captured inside it. The ownership and responsibility on the system should be directed from the top level management. In many authorities the top level management is too busy with the daily work and meetings and the implementation is not getting the full attention. We always recommend the authority to establish a 'steering committee' headed by the most ranked manager such as Minister/ Commissioner or Permanent secretary. We find it critical for the success of the system implementation.

2. BUILD CITIZENS TRUST

According to the World Bank, "30% of a developed country economy is based on real-estate transactions". In Nigeria, the level of land related transactions is relatively low. One of the main reasons for that is the low level of trust the citizens give to the land management system. Therefore, the main objective of implementing a computerized Land Information System (LIS) is to guarantee title to land and engender confident market transactions in landed properties. Once the public start increasing their trust in land transactions in a way that they truly believe that it is secured and their land is not going to be taken away from them by illegal and fraudulent ways, real-estate transactions will increase dramatically and boost the state economy.

The GIS/LIS must be robust and secured in such way that it would be almost impossible to tamper with the data and change land related data like ownership, demand notice, Certificate of Occupancy (CofO) etc. We developed **permission** based mechanisms that differentiate the system users by their position/ rank and the level of the data they are allowed to view, create or change.

We also recommend the authority to implement title documents printed on special **security papers** that makes it almost impossible to duplicate or forge. CofO document represents an asset of great value, a lifetime of investment, and in some cases even the sum of several generations' investment.

The CofO document itself, given to its rightful owner, encapsulates the exact details of the said asset – in case of falsification (unauthorized alteration) or attempt to copy the document, grave implications may arise.

We are suggesting printing the actual CofO on a special pre-printed security featured paper including the following security features –

- Copy-evident paper - A feature which causes a photocopy of the document to appear obviously different from the original. For example, when photocopied paper will display the word "VOID" on the copy, even though it is absent from the original.
- Fluorescent dyes - Dyes which fluoresce under ultraviolet light or other unusual lighting. These show up as patterns and are invisible under normal lighting. This feature is also incorporated into many banknotes and other documents.
- Solvent Sensitive Ink (reactive) - As the name states, would present a visible indicator that the ink has been attacked by a solvent.
- Thermo chromatic ink - Security ink with a normal "trigger" temperature of 88 degrees F, which will either disappear or change colors when the ink is rubbed, usually by the fingertips.
- Metal foil -A metallic foil logo with a bright surface, available in silver or gold. Brightness cannot be photocopied.
- Micro printing - This involves the use of extremely small text, and is most often used on currency and bank checks. The text is generally small enough to be indiscernible to the naked eye. Bank cheques, for example, use microprint as the signature line.

Additional layer of trust is being delivered within the GIS engine. While the plots layout (survey plan) is drafted digitally we perform a series of **topology checks** so that no plots are overlapping and there are no unnecessary gaps between neighboring plots. This is to make sure each land owner is holding what belongs to him by law.

3. INTERNALLY GENERATED REVENUE (IGR)– DEBT COLLECTION

Collecting debt from owing land owners is never easy and sometime almost impossible. There are many reasons why land owners are not paying their debt, but in our view the main one is lack of real **enforcement** and effective **penalties** to debtors. The penalties vary from fines that increase the debt to demolish of the property built on the land and more. Handling debtors is time and resources consuming and the manpower to handle it is usually not enough. The authorities should try to focus on the land owners that can generate the most revenue like business land owners: banks, communication companies, factories, oil fields etc. The Ministry of justice should be able to handle debtors legally by first passing the right laws for land fees collection and then prosecute debtors in court.

4. MAPPING – SOURCE OF SURVEYED PLOTS IS SMALL

Only 3% of the federal land in Nigeria is mapped and surveyed for cadastral use. In many states the situation is similar. Therefore the quantity of plots to manage is low and the revenue generated is small compared to the huge collection potential. Many initiative are being done by the OSGOF (Office of the Surveyor General of the Federation of Nigeria), State's Governments and other organizations. It seems that the collaboration level on the output maps

is low. The PTLRC (Presidential Technical Land Reform Committee) is also working toward a standard for mapping whole Nigeria at cadastral level.
Ay State level, the Surveyor general offices are creating survey plan of existing and new layouts but the pace of increasing the plots for land management is still low.

5. INFRASTRUCTURE – INTERNET AND ELECTRICITY

Developing, installing and implementing IT projects in Africa in general must take into account the poor quality of critical infrastructure as **electricity** and internet. In each of the projects the contractor must install and maintain a good quality generator that will probably work every day for few hours due to electricity breaks. In Addition, in order to keep the main servers functioning 24/7, we install a high quality and usually very expensive inverter with a huge battery bank to hold the server online during electricity breaks over the night and non-working days. These batteries need annual maintenance and replacement from time to time.

Another important aspect is **internet** connection. Most of the GIS applications are based on client server application over secured WAN/LAN. Due to the low bandwidth available in Nigeria, connecting far clients to the server over the internet is problematic. Therefore the architecture of remote sites connecting on line is challenging. We either use high speed satellite internet which is extremely expensive or we work offline during the day and running an overnight synchronization between the remote site server and the main server. Some authorities are also demanding for fully web system which makes it even more challenging to connect and have fast response time. In our opinion Nigeria is still not ready working directly on web applications or cloud computing, but the internet connection is improving fast, so we hope this trend will change in the coming years.

6. LEGAL FRAMEWORK & TRADITIONAL RULERS COOPERATION

Land laws should support the new LIS implementation and should be updated in order to support the enforcement of all fees collection. The Ministry of Justice and Ministry of Lands should join forces and review the State land act accordingly.

In many states in Nigeria the traditional rulers are still the ones who are holding and managing land rights. Therefore when the State government wishes to introduce a computerized LIS to manage all the State land resources they need cooperation from the traditional rulers.

7. R&D – FLEXIBLE DESIGN TO FIT NIGERIA REQUIREMENTS

The first phase of each LIS project is system requirements and needs analysis. Then a specification document is drafted and design documents are defined. It is important to design a system which can be flexible to changes. The system should be able to be modified and customized by the authority staff without changing the system coding. For example the land location tree, the taarif fees rate, the CofO text etc. In addition the system has to be designed

to fit the workflows and procedure which are suitable for Nigeria bureaucracy and files movement and approval process.

8. MANPOWER AND CAPACITY BUILDING – HANDING OVER

From our experience in Federal and State levels, it's very important to invest a lot of time and resources in training and capacity building. In order to hand over the operations of the system, a dedicated task force should be appointed and trained to the highest level. In some projects the authority might consider outsourcing the actual operations of the LIS to the private sector.

During the projects we implemented in Nigeria, we had to make motivation plans to the Ministry's staff in order to keep the work pace high and this should be taken into consideration in the project expenses.

9. LONG TERM CONTRACTS – PPP MODEL

We noticed that this is a painful weakness in the IT industry in Africa in general. Most of the contracts and tenders for GIS/LIS were for a short period of project duration – up to 1-2 years. We recommend publishing a tender for at least 5 or 10 years including Maintenance & support contract. Little consideration is given to software, hardware and other equipment maintenance. A life cycle of digital equipment as computer or scanner is up to 2-3 years and other peripheral equipment needs constant maintenance which is not taken care of on regular basis.

In addition, the software has to be upgraded at least once a year. New features and functionalities needs to be implemented, system bugs needs to be fixed etc.

In the last 2 years we noticed increase in demand for PPP (Public Private Partnership) projects in which the contractor is financing part or the entire project in exchange for a percentage of the payments collected from land transactions. This model has a lot of advantages to the government and to the contractor but there also many risks involved.

REFERENCES

GeoERP – LAPS – www.sivandesign.com

BIOGRAPHICAL NOTES

Engineer Shay Cheruty executes as the Chief Operations Officer of Sivan Design – a leading global geospatial solutions provider incorporating GIS with ERP capabilities.
Mr. Cheruty has over 20 years of experience in managing complex IT projects which for the past 7 years were for Sivan Design.
Mr. Cheruty holds a B.Sc in engineering from the Technion Institute and a MBA in IT from Tel-Aviv University.

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