

# SDI: PROSPECTS AND CHALLENGES FOR FEDERAL STATE DEVELOPING COUNTRIES (Case of Nigeria)

O. A. Ogundele<sup>a, \*</sup>, O.S. Somefun<sup>b</sup>

<sup>a</sup>Regional Centre for Training in Aerospace Survey (RECTAS), P.M.B. 5545, Ile-Ife, Nigeria;

<sup>b</sup> Department of Geo-Informatics, International Institute for Geo-Information and Earth Observation (ITC), Hengelosestraat 99, 7500 AA, Enschede, The Netherlands –  
zinmanship@yahoo.co.uk, ogundele16993@alumni.itc.nl, somefun17070@itc.nl, lsomefun@yahoo.com

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## ABSTRACT

Implementation of SDIs in inherently complex, tension arises from various sources including the need for consensus on standards for example between federal and local agencies (Georgiadou et al., 2007). Despite the numerous benefits of SDI, there are still several failure of the project (Georgiadou and Harvey, 2007) and most of these failures are in developing countries. Factors affecting such failures include lack of technology to handle enormous data, financial constrains and many other socio-economic constraints. More so, there are other underlying factors that have effect on implementation of SDI. One of such factors is the system and structure of governance in the country. A decentralized system brings service closer to the community and also devolves control to the local level. This has a vital implication on SDI implementation and service delivery within the system. It is obvious that system of governance can either facilitate or mitigate against a successful implementation of SDI mostly in developing countries. Nigeria as a developing country is faced with great challenges in implementing NSDI in its present unitary system of government. A look into the prospect and challenges of SDI in the context of decentralization system of governance in Nigeria can aid proper implementation plans of SDIs at all levels of governance, thereby boosting its chance of success. The findings however can be generalized to many developing countries presently operating under decentralization policy.

## 1 INTRODUCTION

Designing decentralization policy is very difficult in any country because decentralization can affect many aspects of public sector performance and generate wide range of outcomes. But it is particularly difficult in developing countries because institutions, *information*, and capacity are all very weak (Litvack et al., 1998). There seems to be gap created in public multi-level organizations and governance with improper implemented decentralization policy, and also that weak information system can contribute to unsuccessful decentralized system. Therefore it can be said that good information management strategies play a vital role in improving decentralized public organization. But we should not be quick to conclude on information system as a magic tool to improve these multi-level systems. Otherwise it could be assumed that since most early decentralization policies are silent on information management, there is one of the greatest pitfalls in most developing countries with Federal State System.

Geo-Information Management System has been very useful in improving various organizations. Geo-information (GI) public organizations have benefited from the evolution of Information and Communication Technology and it has become the base for business processes, most especially now that the concept of Spatial Data Infrastructure (SDI) is prevalent. But how can GIS fits into Institutional framework that is based on decentralization policy? How can NSDI be implemented in a Federal State System of governance? How will GI organizations

that exist in such system successfully embed and use GIS without jeopardizing its decentralized structure.

These are most of the questions confronting developing countries in Africa, Latin-America and Asia that has embarked on implementing information infrastructure. Most of the decentralization policies being used in public organizations in federal state developing countries have not taken care of issues of information management. Therefore it constitutes great problem to implement SDI both at regional level and National level. This paper is focused on implementation of SDI in developing countries that operates on Federal States. We made attempt to find out the prospects of having SDI in such countries and also various challenges that can make it more difficult to implement using Nigeria as a case for developing countries. We also consider the challenges of using Information Management to fill gaps created in Geo-information organizations in developing countries due to dilemmas in decentralization policies.

Nigeria is a Federal State country that is also a developing country facing challenges of managing its spatial data as its GIS grows from one stage to another. Each State in the country is implementing various information facilities. Each of them claiming autonomy based on Local Government Policy of 1976 as included in the country's 1999 constitution. Although the country now has GI policy, but the NSDI has not been established. States like Lagos has been trying to develop its GIS and many other States have not reached such stage. So, the problem is not only with the National level of SDI but also how

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\* Corresponding author. Ogundele O. A. zinmanship@yahoo.co.uk

to establish a regional SDI which can be embedded into NSDI. Nigeria will be a keyhole through which the paper will address various issues surrounding SDI in Federal State developing countries.

Much has been said on SDI and its implementation strategies, but there are still several cases of failure of SDI projects in developing countries. Most organizations in such countries tend to implement standalone system so also governments spend more on GIS development with little result. There is need to narrow down into those circumstances surrounding each country or region. This will allow more depth knowledge to why many SDI projects fail. The paper did not provide a recipe of how SDI can be implemented in such critical situations, but we have opened up more research questions that can help resolve problem of failing SDI projects. And we also try to pin-point the link between governance systems in less developed countries and SDI initiatives. With this governance approach to SDI implementation, there are greater chances of success in establishing SDI in developing countries.

## **2 FEDERAL STATE SYSTEM OVERVIEW**

Decentralization is not easily defined. It takes many forms and has several dimensions. Indeed, a wide variety of institutional restructurings are encompassed by this label, and several variants may be operating at the same time within a country, and even within a sector. But it has significant repercussions for resource mobilization and allocation, and ultimate macro-economic stability, service delivery, and equity. However, there are difficult issues of equity and distributions, coordination's, stability, size and economy stand of decentralized sectors as well as the performance of the sectors. They appear to be dilemmas that generate strong arguments between scholars (Litvack et al., 1998). The benefits of decentralization policies to governance system are more clearly and widely discussed as compare with the challenges that come with its proper implementation. Therefore more of its challenges will be discussed in this paper rather than its benefits.

There are three main broad types of decentralization: political, administrative and fiscal. Political decentralization is the process of transferring the power and authority to sub national level. Administrative decentralization is the transfer of authority and responsibility of service provision of some selected public services to the lower levels or agencies. Fiscal decentralization is the resource re-allocation to sub-national levels of the government (Work, 2003).

Within this decentralization types, Work identified four forms of decentralization that include devolution, delegation, deconcentration and divestment. While terms like devolution is commonly used in political decentralization, deconcentration and delegation are common within administrative decentralization. Political decentralization is always inform of a framework on which all institutions under public system is built to necessitate universal participation and new approach to community institutions and social capital (Work, 2003). More often, devolution leads to a polycentric system of governing where all tiers of government are more autonomy in the governance and resource control. This is sometimes referred to as federalism system of government.

As noted by Baldi, federalism is always accompanied by decentralization, but it is not a necessary condition for decentralization and also decentralization is not sufficient

enough to facilitate federalism. The line between the two is however close and makes it very difficult to separate one from the other. There is difficulty differentiating between a federal state, unitary state practicing deconcentration and a decentralized unitary state (Work, 2003).

Federal states already have a structured system, devolving power and authority to each level within the system; more of polycentricism. Unitary system differs as the central government dictates the limit and conditions with delegation of authority to sub-national level; more hierarchical system (Work, 2003). Most developing countries that are practicing federal state do not practice full federal system as what they refer to as federal state is synonymous to unitary system. A good example of such countries is Nigeria. However there seems to be varieties of decentralization practices evolving in various countries based on the factors such as cultural influence, political influence amongst others. This has great impact on institutions established in such systems. Public institutions have more difficulties carrying out its operations, controlling its resources and offering services within its locality.

Therefore the problem becomes complex for Geo-information organization under a federal state system due to the institutional complexity among other crucial issues that may not well be defined in decentralization policy adopted by developing countries. According to Litvack et al (1998) it is a great challenge for many countries to coordinate doctoral reforms undertaken by a ministry of the central government with decentralization of fiscal, political, and administration responsibilities to local government. Most of these countries are developing countries, which rely on decentralization policy defined over 20 years ago. Ministries under these government system struggle to define clearly their responsibilities and boundaries across the tiers of government.

This complexity does affect the definition of the system as a whole and also go a long way in affecting various sectors under the system. More difficult is the case of GI organizations that not only deals with the above responsibilities but also finds themselves in the role of service provision and management of spatial data. Issues like data collection, data management, location vis-à-vis ownership of data is not clearly defined in decentralization policies adopted by most developing countries.

Furthermore, GI organization that is spread through all levels of government always finds it more difficult to operate within each level of government. Its basic service which is needed at the local level is been controlled and managed by the state level, based on the policies made at the national level. Thus the organization structure also will be affected as well as the information flow through the organization. Interest on information filtering and management will be shared between the controlling state level and the national level that is the top level policy maker. Many times the autonomy of the sub-national level is taken to the extreme of making its policy outside the national policy. Also in the case of unitary system, lower level of the government suffer control from the top level as most of its activities is defined from the top.

## **3 NIGERIA FEDERAL SYSTEM AND GI ORGANIZATION EXPERIENCE**

The system of governance in Nigeria is based on the 1976 Local Government Policy. This was fully institutionalized in the constitution in 1979. The policy established 3 tiers of

governance namely, Federal, State and Local governments. The decentralization policy formed that base for both the 1979 and 1999 constitution of Nigeria (Ekwueme, 2003). The 1999 constitution enable political, administrative and fiscal decentralization to all tiers of government. But there are still rifts within the tiers of government pertaining to autonomy of governance and resource control. This can be seen in various court injunctions on constitution clarifications between state and federal government of Nigeria.

The hierarchical structure of most public organizations is based on the institutional framework that is fashioned out of this policy that has been adapted into Nigeria constitution. GI organization such as mapping agencies that is institutionalized with several functions in all levels of governance are also based on the policy. It functions as the provider of national data custodian and topographic map producer at the national level, it also function as the cadastre office and land conflict resolution at its lower level. The organization finds it difficult to manage the information across all levels of the organization and also to maintain its processes at each level. Another good instance is the urban service delivery that is the function of the Urban and Regional Planning sector that is spread across all tiers of government in Nigeria.

There has been overlapping of mandates, fuzzy boundaries within operations, roles and spatial coverage. This has lead to wide negligence of responsibilities and controversy in organization system. Emanating from the situation are various organizational structure and frameworks among the State governments within particular organizational settings.

With so many organizational problems and inter-organizational challenges, Nigeria is still having forging ahead in the implementation of GISs and also proposing establishment of National SDI for the country. Many of these organizations still struggle with data managements and control, having difficulty with the issue of decentralizing services to the local level. There are still issues surrounding central decision making and tiers autonomy at the governance level and also in various GI organizations. It will be of importance to know how SDI can be successfully implemented in such governmental system.

#### **4 EXISTING SITUATION IN NIGERIA**

In 2003, Nigeria launched spatial satellite (SAT-1) to monitor the environment. That began a new era of Geo-information in the country. This opened several chances for GIS development within the country. Since then there have been several developments in GIS both at the national level and state level. Various GI Ministries and Parastatals started using GIS for data management, services delivery and also for the purpose of decision support. Private organizations such as telecom companies, banks and oil and gas sectors also contributed a lot to the development of GIS within the country. Many of these companies possess digital data of various utilities as well as imageries covering greater area in the country.

Several states have started establishing state level GIS and SDI, initiating several GIS projects with the help of United Nations and World Bank. Such projects include Lagos State Land Information System that was co-funded by World Bank, Abuja GIS that is managing the land information of the Federal Capital Territory of Nigeria.

Research institute such as Regional Centre for Training in Aerospace Survey (RECTAS) and Centre for Space Science and

Technology Education (CESSTE) have been part of the development of GIS in Nigeria. They are responsible for capacity building within the country alongside some other universities providing various levels of training on GIS and Remote Sensing.

In general, GIS is fast establishing in Nigeria and its applicability to all fields is becoming clearer through training from home institutions and also foreign institutions. But in setting up a national or regional infrastructure on GIS, there is still more to be achieved in the country. Most established GIS are inform of stand alone or concentrated. Each organization doing its own GIS and runs with the technology as it evolves. If care is not taken these blooming projects may at the end become failure. Lack of connectivity between these organizational and regional GIS developments may limit the growth of GIS in the country.

This is why SDI is very important in for the country. It is high time things are done rightly from the start instead of amending situation when it already becomes chaotic. Having a local, state, regional and national SDI is a right step that may lift the country from the present situation and help in accomplishing a successful GIS in the country.

Presently the country is taking series of steps in implementing NSDI; there has been a GI policy draft. Great minds Nigeria GI sector came together in 2003 and drafted the GI policy to serve as a guide in implementing the NSDI in the country. The policy is to be an essential backbone for the efficient realization of the NGDI. Data sharing is to be facilitated through a coordinated and structured access to geospatial data owned by public and private sector organisations within a legal framework in order to ensure the rights of all parties (Agbaje and Akinyede, 2005).

Although the present stage of the process is not clear but the policy has been drafted and await ratification from the member of Nigeria parliament. This effort and some others from both national and state organizations are relevant movement on SDI within the country.

### **5 PROSPECTS OF SDI IN NIGERIA**

#### **5.1 Existence and Awareness of GIS**

The prospect of SDI in Nigeria lies firstly in its existing situation. The current situation of GIS in the country has given it edge in establishing a successful SDI. The awareness of GIS in the country is relatively increasing. Many State governments are fully aware of the usefulness of GIS for the support of decision making and service delivery. This is evident is several GIS projects in several States and regions. Also there are many seminars and workshops on GIS usage and SDI implementation within the country.

The existence of NASRDA that is the custodian of GI in the country is also a prospect for the country. The spatial satellite (SAT-1) has sensitized many GI organizations to utilize digital data and satellite imageries in their processes.

#### **5.2 Decentralization System**

Establishing NSDI may look like a white elephant project for developing countries, considering resources factors and time of implementation. Many countries might have abandoned the issue of NSDI based on the magnitude of the input and the long time of expectance of the benefit. Country leaders may want to

begin a project that will yield short term returns for economic and political reasons. Therefore SDI related project may be too abstract and capital intensive unlike provision of basic social needs and maintenance of facilities.

However, local and state SDIs can be developed independently in federal state system. Each States can develop its SDI based on its resources and decides the purpose for which it can be developed. This allows a segmental approach to SDI development which will yield short term result and also serve as a base for a NSDI.

While the policy is been set at the national level to provide standards and guide for implementation, the implementation can be done by State and Local governments at their own pace. Also the federal government may build a framework for implementation and also a national portal through which all States SDI can be accessed. This is one of the main advantages for a federal state country like Nigeria stands to gain with decentralization system.

### 5.3 Availability of Resources:

Nigeria is one of the highest oil producers in the world and also has many other natural resources to support its economy. The country will be able to support SDI project in the country financially. Also many states are generating revenues from their resources thereby giving chances for economic expansion within the country. Although the country may not be the richest in the world and also may still be a developing country, but there is great economic potentiality to support whatever project it will like to embark upon. What is needed is a proper implementation of a well defined SDI plan defined with appropriate available technology. Possession of natural resources is a good potential to attract funding from private source both locally and globally.

Twisting the availability of resources around, it can be said that the awareness of managing several natural resources is also a prospect for establishing SDI in Nigeria. These natural resources are basic support for the economy of the country, so it is very important to manage these geographically dispersed resources. The need to manage these resources effectively and keeping record has been part of the reasons for GI organizations implementing GIS for support.

Human resource is abundant in the country as the population rises to 150 million with latest census result. Many Nigerian are busy developing themselves both within and outside the country. The level of literacy is increasing and there are more graduates both male and female in the country (Aderinoye, 2002). This is an advantage for capacity building for the country generally. Moreover, the presence of two main GI institutes and several universities offering GIS training and degree courses is an advantage for the country to develop its human resources on GIS.

## 6 CHALLENGES FOR FEDERAL STATE SYSTEM IN NIGERIA

There are basic problems facing development of NSDI in Nigeria, they include lack of digital datasets, evolving technology, GI Policy issues and lack of man power. Furthermore one specific problems that is associated with the governance structure is the institutional arrangement which has not clearly define the roles of stakeholders (Igbokwe and Ono, 2005). However, there is more to that problem than role

definition, the arrangement in itself is not clearly defined and also other issues surrounding the organizations involved.

There are many of such challenges that can be associated with a country with a federal state system of governance and few of them are identified and discussed below. These few were chosen from a critical perspective of governance structure and SDI implementation strategies.

### 6.1 Structure versus Scaling

One of the main socio-technical challenges is the issue of system structure and information abstraction across the level of government. Figure 1 shows information scaling and splitting across the hierarchy of governance and organization system in Nigeria. This structure is the simplest modeling describing the scenario of institutional framework of GI organization cutting across the levels of governance in the country.

There seems to be clear delineation between the local levels but when it gets to the state, the complexity of information management and operation control becomes fuzzy and complicated. Implementing SDI in such environment need clear definition of responsibility and boundaries.

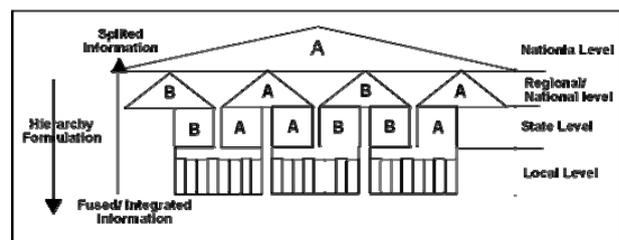


Figure 1: Hierarchical Federal State Structure

In such complicated environment, data collected locally are fused and integrated representing the reality as close as possible. But as the information is filtered up in the system it start getting trim down and also split into various sections. This issue of information scaling and splitting is important to service provision and decision making. There is dilemma of filtering quality of details needed in the process of scaling against transfer of too much details to the top where is not needed. Also this information flow pattern is contrary to the Hierarchical reasoning of splitting down structures in to smaller units approach to information infrastructure as given by Rajabifaard (2000). Moreover, information becomes duplicated as the middle tiers and top tier fights on ownership and usage of the information. At the extremes, redundancy of both data and process is created within on stream of service provision and decision making.

There is also the issue of dual top level in multi-level organization, where most middle level organization has two or more top level to be responsible to. This is common in public organization in most developing countries' federal system. There are possibilities of information flowing across the system in irregular manner(Rajabifard, 2000). Each section becoming independent of the other level, thereby communicating with all other levels irrationally. The reality of public organizations under more than one Ministry is more fuzzy and it's more likely to have multiple top level, thereby creating splitting of information at the middle level (Figure 1). Dual top level can also be caused by autonomy of certain levels of government, as GI organization in each level are to be responsible to the top

level of the organization as well as to the regional/state governing body. There will be complexity in abstraction and splitting of information for the purpose of the federal level and at the same time for the state level of the government.

Therefore in order to have a successful adoption of GIS or implementation of NSDI in Nigeria federal state system, consideration should be made on the structure of the governance system as well as the structure of the organizations participating in SDI so also the issue of information scaling. Variation in structures may lead to imbalance in services to be provided due to data and system interoperability amongst other problems.

## **6.2 GI Policy versus Decentralization Policy**

Most decentralization policies of developing countries are either very old or based on old concepts of governance. They are detailed in terms of political rights and responsibilities, governance and power devolution, financial and resources stratification. But most of them did not include organization management, service provision and most especially data management both spatial and non spatial. Such is the case of the 1976 Local Government Policy in Nigeria. This is a setback in the policy as issues surrounding collection, usage and ownership of data are not spelt out in detail. Most organizations established under the policy are either silent on such issues or use the political standards. For instance planning services are rendered at the local level of planning organization according to the URP law of 1992 which was based on the local government policy of the country. But ownership and management of planning data varies within the country's State governments. While Lagos State is claiming the ownership of all planning data within its jurisdiction, other states such as Oyo, Kwara and Osun are still in different to ownership and management of planning data. Others include EIA Decree 86 and SURCON Decree 44.

On the other hand, GI policy in Nigeria which is referred to as National GI policy is not based on the decentralization policy of the country. Of all issues addressed in the GI policy, the decentralization issues and polycentricism of organizations and governance are not addressed. It seems as if the policy abstracted from the reality of three tiers of governance and assumed a national approach of inter-organizational operations at the national level. This is a setback for SD development as most public GI organizations cut across the three tiers of government. The above mentioned decrees are stated in the draft as affiliate with the GI policy. There is an unforeseen challenge in implementing the GI policy if it does not address the issue of data in related to unitary system in Nigeria.

One major identified challenge of NSDI in Nigeria is the delay in ratification of GI policy (Igbokwe and Ono, 2005; Kufoniya, 2004; Nwilo and Osanwuta, 2004). But the problem extends far beyond the issue of ratification. It is better to correct and amend this draft while it is still not ratify, than to wait until it is ratify and face the consequences of the short comings. However, technology and concepts of GIS is fast evolving, so the policy draft of 2003 is definitely obsolete for the techniques and applications of 2008.

## **6.3 Polycentricism (Autonomy versus Common Interest)**

Closely related to the above challenges is the issue of autonomy within the Federal states in Nigeria. State government within the country is autonomous in resource management and

development processes. They define policies relating to service deliveries within their boundaries amongst other regulations. This has brought about polycentricism of the middle tier of the governance in Nigeria. There have been movements of complete resource control and policy re-definition in advantage of state governments. The most recent movement in the country is the local government trying to claim autonomy from the state and federal government.

While this may seem as a good sign of empowerment of lower tiers of government within a federal state system, it also comes with challenges of individual interest overriding the common interest of the country. Establishing SDI in such polycentric system will come at a cost of interoperability. Each State government may involve various standards and different tools that may not interoperate with one another. The situation may become complex if local governments establish different standards for SDI.

Lagos State is having its GIS infrastructure and Land information system, Abuja FCT is establishing its GIS, Enugu State is starting its GIS project soon and Oyo State is presently digitizing spatial data. These projects and lots of others are done independently with different standards and applications. One vital question should be about the platform on which the National SDI will be built. Is it going to assume its own standard and applications using its own National data or build on the state divided SDIs. The challenges range from purely technical problem of data interoperability to basic social problem of trust and transparency among the State of the country.

## **6.4 SDI Project scale and Resources Availability (Imbalance Resources)**

Local Governments in Nigeria are mostly supported by state governments so they have limited resources to be autonomous, but some of them still propose autonomy of local level. Moreover, there is great imbalance within State governments that are supporting these local governments. While some are very rich in resources and revenue, others are highly dependent on allocations from the federal government. Implementing SDI in each level of governance requires lots of resources and capacity which may be too much for federal government to solely sponsor. How these projects can be founded is a strong challenge against a successful implementation of SDI in the country.

Some local governments have resources to conveniently establish SDI and some cannot even maintain the existing manual data handling system. The same imbalance applies to the State governments and also political regions. While some can afford the most expensive and most recent technology, some have to rely on cheap and open source tools and application if they were to implement SDI.

## **6.5 Public Private Partnership Deficiencies**

Nigeria as an example of developing country still has weak public and private partnership. This can be attributed to many factors of socio-economy within the country. They include Long age of disparity between public and private capital, resources and capacity, and also due to difference in targeted values of the two parties. While public offices are targeted at public service delivery (pure public good system), privates are going for profit oriented service provision.

The issue of NSDI is even more particularized to public organization rather than a joint effort of public and private organization. According to Agbaje and Akinyede (2005), government agencies are the main sources of geo-information in Nigeria and hence the major stakeholders in the development of the infrastructure. Placing public organization as the major stakeholders and private as minor in the NSDI project in Nigeria may have adverse effect on its success.

Also the structure of the private organizations is absolutely different from most public organizations which reflect decentralized structure. Combining data and services from such different structured organizations may be very difficult. Issues like data scaling and level will be of great concern in fostering public private partnership.

## 6.6 Political Interference

There is imbalance of priorities by difference government and political administration. While one state government realized the necessity of establishing SDI within the its state, the bounding states may have some other projects in mind. Some governors believe in solving immediate problems than making a development plan that will last longer than their tenure in office.

Variance of priority affect issues like purpose of the SDI, some may target Health service with GIS and the other thinks of LIS for the purpose of land revenue and taxes. Also the effect is on budget allocation for SDI implementation and availability of alternative technology at cheaper cost to save money.

Personal interests, Political rivalry and Corruption of power are main plague in African developing countries that are affecting implementation of development projects. SDI is not exception as most brilliantly packaged SDI projects are either not implemented or result to failure due to poor funding and sabotage.

## 7 CONCLUSION

There are several other prospects and challenges of SDI in Nigeria but these few were mentioned to create insight into the existing situation. Also complex governance structure based on decentralization policy may hinder smooth NSDI implementation but at the same time help in developing Local and State SDIs. Therefore it is necessary to consider the governance policies and impacts on GI organization as one of the criteria to be used in establishing NSDI projects in developing countries. However, the challenges mentioned in this paper is integrated and also have many sub problems that may hinder successful implementation of SDI in Nigeria

Building SDI assumes the alignment of government organizations concerned with geo-information across all levels of government. Aligning multiple agencies with different workflows, diverse technology and system (mandates). Integrating their workflow and business models will be daunting, having difficulties and heading towards failure (Georgiadou, 2007). More difficult is it when such GI organizations cut across all levels of governances in a federal state system. Before any alignment can be done, there is need for detail examination of the system to identify all factors surrounding GIS implementation, going deep to the root of all policies supporting GI activities and stakeholders.

In conclusion, the strength of SDI in Nigeria lies in its challenges. If the country can confidently face those challenges and find solutions to them, they can be turned into potential factors that will facilitate successful implementation of SDI in the country. Also this issue can be generalized to many other federal state developing countries that are embarking on NSDI implementation in order to find both the weaknesses and potentials of SDI localization in their region. Developed countries with similar governance system can be a guide in the setup of SDI in the country but it should not be used as a blue print to which the SDI is planned.

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