A Framework for Electronic Services Integrationand Seamless E-Services Delivery in Nigeria Public Sector

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Abstract -The network of computing facilities engineered by the invention of the internet has significantly transformed the mode of service delivery in the public sector from traditional -location and time- based mode to electronic- boundaryless and timeless- mode which aims at facilitating efficiency and effectiveness in service delivery. In a developing and mono-economy nation like Nigeria where oil production is the main source of revenue and where slight variation in the price of oil do cause significant impact on the economy, internally generated revenue is seen as a strong point of leverage where negative impacts arising from variations in crude price can be mitigated by revenue generated from public sector services to the citizens. Thus, in attaining ease, transparency and inclusiveness;revolutionizing the service electronically (e-service) becomes important. This paper provides a strategic framework aiming at guiding the deployment of e-services as part of e-government in Nigeria. The needed interrelationship and communication essential for efficient and effective e-service delivery among existing government agencies were delineated and the additional infrastructure required for the collaboration leading to good service delivery were described.

Keywords-- *Web Service Applications, Government Agencies, E-Services, E-Service Framework, Nigeria*

1. INTRODUCTION

The invention of Internet and the web have resulted in service revolution and reinvention across the globe, thereby making Internet and the Web basic necessities [1]. With the use of the Internet, the communication and interaction among citizens and the government can be conducted anytime and anywhere with the click of mouse and without physical presence at any government offices [2]. This will enhance the accountability of government; improve the efficiency and effectiveness of internal operations, and public communication with the citizens.

According to [3], e-governance are of three main domains: E-administration, E-services and E-society. In a nation with no practical guideline on e-government strategy, experimenting with e-service is seen as a good start. More so, the need for services is mandatory for the public, whereas generation of revenue is also important for government. Therefore, proper deployment of E-services can re-engineer the provision of services in a nation in ways that help to eliminate corruption and promote transparency and accountability. Subsequently, it builds trust and participatory governance.

The web is fast becoming the avenue via which many governments deliver services to citizens for several needs. The prediction by [2] that the number and variety of services rendered online are increasing on daily basis with a faster pace expected in the future has now been proved right as service delivery can be made possible irrespective of time of the day and the location of the agency. [2] maintained that the success of e-services was not only a function of government support, but also on citizens' willingness to accept and adopt e-services.

According to [4], in the government circles, electronic services are referred to as e-services, which relate to services that public organizations provide. The term e-services are further defined as interactive and content-centred services that are accessed through the Internet [5]. E-service platform provides the opportunity for value-added and integrated

services, which are delivered by composing existing e-services. The goals of e-services are not only to move forms and services provided by different agencies of the government to Internet, it is more a question of developing one-stop government solutions and the possibility to include citizens into government in a more active and mutually useful [6]. It is therefore expected that e-services will bring added value in the management of government organizations and increase efficiency in internal processes. This provides a means of improving the quality of government services and encouraging greater participation in the democratic process via the use of innovative information and communication technology (ICT) [7].

However, due to rapid use of ICT some government agencies in Nigeria have developed e-service portals which rely on information technology (IT) [8]. Like every developing nation, Nigeria is striving to achieve best practices or international standards where most services are rendered electronically. Consequently, it has set for itself the goal of developing its ICT infrastructure so that IT becomes an enabling platform for effective service delivery from one sector of the economy to the other. E-service in Nigeria can be traced to the formulation of the Nigerian National Information Technology (NNIT) policy in the year 2000 during the reign of Chief Olusegun Obasanjo as the president. The main goal of the policy was to make Nigeria an IT capable country in Africa and a major player in the information society and also use IT for various service delivery, job creation and good governance [9]. Although the 2016 global ranking for e-government adoption ranked Nigeria 143 out of 193 nations, a score of 0.4143 out of 1 in online services was the highest score among other factors used as indices for the ranking. Moreover, e-services delivery when adequately catered for will eventually drive Nigeria to desirable level in e-government adoption. Thus, this study is focusing on e-services in Nigeria as there are existing practices under this aspect of e-governance which can be adequately deployed to provide implementation guide for both e-administration and e-society.

II. BACKGROUND OF THE STUDY

A. The Prospect in Information Technology

Obviously, the role of Information Technology (IT) in economic growth cannot be overemphasized. E-services are made available when traditional business processes are re-engineered to take advantage of information technology for accessibility and reachability irrespective of location and time. The elimination of human intervention in service delivery is also catered for to some degree by the use of IT and this is the focal point where technology plays significant roles in a nation like Nigeria. A major challenge to revenue generation in Nigeria is the leakages of public funds to the hand of individuals. Thus, the provision of services electronically will help assist to checkmate fraudster's activities in the collection of various government revenues in Nigeria [10]. Apart from IT eliminating human meddling to some extent, several portals of government agencies exist in silos and fail to cater for seamless delivery of services that cut across different governmental agencies. Although, the development of portals indicates technology engagements, lack of integration of these portals is clearly a serious missing link, which has been attributed to unavailability of strategic framework to guide e-government deployment in general.

B. Information Systems for E-Services in Nigeria

The development of information systems for the uptake of e-services in Nigeria has been on the increase. Government agencies acknowledged the need to transform from the traditional service delivery into the electronic form and many have keyed into the development of systems to make their information available via websites or portals. Several agencies of government among which are; Immigration, Custom, Nigerian Port Authority, National Health Insurance Scheme, Police Force to mention but few have their services available on the web. Separately, each agency with its own information systems has been rendering services electronically to the citizens, though without adequate consideration for interoperability and integration for information exchange, harmonisation

and sharing. Adversely, cases of discontinued use of information systems among these agencies is not uncommon and this has subjected the citizens to lots of hassles such as reprocessing of some services. Due to inadequate plan in the use of information systems, effectiveness and efficiency expected from the provision of e-services have not really been met. Another salient observation is the lack of transparency and trust among the citizens in the way information systems are used for the provision of e-services in most of these government agencies.

C. Existing Platforms to Support E-Services Provision

There are government agencies in Nigeria with statutory responsibilities that will aid effective and efficient delivery of e-services to the citizens when their roles are adequately tailored to create seamless services. First among these agencies is the National Identity Management Commission (NIMC), which is the institution in-charge of creating unique identification number and managing the registration data of every citizen. Another one is the Corporate Affairs Commission (CAC) which is a similar body to NIMC but in-charge of corporate or business registration. In an integrated systems environment, information residing within these two agencies can be easily shared or pulled by any governmental agency rendering services electronically to citizens (C2G) or business organization (B2G) respectively. A practical and purposeful use of these two agencies will undoubtedly lay good ground for efficiency and effectiveness in service delivery as individuals or business organizations will only need their identification or registration numbers to perform any transaction electronically. Figure 1 depicts this unique role of agencies managing identity registration. In addition to the agencies mentioned above, Nigeria also established National Information Technology Development Agency (NITDA) which is responsible for IT policies in the nation and registration of any ".ng" amongst others. Thus, NITDA is the registering point of any government-based e-service link in Nigeria. This role exercised by NITDA is to eliminate the fear of being lured to fake sites and ensure that trust in the e-service platform is strengthened. A new policy of the government called Treasury Single Account (TSA) which mandate all government agencies to close multiple accounts and use single account domicile with the Central Bank of Nigeria (CBN) as financial transaction platform provides good avenue for transparency and accountability in the delivery of e-services. With all these institutional provisions on ground, it is believed that the building blocks for adequate and accountable service delivery are in place to be explored.

Figure 1. (Source : https://www.nimc.gov.ng/about-nin/)

D. E-Literacy and Digital Connectivity

Generally, e-literacy represents the level of knowledge, skills and readiness of peoples to participate in an IT enabled society. Thus, the engagement of Nigerians in information-based activities via digital platforms has shown a paradigm shift of citizens queueing for services to those wanting to get thing done at the comfort of their homes. Since the advent of stable democracy, internet usage in Nigeria has grown tremendously from 0.1% in the year 2000 to 46.1% in 2016 (Internet live stats, n.d.). The acceptance rate of e-banking clearly indicates an appreciation of e-service delivery. The revolution in service delivery which makes it possible to roll out services using mobile based applications further strengthen the digital connectivity of citizens in Nigeria. As one of the nation with high uptake of mobile gadgets with internet accessibility in Africa (itnewsafrica.com/2015), digital connectivity is

getting entrenched and the provision of digital services will further strengthen this. Therefore, e-services provision will have positive influence on digital connectivity of the citizenry.

III. THE PROPOSED FRAMEWORK

Primarily, this paper focuses on the development of a framework that abstracts e-services as an aspect of e-government strategies. According to [11], a strategic framework provision has been the missing link in most e-government strategies worldwide. A framework that guides the development of a project through the pilot stages to full implementation is essential for successful deployment. Lack of guiding framework have resulted in nations replicating e-services from sister nations and such practices have been found to have resulted in wastage of time, money and resources [11]. Since no approach can be said to have provided universal best practices in e-government strategies, public values of interest have become the guiding vision with which different nations set their strategic plan in e-government development.

In Nigeria, transparency and accountability are the bane of public service delivery, thus culminating in corruption. Therefore, transparency and accountability can be seen as worthy goals guiding the development of strategic framework for e-services as a part of e-government in Nigeria. With transparency and accountability helping to stamp-out corruption, other public values such as participatory, trust, efficiency and effectiveness will be catered for. Minimizing human mediation in service delivery would curtail the major loopholes through which corruption activities thrive in Nigeria.

A. High-level View of Proposed Framework

For the attainment of seamless service delivery, integration across different levels becomes essential. Such integration means sharing of information and process needs to be addressed in two stages to enable meaningful service transformation. Likewise, it involves integration of applications within an agency and others external agencies participating in service delivery chain. The earlier peer-to-peer integration approach in e-government does not allow for loose coupling of applications, system agility, expansibility as well as interoperability thus inhibiting utilization throughputs. Therefore, the proposed framework takes a sequential integration approach consisting of processes, resources and their integrations based on Service Oriented Architecture (SOA). SOA is an architectural approach to software design that allows components to communicate and provide services to one another over a communication platform or network have been considered as viable platform seamless integration of applications and technologies [12],[13].

Thus, in enabling internal integration because of the possibilities that information systems within agencies or MDA are stove-piped, Figure 2. presents the basic architecture representing the layers of communication among several components of organizational (agency-based) information systems. This specific framework is to serve as guide for agencies rolling out services electronically to ensure that seamless internal functionality exists.

The presentation layer at this stage is accessed via intranet and it is only available to internal users for processing service request. The middle layer (business logic) refers to where the rules on intercommunication and the methods for such are defined and implemented. The web service application server (WSA), business process server (BPS), enterprise service bus (ESB) and the registry server are put into use in this layer. WSA server deals with the creation, deployment and management of web services. With WSA server, software objects are created with different languages are able to communicate when they are web-service enabled. ESB is a middleware facilitating integration of business processes by providing an intervening layer where reusable web services developed in different environments are made available [14], [15] for use. The BPS carries out business process by using Web Services Business Process Execution Language (WS-BPEL) standard to construct web services into complex applications[16, 17]. Registry server registers web services available to be shared with external applications based on the Web Service Description Language (WSDL).

The database layer encompasses databases of different applications that are integrated according to push or pull models. In the push-based approach; application calls on another application's database via structured query language (SQL). However,

integration based on pull approach relies on triggers and polling. The triggers aggregate data changes to be made available to interface tables and the polling is carried out by adoptors who retrieve the changed data.

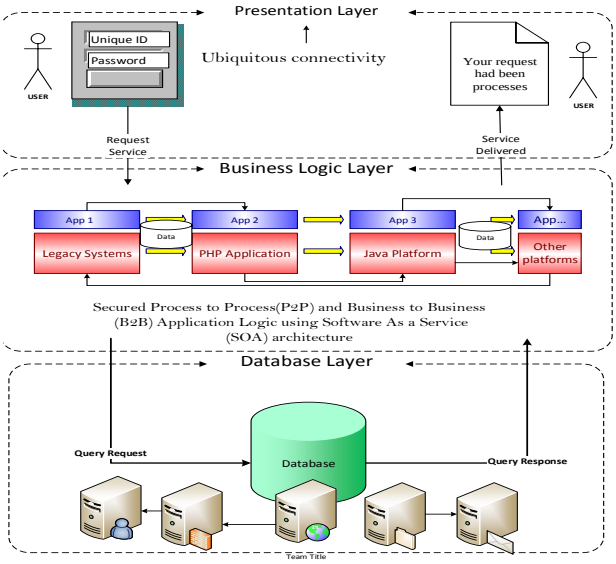

Fig 2: The system Architecture

B. *Detailed View of the Proposed Framework*

Figure 3 presents detailed view of the proposed framework for e-service delivery that takes care of information, processes and services sharing across different agencies. Using SOA based integration technology (web services), the study builds on the work of [18]to specify the layers of communication among several components of the framework which involve the client layer, e-service layer, business logic layer and the infrastructure layer.

1) *Client Layer*

The client layer specifies the varieties of objects requesting e-services via the unified or single access platform. The single access platform converges the gateways to all e-services provided by government and allows for expansion when additional services are available to be integrated. At this level, various types of clients are identified: the citizens, businesses, other government agencies, and other non-governmental agencies. In addition to this level are the medium of accessing the unified e-services; in this category are the mobile-phones, tablets, PCs, web etc. It is important to note that this framework would take advantage of widespread utilisation of smart mobile phones by Nigeria educated elites who are the primary consumers of e-services. Thus, mobile apps and USSD development for assessing the single e-service platform will need adequate consideration.

2) *E-Service Layer*

The next layer in the architecture is the e-service layer that integrates all the existing e-services provided by government. A common or general interface is provided to make the web interface for any of the e-service easily accessible to users. Because of the expected increment in the number of services to be made available and for future need, further categorizations of these web interfaces are collated to a unified platform that provides a single sign on access. This layer also provides the room for incremental addition of new e-services. A single sign-on access is believed to be better than multiple access in the sense that it facilitates the provision of higher quality of service to those who demand for different services. This layer constitutes an important layer in promoting the visibility of online services that are available to citizens. The need for process integration is also envisaged at this level. Therefore, with the single access approach, e-services provided will be grouped according to citizens or business need. For example, the importation of certain items such as drugs or food require the clearance of National Agency for Food and Drug Administration and Control (NAFDAC).

3) *The Business Logic Layer*

The business logic layer connects the e-services layer and the data repository or information source for easy exchange and sharing among different systems making up the e-services eco system. This layer provides the strong foundation for an integrated single e-portal of government services and allows for strong interrelationship and collaboration among

government agencies. The layer facilitates real-time communication between systems of different government agencies at the data and process levels. The layer in this framework uses the technologies of web service applications to facilitate data integration, manipulation and rendering of information in real time. Different technologies have been proposed by industry as integrating medium for organizational integration. Among these are Enterprise Resource Planning (ERP), Enterprise Application Integration (EAI) and Web Service Applications (WSA). Web service being the technology for Service Oriented Application has gained prominence

4) Infrastructure Layer

The basic foundation for the development of integrated services using the business logic applications is in the infrastructure layer.

The communication and interrelationship among different systems cutting across organization can only be realized when strong and reliable infrastructure are put in place. Consequently, a lot of technological investment is required at this stage. Without the infrastructure and agreed standard of communication, electronic transactions within and across organizations becomes difficult, thus the technological needs which needs to be provided for effective and efficient service delivery are the focus of the infrastructure layer. Basic technological requirements such as servers, computing platforms, local area network (LAN), intranet extranet and internet and other networking infrastructures provision remains paramount at this level.

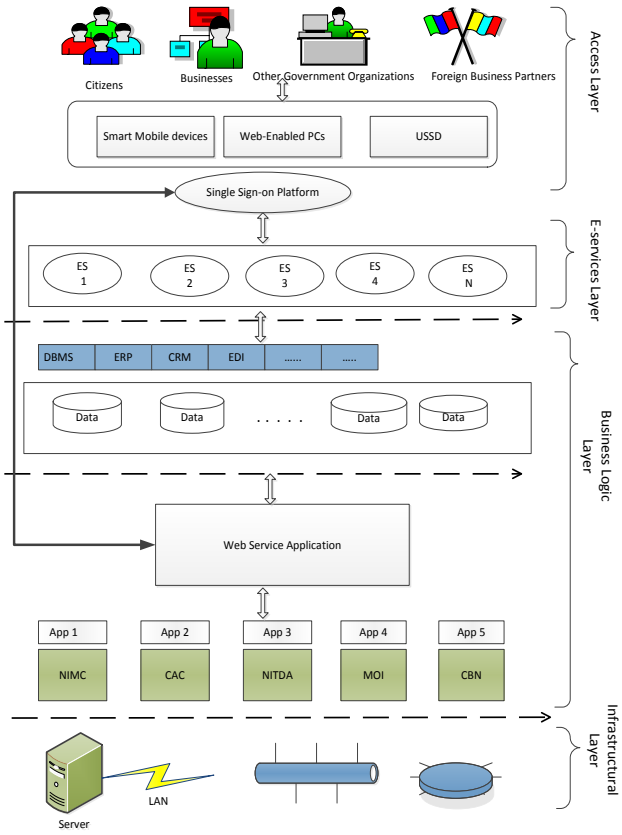

Fig 3: Detailed View of the Framework.

IV. CONCLUSION

The importance of migrating public sector services from paper-based mode to electronic form is high in a nation where citizens are showing much appreciation of electronic and mobile platform for business dealings. Consequently, the understanding of e-services delivery through an architectural and strategic framework is more important in the light of the fact that services span within and across agencies of government where data, information, resources and processes are shared. The purpose of this study has been to develop a strategic framework that guides policy makers in Nigerian public sector on how to properly harness and leverage on the functions of existing government agencies and integrate processes across organizations for effective and transparent service delivery. The framework delineated four layers comprising access layer, e-service layer, business logic layer and infrastructure layer. Based on the identified functions of existing government

agencies, the framework advocate for unique identity via national identification number (NIN) for citizens and corporate unique number for business as the only information requirement for e-service requests. The framework also acknowledges the importance of safeguarding the citizens from fraudulent sites and promoting transparency by incorporating the roles agencies responsible for registering the ".ng" domain and linking revenue generation from various e-services to the government single payment platform to promote accountability and block leakages.

Although the framework has described necessary architectural needs and linkages for robust national e-service platform, it is imperative to note that the study is purely qualitative. Augmenting the study with quantitative approach and purposive interviews where practitioners and stakeholders are asked to make inputs would further strengthen the reach applicability of the framework.

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