A Conceptual Model of Mobile Rural Information Kiosk

Auwal A. Tata and Mustapha M. Sani

Abstract-Sub Saharan Africa is endowed with small and medium scale farmers producing a large percentage of food crops, sustaining its large local populace and environs. Lack of access to knowledge on modern farming techniques has greatly prevented these farmers reaping the full benefits of their labour. As such, lots of wastages are evidence along the full line of crop cultivation. As a solution, successive governments have been utilizing the services of agricultural extension workers to disseminate information on better farming techniques to the rural farmers. Recent population growth has proven this system to be inadequate.

Information and Communication Technology (ICT) has proven to be a cheap and effective means of information dissemination. In particular, mobile communication has broken the barrier of infrastructural deficit in rural community as it relates to communication. Additionally there has been an unprecedented burst in the use of mobile telecommunication across rural communities. This paper takes advantage of these trends to presents an effective communication model for the implementation of an information kiosk that will complement the effort of the extension workers to better serve the rural farmer. A combination of Software-as-a-Service (SaaS), Platform-as-a-Service (PaaS) and mobile communication infrastructure are combined to work as components of an information kiosk for effective communication. This will afford the rural farmer an easy-to-use and familiar tool for having cheap access to extension services.

Keywords-Information Kiosk, SaaS, PaaS, IaaS.

I. INTRODUCTION

Agriculture is the primary source of livelihood of rural African communities, providing a large proportion of the food need of its communities. Nigeria in particular is one of the most naturally endowed nations in Africa having virtually all its landmass very arable suitable for cultivating various cash and food crops. Agriculture plays significant roles in Nigeria's economy accounting for about 20% of the GDP. This however is a sharp decline from a previous GDP 32.1% according to the World Bank Group [1]. Over the years information on better farming techniques are largely from indigenous or local knowledge that has been passed from generations. But this has proven insufficient to tackle modern challenges resulting in continued decline in farm yields [2].

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In an effort to revert the trend, successive governments has employed the services of extension workers to be able to educate the rural farmers on better farming techniques. The growing demand in terms of quantity and quality of agricultural product offers opportunities for improved livelihood of the rural farmers. However, the fast growing population of Nigeria has largely rendered the services of the extension workers unnoticeable. More so, modern challenges and lack of easy access to effective solution techniques has partly hindered the ability of the Nigerian rural farmers from meeting up with accompanying escalating food demand [3].

Information and Communications Technology (ICT) presents a highly suitable and effective means of educating the rural farmer thus ensuring better and improved livelihood [4]. Additionally, Achieving sustainable agricultural development lies more on the knowledge, information sharing, appropriate communication methodologies, channels and tools available to the rural farmers than on the material inputs such as seeds and fertilizers [5]. Conversely, It will be right to assert that harnessing the power of ICT will greatly enhance the information requirement of the rural farmers, creating the much needed awareness that will not only bring them out of the current state of poverty to a much desired state of affluence.

Coleman affirmed that providing information to rural communities in Africa can best be achieved through ICT tools. One of the most viable ICT platforms for dissemination of information to rural communities globally is the use of Public Internet Terminals in the form of Information Kiosks [6]. But this has proven unsuccessful. Socio economic factors, illiteracy and computer phobia has greatly contributed to the failure of such system in rural communities [7].

The recent proliferation of mobile phone has transformed communications in sub-Saharan Africa, with countries like Nigeria and South Africa attaining about 90% mobile phone ownership within its adult population. It is even more encouraging to know that there has been steady rise in the smartphone penetration in the region, with appreciable number of users using the smartphone to access the Internet [8]. Perhaps, taking advantage of this unprecedented love for mobile devices could avail us with a means of easily disseminating information timely to rural farmers on modern farming techniques and best practices.

Tata A. A. in an earlier paper conceptualized an information kiosk model that took advantage of the rising trend in mobile phone penetration. The model, based on the Closed User Group (CUG), constituted the rural farmers and the extension worker into a group of users registered with a particular Mobile Network Provider. A monthly payment plan is agreed upon, that will afford unlimited intra-group voice

calls for exchanging farming information [9]. As ingenious as it looks, this model is not devoid of peculiar problems.

II. STATEMENT OF PROBLEM

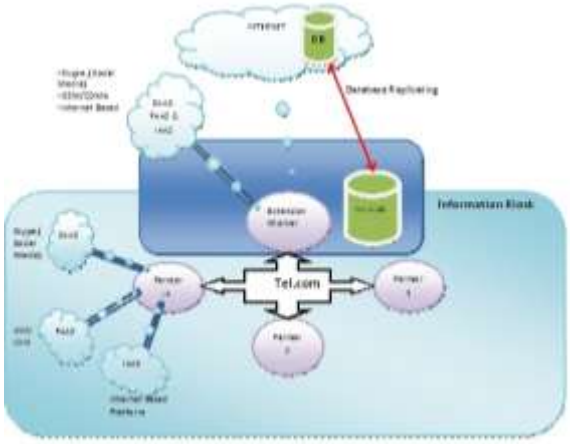
This work is an improvement on the earlier mentioned CUG based model. In particular, it attempts to address the following shortcomings of the CUG model:

1. Monopoly of a single mobile service provider
2. provide the flexibility of platform
3. One-to-one communication

III. METHODOLOGY

An extensive study of journals and write-ups highlighting the importance of information to the improvement of the farming output of the rural dweller was carried out. The wide acceptability of information and communication technology via the mobile phone and its corresponding easy means of disseminating information were also established. Related works, particularly the CUG based model of an information kiosk was studied to see the inherent problems associated with it and improvements and modifications were made on the model to further enhance rural farmers' easy access to farming information that will translate to better yield.

IV. THE PROPOSED MODEL



V. MODEL DESCRIPTION

The information kiosk is essentially cloud based. This affords users with services to access software, hardware and data resources in a transparent way The goal of such cloud is to renders users with services to access software, hardware and data resources in a transparent way. [10] Figure 1 is an illustration of its schematic diagram. The entities labeled farmer are essentially smart phones in the custody of the farmer. The phones are access devices to different cloud delivery service platforms[11];

1. Software-as-a-Service (SaaS)
2. Platform-as-a-Service (PaaS)
3. Infrastructure-as-a-Service (IaaS)

Software-as-a-Service (SaaS): Is a software distribution model in which application is centrally hosted on a cloud infrastructure by a service provider and made available to a customer through client interface e.g. web browser [12] [13]. A social media application will be installed on each phone and registered on a group. The group will then form a rallying point for; farmer-to-farmer, farmer-to-extension_worker and extension_worker-to-group communication. This will be mobile service-provider independent.

Platform-as-a-Service (PaaS): Is a development platform, supporting application hosting environment, as a service to developers over the web to possess development infrastructure including processing environment, tools, configuration management, etc. A PaaS provider hosts the hardware and software on its own infrastructure. As a result, PaaS frees users from having to install in-house hardware and software to develop or run a new application. [14] [15]. With the current downward trend in call charges [16], the need for implementing CUG as a means of cutting call cost is defeated. Communication between all the stakeholders can commence using the call platform provided by the mobile service provider. In particular the extension worker with a higher literacy level and little state funding, can initiate conference calls to disseminate information easily.

Additionally, a simple and intuitive web portal can be implemented in the local language for demonstrating various farming technique. This should be administered at a central level for country wide access. The farmer entity can now be used to access the web information.

Infrastructure-as-a-Service (IaaS): This service is offered via remote delivery of a full computer infrastructure e.g., virtual computer, server, storage device, etc. for running application and platform [17] [18].

The smartphones that make up the farmer entity, the mobile computer at the disposal of the extension-worker entity and the servers hosting the services all form the foundation of the cloud delivery services. These constitute the bedrock that supports the SaaS and PaaS.

It can be seen that the extension worker entity is a step ahead of the farmer entity. In addition to the smart phone, it comes with a mobile computer device attached. This has installed locally a database platform that captures all peculiarities of all communications. The local database is then synchronized with a cloud based database that is accessible to decision and policy makers for effective policy formulation.

VI. CONCLUSIONS

It can be observed that dependence on a mobile service provider for the implementation of the kiosk is avoided since the system is platform independent. Each locality can decide to choose the platform to use based on market factors such as call tariff and data charges. Additionally, this model exhausts all options currently available for information dissemination using the mobile phone, thus providing the flexibility of choice.

The model provides for high scalability in terms of the number of farmer entity that can be in a group as well as the geographical span of their locations. A single group can service an entire region in a country sharing similar farming conditions.

This model provides an intuitiveness that even conventional information kiosks might not provide. It has the capability that almost equals man-to-man communication between the farmers and the extension worker. This is made possible by the ability of the modeled kiosk to provide voice, video and data communication for dissemination of farming information.

On final note, this kiosk is completely mobile and cloud based removing the burden of managing the technicalities of maintaining an information kiok from the farmers. More so it is immune to vandalism.

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