Towards a More Mobile KMS

Julius Olatunji Okesola
Dept. of Computer and Information Sciences
Tai Solarin University of Education,
Ijebu-Ode, Nigeria
tunji_okesola@yahoo.co.uk

Oluwafemi Shawn Ogunseye
Dept. of Computer Science
University of Agriculture
Abeokuta, Nigeria
Ogunseyeoluwafemi@yahoo.com

Kazeem Idowu Rufai
Dept. of Computer and Information Sciences
Tai Solarin University of Education,
Ijebu-Ode, Nigeria
ruffyk2001@yahoo.com

***Abstract*—Present knowledge management systems (KMS) hardly leverage the advances in technology in their designs. The effect of this cannot be positive because it creates avenues for dissipation and leaks in the knowledge acquisition and dissemination cycle. In this work we propose a development model that looks at KMS from the mobility angle enhancing previous designs of mobile KMS (mKMS) and KMS. We used a SOA based Smart Client Architecture to provide a new view of KMS with capabilities to actually manage knowledge. The model was implemented and tested as a small scale prototype to show its practicability. This model will serve as a framework and a guide for future designs.**

Keywords- Knowledge Management; Service Oriented Architecture; Smart Client; Mobile KMS; Architecture Introduction *(Heading 1)*

I. INTRODUCTION

Knowledge still remains the key resource for many organizations of the world. This is going to be the status quo for a long while. Organizations therefore attach a high level of importance to knowledge acquisition and dissemination. The understanding of this fact is however not fully appreciated nor obvious in the design of many KMSs. Tacit knowledge which is the major source of competitive edge can be very transient, organizations that have the utmost value for knowledge would therefore understand the need for a system that can help acquire knowledge from experts or knowledge sources regardless of location and time and can also help disseminate knowledge to where it is needed when it is needed. We emphasize two concerns for consideration, firstly, Knowledge is only useful when it is applied [awad], but knowledge can only be applied when it is available when and where needed. This therefore requires KMS designs geared towards mobility. Secondly, since tacit knowledge can be generated in any instance, we need KMS's that is optimized to be available at those instances to facilitate acquisition of such knowledge for solving an organization's problems. These are issues that tend to emphasize a need for a more mobile oriented based design for KMSs. Mobility as referred to in this work goes beyond the use of mobile devices like Smart Phones, PDA's and mobile phones to access KMS, We instead proffer a model using current Service Oriented Architecture (SOA) and smart client architecture that can cut across different hardware platforms and

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positions KMS for quick dissemination and acquisition of knowledge and other knowledge management functions to the benefit of the implementing organization. We do not limit our design to mobile devices like the previous reference models because of the fast disappearing line between the capabilities of mobile devices and computers. However, like the previous reference model, we however take into considerations the limitations of mobile devises [4], the limitations of organizations as regards location of experts and the individual limitation of the experts which can include, distractions, time pressure, work overload etc. We therefore build on previous research closing the gap between them and current possibilities and shed light on a potential way forward.

II. A New Model

Current KMS and mKMS design is really too network dependent helping only to retrieve and present knowledge resources to staff that are not within company premises but have access to company network [1& 2]. Our proposition improves on this by considering more than retrieval and presentation to acquisition and scalability. We also consider a bypass to intermittent connections through the design in such a way that if the staff is outside the reach of organization network for any reason, when he/she is within the network, they are immediately kept at par with any modifications or changes to sections of the knowledge base that affect them. They can also store knowledge on the device's light database/memory for upload to the server at a later time. previous work [5], shows that the basic expectation of a mKMS are.

– facilitating the registration and sharing of insights without pushing the technique into the foreground and distracting mobile workers from the actual work,
– exploiting available and accessible resources for optimized task handling, whether they are remote (at home, in the office, or on the Web) or local (accompanying or at the customer's site), and
– privacy-aware situational support for mobile workers, especially when confronted with ad-hoc situations.

That is, mKM systems must not only provide mobile access to existing KM systems but also contribute to at least some of the above management goals.

A. SOA & Smart Clients

Service Oriented Architecture is an architectural paradigm that helps build infrastructure enabling those with needs (consumers) and those with capabilities (providers) to interact via services across disparate domain of technology and ownership [7]. SOA can enable the knowledge capabilities created by someone or a group of people be accessible to others regardless of where the creator(s) or consumer(s) is/are. It provides a powerful framework for matching needs and capabilities and for combining capabilities to address needs by leveraging other capabilities[7].

Smart clients can combine the benefits of rich client applications with the manageability and deployment of thin client applications

Combining SOA and Smart Clients provides the following capabilities[3]:

- Make use of local resources on hardware
- Make use of network resources

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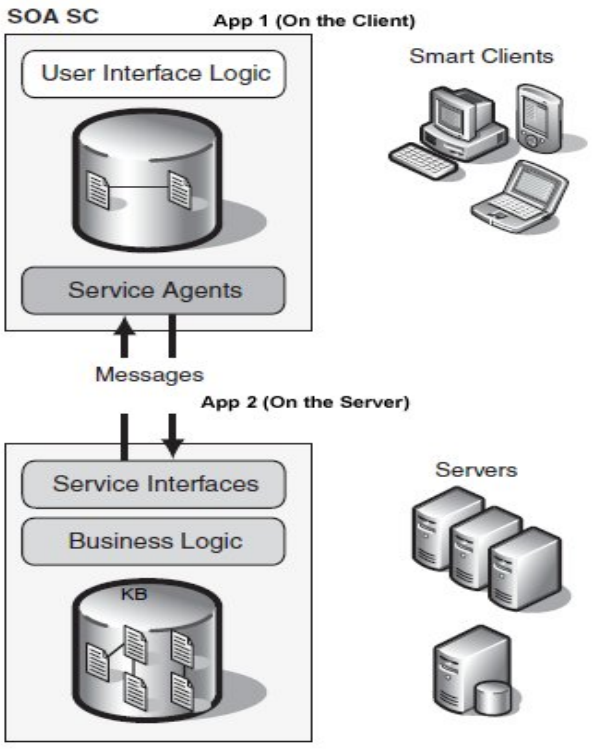
- Support occasionally connected users and field workers
- Provide intelligent installation and update
- Provide client device flexibility

These features are considered major advantages in improving KMS reach.

III. The Design

We propose a SOA based smart client model. The model can work with most mobile/computing device [3 & 6] and is not restricted to those that can use a database system. It also allows for loose coupling. The system's main business logic and data layer is situated on the server and a minor logic and application/presentation layer will reside on the user's machine.

Figure 1 below shows the overall architecture of our proposed model



The system will therefore have two parts, the server side application (App 2) & the client application (App 1).

1) At the client (App 1)

the system uses a thick client that can run on a wide range of devices from mobile devices to laptops. The smart client has the security information (login) and the user can use it to enter knowledge as it is generated in their field operations. The knowledge is synchronized with the company's knowledge base once they are within the reach of a network or onsite.

With App 1, the user will be able to store tacit knowledge as they are generated in the field. These knowledge which would normally be either scribbled down in jotters/ pieces of papers or forgotten (lost), can be saved and uploaded into the company's server when the user is within the reach of company network.

2) At the Server (App 2)

The server application comprises of a summarizer module. The module provides summary for knowledge solution which it sends to the client app/remote device. We employ on site synchronization between mobile device/computer with the KMS server. On site users can get the un-summarized version of the solution while the off shore users have to request. Further illustration is done through our sample application in the next section. The advantages of the new model are:

- decouples the client and server to allow independent versioning and deployment.
- reduces processing need on the client to a bearable minimum.
- gives more control and flexibility over data reconciliation issues.
- affords a lightweight client footprint.
- structures the KMS application into a service-oriented architecture.
- gives control over the schema of data stored on the client and flexibility that might be different from the server.

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- The client application can interact with multiple or disparate services (for example, multiple Web services or services through Message Queuing, Web services,

or RPC mechanisms).

- custom security scheme can be created.
- Allows the KMS application operate in an Internet or extranet environment.

many smart client applications are not able to support full relational database instances on the client. In such cases, the service-oriented approach shines bright ensuring that the appropriate infrastructure is in place to handle data caching and conflict resolutions [3].

The figure bellow depicts the message exchange pattern between the proposed model.

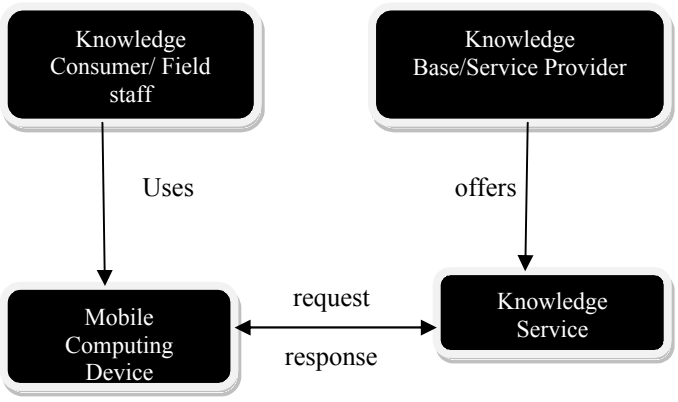

Figure 2: The interactions within the system

IV. APPLICATION

A prototype inter-Agency Criminal Knowledge and Intelligence System called the "Field Officer Knowledge Engine" (FOKE) was designed. The working of the system is described herein.

The FOKE prototype was designed to run on windows mobile 5.0 series customized for the specific purpose of running the FOKE. The aim of this prototype is to provide a platform for collaborative crime fighting between the different government security agencies in the country. Since they are many agencies that fight specific crimes, they can have a central collaborative server to which criminals can be upgraded to based on certain criterion. Field agents of all agencies can be updated on current threats and criminals to watch out for regardless of where they are and they can share valuable findings with their collaborative communities of practice whenever the need arises without necessarily affecting their everyday task and individual goals.

The Full application resides on a development server for the purpose of testing, a lap top pc (serving as a regular client), the systems running the mobile device simulator and the development server are both allowed to connect to each other through wifi (ad hoc network). The simulation smart client was able to consume the services exposed by the application residing on the server when in the range of the wifi and when out of reach it cached data on the mobile device and laptop which it synchronized with the Knowledge base when connection was restored. The result of this simple implementation is shown in figures 3 and 4 below.

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Figure 3: Login Page of the FOKE Prototype

The system is installed with user information locally stored. The system uses an Application Block {code} to detect availability of service indicated by the green label in figure 3.. The system detects the location of the officer when the officer is within range and requests password for authentication. Local data storage utilized a combination of long-term and short term data caching technique [3]. For the sake of security, the user PIN is store as in short-term caching so as to ensure volatility. Knowledge entered into the system by user is however stored through long term caching. When the user accesses a knowledge resources from the remote knowledge base server, the resource is stored through a short –term caching to provide only quick revisits and save limited memory in mobile devices.

Figure 4: the Activity Page for the FOKE system

The application page served as the main presentation page. The system allowed for search through a search box, information/results returned were however highly filtered and summarized to avoid memory overload.

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V. CONCLUSION & FUTURE WORK

The work showed how smart client and SOA can be combined to help extend the reach of KM practices through a proactive knowledge retrieval and knowledge acquisition model, the prototype implementation does not only shed light on 'how' it can be used to solve KM problems but also on where it can be used. The fact is smart client might be a little more restrictive that a thin client based model, because it implies that only specific kind of hardware can use it. This is an advantage for security.

From the sample implementation, It was seen that the design is indeed practicable and can serve as a framework for future design models of KMS. We did not give too much consideration to the issue of security in this model relying on basic security features of the system. This can enjoy more research and improvement.

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AUTHORS PROFILE

Dr. Julius O. Okesola is a Lecturer at the Department of Computer and Information Sciences, Tai Solarin University of Education, Ijebu-Ode, Ogun State, Nigeria. His areas of interest are: Information Systems, Multimedia Databases, Visualization, Computer Security, Artificial Intelligence & Knowledge Management.

Oluwafemi Shawn Ogunseye received his first degree in Computer Science from the University of Agriculture Abeokuta, Ogun State, Nigeria. He is an avid researcher. His areas of interest are: Information Systems, Computer & Information Security, Machine Learning & Knowledge Management.

Kazeem Idowu Rufai is a lecturer at the Tai Solarin University of Education, Ijebu-Ode Ogun State in Nigeria. He is an avid researcher whose research interest include Knowledge Management Systems, Computer Hardware Technology etc.