A Mobile Knowledge Management System Architecture in Higher Education Institution

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ABSTRACT

This paper proposes systems architecture for a mobile knowledge management system (KMS). The architecture is based on a review of system architectures of several mobile-based applications. The architecture is designed to be appropriate to the context of an IHL.

Keywords

Knowledge Management, System Architecture, Mobile Knowledge Management

1.0 INTRODUCTION

In recent years, knowledge management has been the topic of interest among many communities, especially academicians. In higher education institutions, knowledge is part of the university community. However, most of them are in the form of tacit knowledge. To effectively enable the process of creating, acquiring, and disseminating knowledge among the members of the universiti, some form of system must be implemented. A knowledge management system, when implemented properly, can greatly help out the process of capturing and disseminating knowledge to each participant of the system. With the latest technology of mobile devices, knowledge management can be now implemented in the form of mobile systems. This paper refers to such systems as mobile-based knowledge management systems (MBKMS).

2.0 KNOWLEDGE MANAGEMENT SYSTEMS

Knowledge is perceived differently by different organizations. It all depends on how the said knowledge plays the role in the organization. According to Nonaka (1994), knowledge is a complex concept and a number of factors will determine the nature of knowledge creation, management and sharing. Knowledge is also viewed as a fluid mix of framed experience, values, contextual information and expert insight that provide a framework for evaluation and incorporating new experiences and information (Davenport and Prusak, 1997).

To get a better picture of what knowledge management is all about, the difference and relationship between data, information and knowledge must be understood. In general, data are considered as raw facts; information is regarded as an organized set of data, while knowledge is perceived as meaningful information. Data and information is distinguished on their "organization", while information and knowledge are differentiated based on the "interpretation" (Bhatt, 2001).

In order to better facilitate the process of managing knowledge, suitable systems have been developed to assist in this task. Nonaka and Konno (1998) suggest that information systems can assist knowledge activists to serve as catalysts of knowledge creation and as connectors of present initiatives with those in the future. Elements such as capture, reuse, maintenance and transfer of knowledge are essential in knowledge management systems, observed Tiegland et. al (1998).

3.0 MOBILE SYSTEM CHARACTERISTICS

A good mobile system is a system that can support users who are distributed. Figure 1 below shows a generic mobile system architecture (Pitoura, 1994). There are two types of hosts: mobile and fixed. Several of the fixed hosts are supported with wireless interface to communicate with the mobile hosts. These fixed hosts are

known as base stations or mobile support stations. The area covered by a base station is called a cell. Each mobile host can communicate with any base station that is covered by the area in which the mobile host moves in.

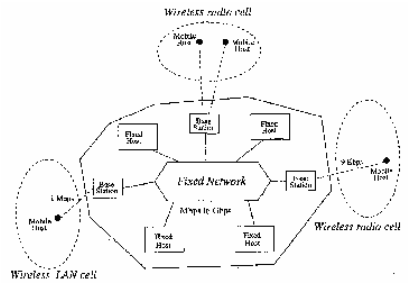

Figure 1: A general mobile system architecture

3.1 Mobile Knowledge Management System Architecture

From the literature, it is noted that the FieldWise system architecture (Fagrell, 2001) is generally suitable to be adopted into many mobile work domains. It consists of the components as listed in Table 1. Figure 2 shows the FieldWise architecture.

Table 1: Components of FieldWise Architecture

Component	Roles
Mobile Client	Capturing and organizing notes
Translator	Translate the information to and forth between server and mobile client
Server Engine	The central place to process query and request from mobile client
FieldWise Database	Stores user preference and service range
Interest Agent	Monitor updates that match user's preference
Query Adapter	Process queries
Internal Sources	Internal documents and records
External Sources	External sources

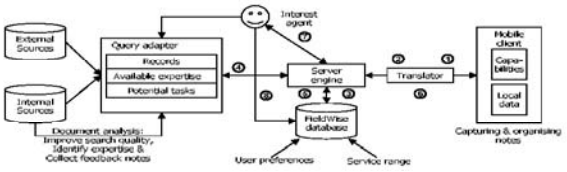

Figure 2: The FieldWise Architecture

3.2 Other Mobile Systems Architecture

Although only the FieldWise architecture was found to address mobile knowledge management requirements, there are other similar system architectures that can be considered towards implementation of a mobile knowledge management system. They have characteristics that can be adopted into mobile knowledge management implementation. The Welcome system architecture (Lehner et al, 2002), originally developed as part of University of Regenburg's wireless e-learning implementation. is divided into three layers as follows (Figure 3).

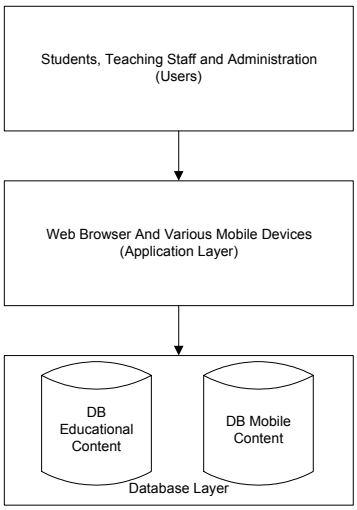

Figure 3: Welcome System Structure

The WELCOME system architecture is divided into three components, namely the three components of mobile education, student, teaching staff and administration, an application layer which enables them to communicate and a database layer. The knowledge users can easily substitute the users stated in the architecture. The application layer is different depending on the devices used at that moment. In the database layer, there are two different databases, one used

to store educational content while the other one contains all additional which might be useful in a mobile environment. In this layer, the educational content could be replaced with knowledge content.

Agogin et al (2003) has designed a wireless architecture that can be used to enable m-learning using mobile devices. In this architecture, the content in the corporate knowledge base will have to be modified depending on the capabilities of the mobile client, user preferences and available bandwidth.

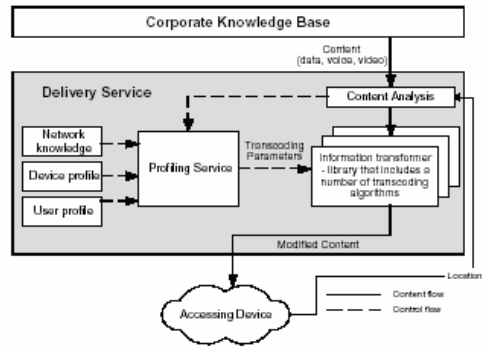

Figure 4: System Architecture (Agogin et al 2003)

The Profiling Service is used to determine the characteristics of the mobile devices, such as screen size, network speed and the user profile. The model of the user will take account of the input capabilities such as voice, pen, buttons and switch access for the disabled. The content available to the user will be modified compared to those available in the desktop system based on the personal preferences and her access device. All the information requested via the Content Analysis module, will have its content filtered and modified (transcoding) accordingly before being delivered to the end-user.

4.0 OTHER CONSIDERATIONS

In the previous sections, existing system architectures that is suitable to be adopted in developing a mobile knowledge management system is discussed. In this section, some other considerations that should be included in the mobile knowledge management system are looked into.

Tiwana (2000) has suggested that there should be seven layers of components that must exist in any knowledge management system. Table 2 lists the components in the respective layers.

Table 2: 7 Layers of Knowledge Management System

Layer	Components
Interface	Browser, Application Screen Design
Access & Authentication	Authentication
Collaborative, Intelligence & Filtering	Search, Personalization, Indexing
Application	Skill directories, forums
Transport	TCP/IP, email
Middleware and Legacy Integration	Wrapper Tools
Repositories	Data warehouse, forums, documents

Tiwana (2001) also highlights the importance of social exchange to enable knowledge sharing. By having some mechanism to rate contributions by members of the system, they will feel that their contributions are appreciated and encouraged to do more in the future. Mobile devices facilitate this process.

5.0 Proposed System Architecture

After taking into considerations the components which make up a successful mobile knowledge management system, we proposed the following system architecture to be implemented in institutions of higher learning. See Figure 5.

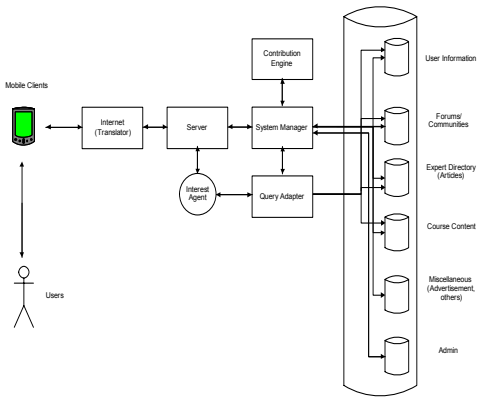

Figure 5: Proposed System Architecture

In this proposed architecture, the users will access the system through the mobile client. The mobile client will be used to capture and organize information. It will then communicate with the server through a translator (internet) which will enable synchronization between the server and the mobile client. Authentication will be done on the server to verify the user. The system manager here enables the system administrator to modify the system as necessary. Any query in which the user requests will be processed in the query adapter, retrieved from the repository and return back to the mobile client. The interest agent here will continuously monitor for any update according to the user preferences. It will also determine whether the mobile client is suitable for downloading articles due to the space in the mobile client. The contribution engine will calculate the rating of the users' knowledge contribution to the system. In the event of loss connection (no direct connection to the server), the users can still access certain information which has been downloaded into the mobile client.

6.0 Conclusion and Future Work

The proposed architecture has taken into account elements of reviewed system architectures. It authenticates the user, enables search, personalization of preference, rates the contribution of the users and provides offline information (system workable even during offline). As the system architecture is currently being implemented, further refinements can be made to the system architecture.

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