

ENHANCED CUSTOMER-BASED KNOWLEDGE MANAGEMENT SYSTEM FOR PRODUCTS GENERATION IN BANKING SYSTEM

Olusola O. Olodude, Bolanle F. Oladejo

Department of Computer Science, University of Ibadan, Ibadan, Nigeria

ABSTRACT: Today's banking system are engulf in greater risks arising from the global economy recession. These banks are struggling to emerge from the economic recession and depression by capturing and retaining much more loyal and stable customers in the financial stage. This research work models and implement a Customer-based Knowledge Management System that will exploit customers' knowledge for competitive advantage. This study utilized a Collaborative Customer Intelligence Architecture (CCIA) with a multi-dimensional approach to pragmatic product developments processes which permits data to be merged, transformed, analyzed and determine customer's patterns or behaviour. The system utilized the Apriori algorithm of associative data mining to promote customer segmentation while recommending the most fitted products and services to individual customers. This system is called the Collaborative Customer Management System (CCMS). This paper addressed significant gaps in existing customer relationship landscape within the banking operations. The results showed how an intelligent product recommender would help the banks to roll out basic products and services that would transform customers from ordinary passive recipients of products and services to an empowered knowledge collaborators.

KEYWORDS: Customer Knowledge Management, banking industry, Apriori Algorithm, data mining

1. INTRODUCTION

The application Knowledge management (KM) has been on the increase since the early 1990s when various firm began to harness customer's knowledge and distributing it to the right people at the right time, and giving the organization a competitive advantage over competitors if the knowledge assets are utilized more effectively and wisely ([CBM04]). More and more organizations are implementing KM initiatives with various degrees of success. The utilization of information and knowledge has been on the increased in various organizations. This helps organizations to streamline operational functions and improve decisions making process. Knowledge management is an organization is seen as a strategic attempt to capture information and experience of employees and customers and store them in the database, and later disseminate this knowledge to gain more

benefit and competitive advantage. However, organizations are acquiring skills and capability in handling internal knowledge and also applying it towards the achievement of the organizational goals, they are looking towards new sources of knowledge that are not necessarily found within the boundaries of the firm ([Paq06]). This knowledge also allows an organization to develop resources and sustainable competitive advantage and to do better than rivals ([Sha03]). [Cha97] described Knowledge Management as the process of inspiring people to share information, knowledge and ideas, with the ultimate aim of creating value-added products and services.

With its function of financial intermediation, the banking industry can be presumed to be the facilitator of a sustainable growth of a given economy. Sound and stable banking industry possesses the ability to stimulate economic development for a nation. According to [A+11], the turmoil on financial industry today has made it difficult for companies and organizations to survive in troubled market environment. Recently, we have seen both financial companies as well as national economies being faced with severe economical problems. Banks today, however, face many challenges which include large-scale competition for customer's deposits, loans, increasing customer demands, shuddering profit limits, and the need to keep up with the new financial technologies that will ease banking operations. Frequent customers' bombardment and long queue at various customer care centre for series of complaints shows the deplorable state of the industry. Lack of proper management of information systems, plans, procedures and tools, has become very annoying in many banks to the extent that most information is regarded as noise. The automation of most manual processes within the banking industry has also resulted in the creation of many information systems even within one bank. While these information systems were able to help banks to better manage their processes and resources, it has also resulted in the creation of huge volumes of data and information causing information explosion. This always occurs when banks are faced with loads of information, and they have to take time to go through the bulk of information in taking decisive decisions. These loads

of information could result in less reactive responses and decline of capacity.

With increasingly competitive environments and struggling economies, today's banks are trying to stay afloat in rough waters. Internal and external pressures are placing demands on banks that are affecting their competitive edge. These banks are continuously struggling to survive economic recession and depression in the marketplace. Customer relationships are becoming more and more important for banks as market conditions gets harder. With the increase in competition, eroding margins, high demands from customers and the life-cycles of products and services shortening abruptly, the call for banks to solidify their relationship with their customers and offer them the needed services became imperative. It is also important to know that the problem confronting the banks is not lack of new products and services but that of acceptability by their customers. Therefore, the authors designed a comprehensive and collaborative knowledge management system for Nigerian banks that embraces the creation, retention, sharing and utilization of customer's knowledge which are consequently deployed to meet individual customer's needs by generating new product and services that serves each individual customers best. The enhanced and enterprise-wide knowledge-based application was meant to improve customer's service by accelerating business decision processes within the banking industry.

2. LITERATURE REVIEW

Section 2.1 and 2.2 review knowledge and knowledge management respectively. Section 2.3 describes customer's knowledge while section 2.4 explains how customer knowledge can be managed. Section 2.5 explains some customer's knowledge management structures in Malaysia Banks.

2.1. Knowledge

Although there is a focus on knowledge today, only few researchers can give a clear account of what knowledge actually represent. There is as yet no generally accepted definition of knowledge, although many have tried to pinpoint what knowledge is and how it can be classified into different kinds of knowledge ([DT00]). Oxford Dictionary defines knowledge as "a person's range of information" Webster's dictionary defines knowledge as "the fact or condition of knowing known by a person or a group of people". Knowledge has been the subject of keen interest virtually in every organizational analysis ([TS04]). In marketing, knowledge comprises the essential

principle of the marketing concept as this is expressed by means of market orientation, which denotes the case of a firm that systematically collects and circulates information about the customers and competitors, and takes decisions that are firmly based on this information ([HH98]). Spiegler ([Spi00]) explained that process data are being captured from various directions and techniques which are then processed to create information. Information is defined as "data endowed with significance and intent", or data that make a difference. Data becomes information when they add value in some way, and then information becomes knowledge when it adds insight, abstractive value, better understanding.

2.2. Knowledge Management

Even though, Knowledge Management is crucial to organizational survival, yet it is a difficult task because it requires large expenditure in resources. Lee & Yang ([LY00]) explained that knowledge management is an emerging set of organizational design and operational principles, processes, organizational structures, applications and technologies that help knowledge workers dramatically leverage their creativity and ability to deliver business value. The process of knowledge management involves the overseeing of company's corporate knowledge and information assets with a view to provide the knowledge to as many staff members as possible as well as to enhance more consistent decision making ([BS03]).

2.3. Customer Knowledge

According to Gibbert et al. ([GLP02]), customer knowledge within the marketplace is a significant resource that can be managed to support research and development, improve innovation, facilitate sensing emerging market opportunities and support the management of long term customer relationships ([DM03]). Customer knowledge refers to understanding your customers, their needs, wants and aims is essential if a business is to align its processes, products and services to build real and intimate customer relationships, Guaspari ([Gua98]). [Paq06] states that consumer preferences of new products, knowledge derived from joint research and development, design improvements from suppliers intended to reduce the cost of manufacturing and knowledge regarding trends within the business environment.

2.4. Customer Knowledge Management (CKM)

According to Paquette ([Paq06]), the process that a firm employs to manage the identification,

acquisition and internal utilization of customer knowledge are collectively referred to as Customer Knowledge Management (CKM). It is within these processes that an organization and its customers collectively work together to combine their existing knowledge to create new knowledge. Accordingly, Gibbert et al. ([GLP02]) describes CKM as a tactical process by which companies liberate their customers from being a passive recipient of

products and services, to an empowered and authorized knowledge associates. Davenport et al. ([DHK01]) argued that knowledge about the customer should be the first step, and organizations should create processes to better manage the relationships they discover with this information to create profitable interactions. The focus they present remains with learning about the customer's needs through different channels.

2.5. Existing CKMS in Malaysia Banks

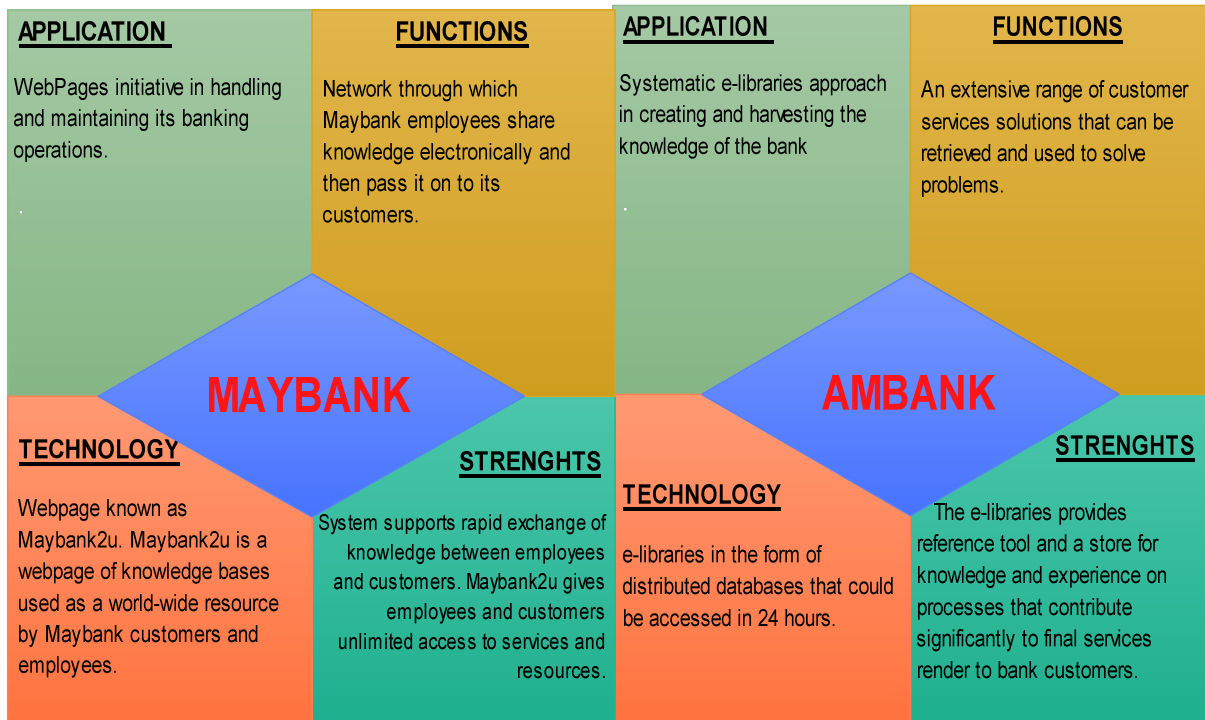


Fig 2.1: KMS structure in Malaysia Bank. Source: [HN06]

3. THE METHODOLOGY

Section 3.1 describes the Collaborative Customer Management System (CCMS) while explaining the methodology life cycle. Section 3.2 designed and explained the system sequence diagram while section 3.3 designed and explained the technical architecture of the system.

3.1. The Collaborative Customers Management System (CCMS)

The authors explored a holistic approach whereby products and services are collaboratively developed to meet individual customer's needs, hence, the need for the development of a Collaborative Customers Management System, (CCMS). Figure 3.1 described the methodology cycle undertaken in the development of the CCMS application. The cycle detailed six steps taken for the CCMS

implementation and their various techniques targeted at providing a comprehensive modeling of a robust, dynamic and efficient knowledge management system within the banking industry.

The cycle shows step 1 as identification of knowledge requirement through the use of interview / online survey to appraise the existing system. The second stage is the evaluation of the people, process and products using peer assist and observation techniques. Using categorization and mapping, the third stage decides and designs the system components and its architecture. Segmentation of customers was conducted on the basis of age, income, turnover, occupation, volume and mode of transactions etc. The fourth stage of the methodology cycle developed the system with the utilization of data mining, data warehousing technologies. Stage five utilized the develop system. Finally, stage six involves evaluation of the system through pilot testing.

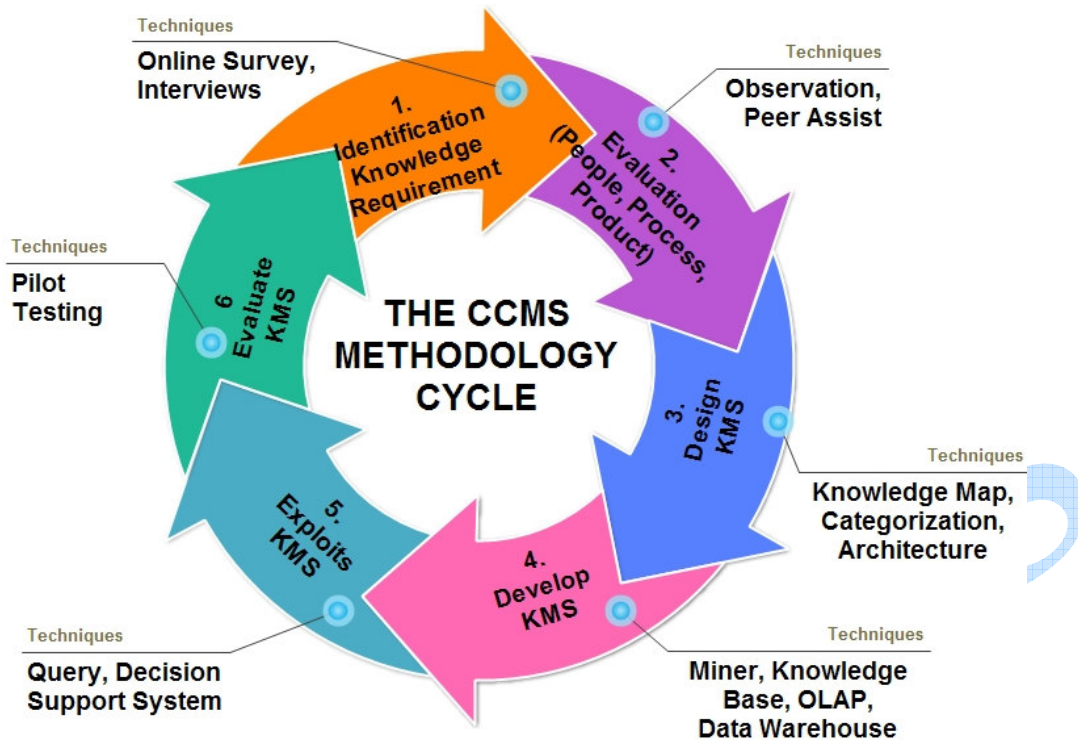


Fig 3.1: The CCMS Methodology Cycle

3.2. Sequence Diagrams for the CCMS

The sequence diagram is a dynamic model that shows the explicit sequence of messages that are passed between objects in a defined interaction. The bank employee sends a login request to the bank network, upon validation the CCMS display the employee console main menu. The bank employee has access to create customer and the bank network display the customer profile. The bank employee could simulate transaction for customers which will be track by bank network. Customer login to the bank network and upon validation, the system display individual customer profile. Customer sends comment and it is display by the bank network upon which the bank employee could view. The bank employee setup interview for each customer and their responses is being viewed on the bank console. The bank recommends products for each individual customer and such products are being viewed by the customer. The customer thereby provide feedback which viewable on the bank console.

3.3. Technical Architecture of the CCMS

The architecture illustrates how existing banking operations can be incorporate with knowledge management tools. The CCMS architecture is an interactive system, between the employee and

customers and it is sub-divided into six layers vis-à-vis: User Access, Creation, Retention, Sharing, Exploitation and Utilization which were discussed below in figure 3.3.

Each of the components involved in this architecture is hereby discussed below:

3.3.1 User Access: Both staff and employee will be able to interact. The Interactive Zone is a web-based Enterprise Knowledge Portal that is increasingly sophisticated and offer opportunities for manipulating, analyzing, and presenting of information, always characterized by intuitive, easy-to-use user interface.

3.3.2 Creation: The Customer Interaction Channel contains typical banking information systems which serve as the temporary area in a banking operational environment. The layer contains five different components which are designed to meet the CCMS objectives of eliciting knowledge from customers to meet customer knowledge strategic needs, and business processes. These components include Customer Information System (CIS), Loan Information System (LIS), Card History (CH), Transaction Records (TR) and Complaints Resolution Center (CRC).

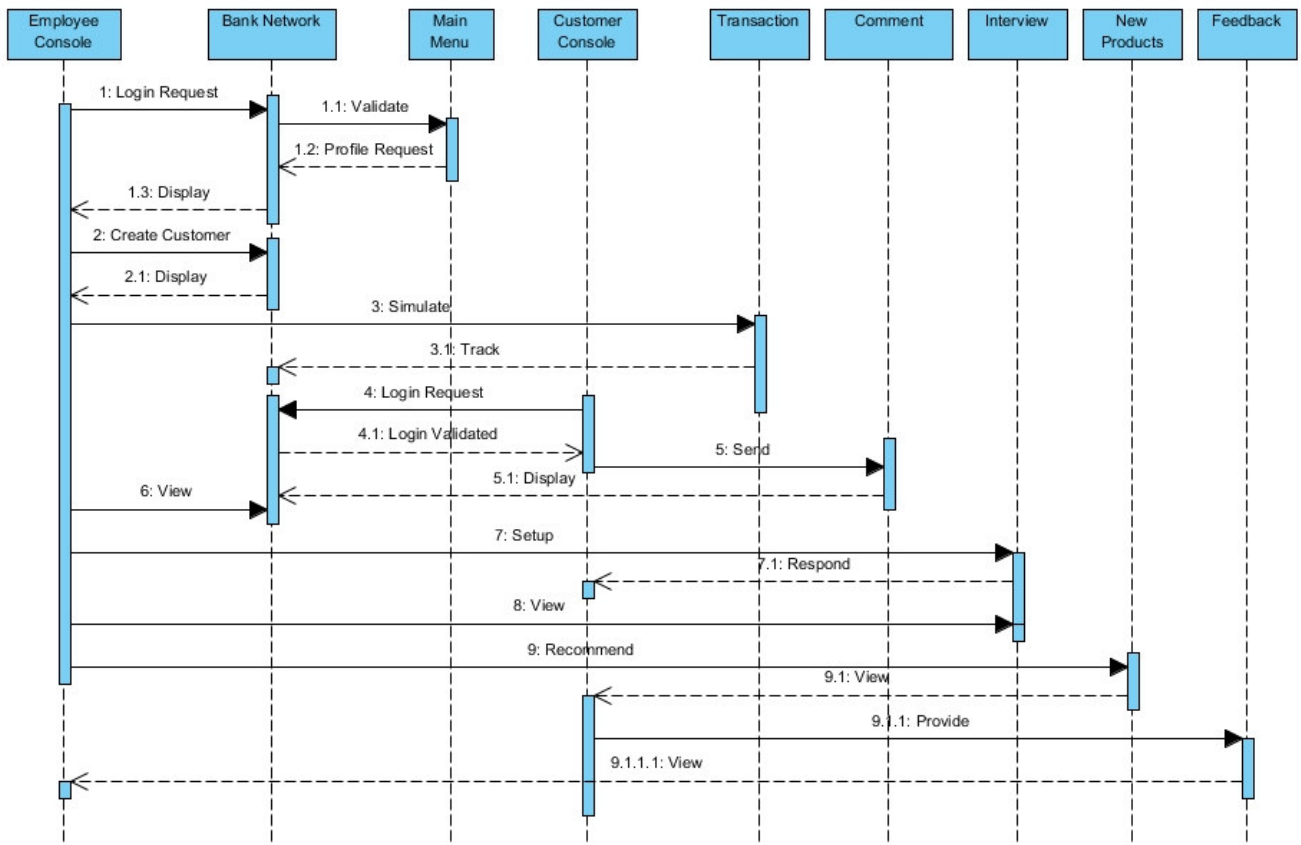


Fig 3.2: The CCMS Sequence diagram

3.3.3 Retention: All data within the information systems located within the operational environment are stored in the Operational Database. The Operational Database contains detailed data used to run the day-to-day operations of the banking business. The data continually changes as updates are made, and reflect the current value of the last transaction. *The Extraction Transformation and Loading (ETL)* packages extract data from operational data source, eliminate data error and redundancies, and provide tailored data for access and analysis and load to Data Warehouse.

3.3.4 Sharing: All complex and business knowledge stored in the operational database needs to be managed and shared effectively for all stakeholders to utilize. *The Data Warehouse* acts as a repository for current and historical operational data, where it is organized and validated so that it can serve decision-making objectives. It is also responsible for collecting, converting, cleaning, aggregating, and indexing customers' data.

3.3.5 Exploitation: The exploitation layer contains collective intelligence components which includes general query, intelligent miner, and OLAP. *The Intelligent Miner* provides the means

for business intelligence through ad hoc and managed query environment and knowledge mining. The Apriori Algorithm is employed as a computational tool that will assist in making decisions by analyzing the data, and discovering useful patterns for predicting new trends. Association rules were used to analyze the patterns of customer's behavior of different time periods for each customer's segmentation. The *Online Analytic Processing (OLAP)* functionality is used to gain a deeper understanding of specific banking operational issues.

3.3.6 Utilization: Users need utilization layer to access the system's various data resource. The *Business Development Unit (BDU)* is responsible for the development and generation of new products and services that will be suggested to the bank customers. The BDU key into the decision platform to extract knowledge necessary for making decisions that will spread around the organization. **The Decision Analysis** is programmed to classify the customer's transactional pattern to the corresponding guideline, for making recommendations. The BDU also apply the analyzed decisions to exploits the *Personalized Customer-based Product Recommender* with the aim of suggesting most fitted services and products for individual customer.

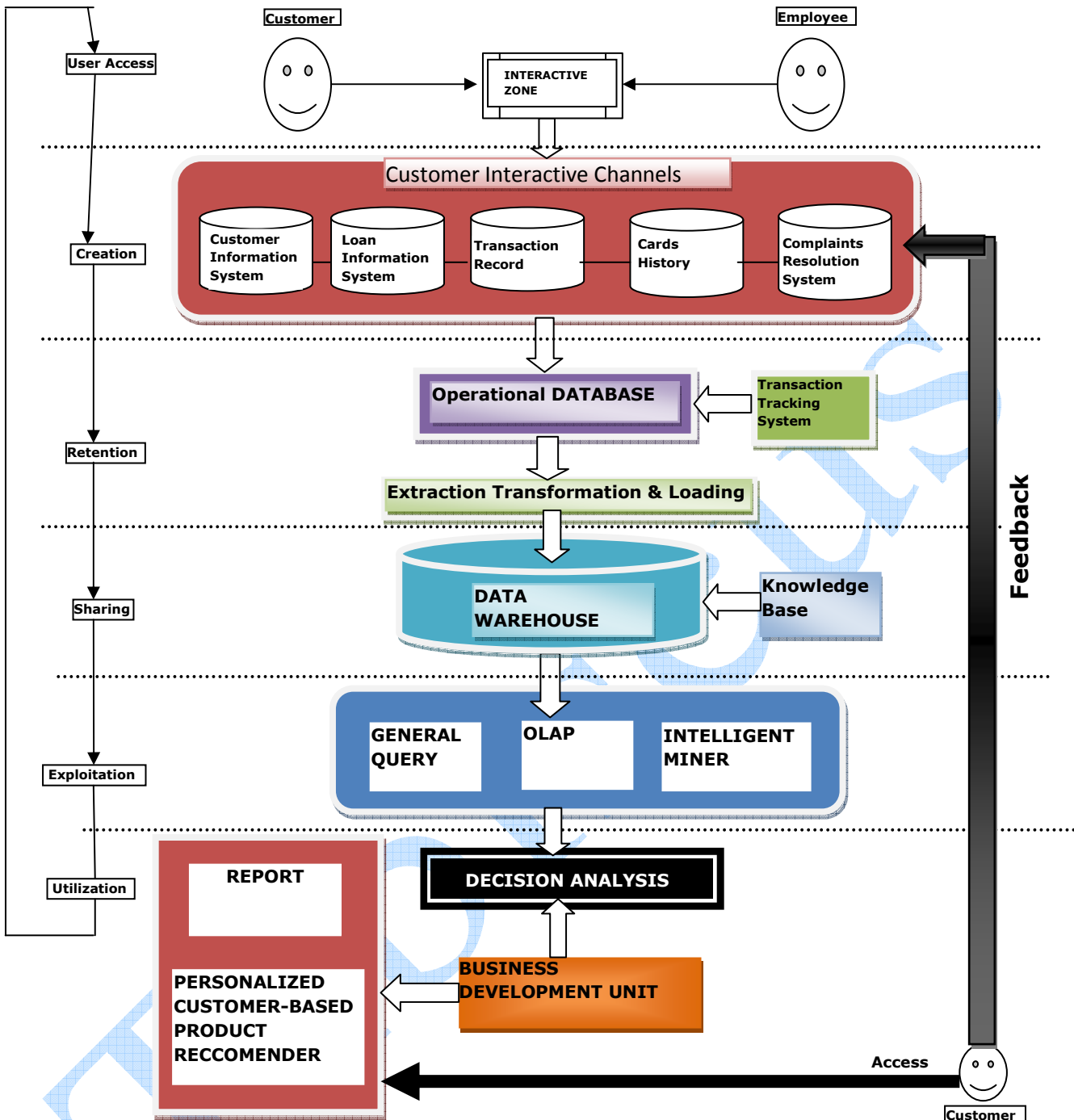


Fig 3.3: The Collaborative Customer Intelligence Architecture (CCIA)

4. RESULTS AND DISCUSSION

The interfaces were tested with data to ascertain the functional and operational efficiency of the system.

4.1. Home Page

The home page in fig 4.1 below launches

immediately after logon as a bank employee. From this interface, bank employee can create a customer, simulate transaction for customers, create new product, view customers comment, setup up interviews for customers, suggest new products to individual customers and finally generate reports.

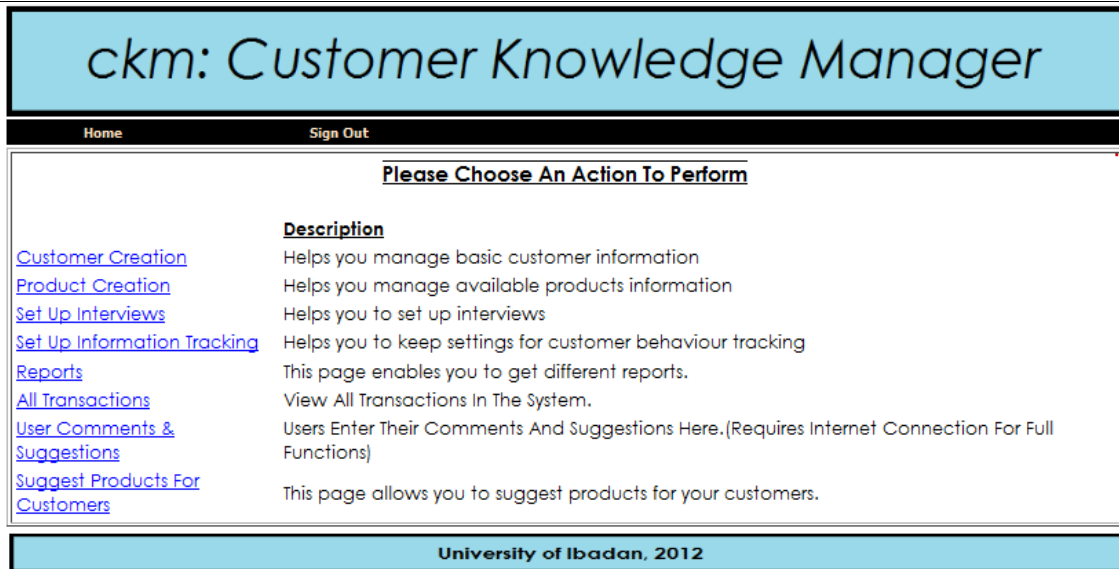


Fig 4.1: The Home Interface

The “*customer creation*” link is used to create customer’s database. The “*product Creation*” link helps the bank to manage available product among its customers. The “*setup interview*” link is used to initiate interview with specific customer. Pre-loaded questions are sent to customer’s profile. For example, the bank setup an interview for customer: “**OLADOKUN**”, “**ARE OUR TELLERS FRIENDLY WITH YOU IN BANKING HALL?**”. Customers “**OLADOKUN**” could respond with “**NO! THEY ARE NOT**” which will be accessible on the interview interface of the bank for making decision on products and services. The “*All Transaction*” link helps to simulate transactions for customers. Transaction data provide the types of channels that customers normally use in making transactions, allowing banks to target promotions that will encourage customers to try alternative or

other services that will serve best. For instance, a customer who frequently pay water bill online might be encouraged to try to also pay his/her electricity bill through the same channel. Also a customer who purchase recharge cards using the ATM may be introduced to the bank web or mobile applications for recharge card services. The interface helps to simulate transactions for customers. The customers transactions are being tracked for product and service recommender. The bank can also view customer’s comment using the “*view customer comment*” link.

4.2. Product Suggestion Page

The product suggestion link from fig 4.1 leads to the interface in fig 4.2. At this stage, most fitted products are suggested to each customers based on their personal data, transaction record and interview response.

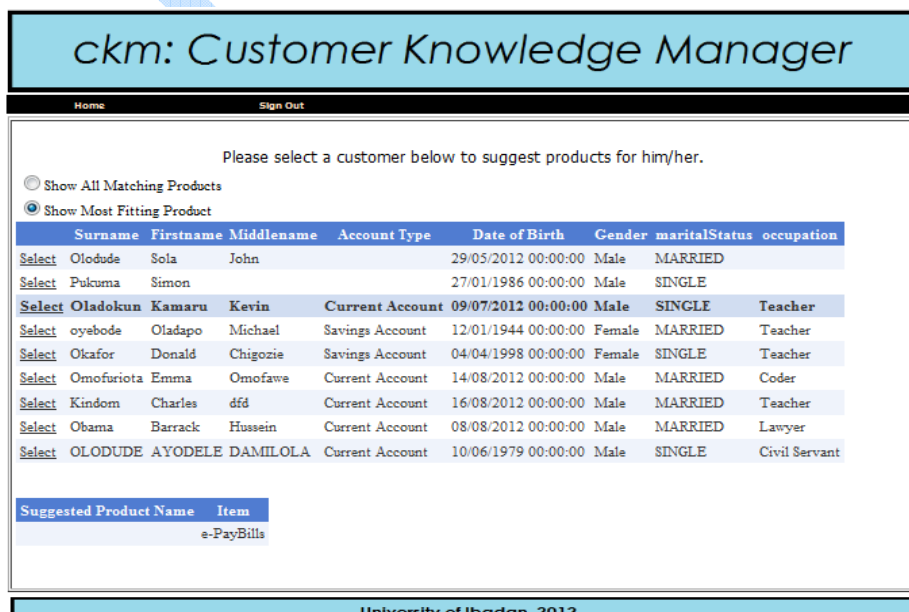


Fig 4.2: Product Recommender Page

Based on the information supplied and tracking of customers transactions, the recommender suggest “*the most fitted products*” to selected customers as seen above. For customer “**OLADOKUN**” the most fitted product is “*e-PAYBILLS*”.

4.3. Testing

After a successful design, implementation and data testing of the CCMS, selected Banks Representatives were invited for the testing of the system. They compared the CCMS with the existing structures in their various banks - a performance testing of the system. The banks representative’s responded to a survey at the end of the testing. From the survey, it was discovered that all the respondents proved to be satisfied with the operational performance of the system.

5. CONCLUSION AND FURTHER WORK

5.1. Conclusion

Today’s customers desired that every collaboration with their banks be tailored to their needs and preferences. The CCMS solution therefore, delivers the ideal package for customer focus in banking operations that will help recommend specific products and services to each individual customers based on their personal and transaction information. With the automated process of product recommendation in the CCMS application, every customer interaction with the bank would be a catalyst for innovation, idea, growth, enhancement the customer satisfaction.

5.2. Further Work

One of the major targets for this work includes ability to detect potential fraudulent customers before recommending banks products and services to such a person.

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