Modelling a Knowledge Management System for an Electricity Company

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Abstract- Knowledge Management system is a system that will allow employees or users to get the required information they need and at the required time, anytime and anywhere as far as there is a network coverage in that area, this will make them perform their duties well. This system is made up of a program runner which is the PC, this is called the Server, the GSM modem that aids the user's phone to communicate with the Server even when connected, MongoDB is a database System that stores data as JSON-like documents with dynamic schemas, Chrome browser, a software application used to locate, retrieve and also display content on the World Wide Web. AT Command that establishes communication between the Modem and the Server. JavaScript and HTML, Protocol Distribution Unit that also helped in the processes of this Project. The project is suitable for broad range of applications as it can be applied in various areas of human life. It can be customized to fit in any organization. Corporate bodies like Communication Companies, Oil firms, Banks can use a Knowledge Management System to get useful information from experts to keep their jobs moving effectively and also to attend to, and satisfy their customers by providing prompt answers to their queries. Generally, it is a means the organisational intellectual resources and information are within the business environment.

Keywords: Company, Electricity, Knowledge, Management, Modelling.

I. INTRODUCTION

An organization's competitive edge depends on how it manages its knowledge assets. The organisations advantage lies on what they know, and the problem is how to manage them. KM is managing the corporation's knowledge through a systematically and organizationally specified process for acquiring, organizing, sustaining, applying, sharing and renewing both the tacit and explicit knowledge of employees to enhance organizational performance and create value[1]. This is a system that will enable electricity company employees get the right knowledge to the right person at the right time. This technology is represented by an inter-related collection of databases that support rapid exchange of knowledge between employees who are separated by time and space. This is a system for employees in an organization to capture, store and disseminate information, through a Knowledge Portal.

Knowledge Management system finds its applications in many areas especially in corporate bodies like banks, communication companies, institutions and many others.

II. PROBLEM STATEMENTS

Assume a Company that has a lot of branches all over the world, and their employee needs information to do their jobs effectively. The specialized information and knowledge they need are difficult to find and even when they did find it, it is often not accurate[2].

Highly skilled professions like medicine and nursing, find it difficult retaining and utilizing knowledge of the best practices. When people leave an organization, their knowledge assets leave with them. Companies do suffer setback from losing key staff. In this era of uncertainty, where there is shrinking of budgets and staff reduction, knowledge is highly at risk. The most knowledgeable employees typically leave first and critical social networks are destroyed. The time required for knowledge transfer is compressed and compromised. Useful information usually resides in various documents, email messages, chat transcripts, projects, processes, and most of the time in people's heads and mind. Most of the time this knowledge is not stored and therefore difficult to retrieve when necessary. Information about processes and practices are usually resident in a particular individual's head and even more difficult to capture and use. These types of difficulties in an electricity company led to the systematic direction of this paper. A knowledge management system tends to capture knowledge from people before they leave, retire or die. It includes a portal, which comprises of electronic forum discussion, online consultation, information upload, information retrieval and email, this technology gives employees and customer's unlimited access to expertise services worldwide. A feedback loop is set up, so that after listening to customers and queries that relate to a particular area, those that could not be answered by the customer service consultant will be posted on the forum for others that are specialist in that field to answer. Normally the request for help is picked up by anyone who has expertise in the related field. If the request was not attended to for a few hours, the forum specialist would pick up the request, identify the potential experts and try to get their attention in order to answer the questions. After all, the knowledge will be organized, validated and stored into the repository and is ready for use and reuse if a similar query is received in the future. People tend to work within silos of information that don't get shared across an organization easily.

People are forced to indulge in repetitive work when they could actually tap into a knowledge system and work in a more innovative manner. A knowledge management system should afford an easy-to-use interface (e.g. a portal) and allow access to information based on the role the user plays [3]. This system would connect to all kinds of documents like web pages, text documents, spreadsheets, emails, PDF documents, images etc. Information also exists on people's heads and this system will provide an impetus for people to document or share knowledge that is resident in their heads. Knowledge Management is an Information Technology systems that facilitate knowledge sharing and knowledge management. The main role of this Information Technology systems is to help employees share knowledge through common platforms and electronic storage to help make access simpler, encouraging economic reuse of knowledge. Information Technology systems can provide codification, personalization, electronic repositories for information and can help people locate each other to communicate directly. With appropriate training and education, IT systems can make it easier for organizations to acquire, store or disseminate knowledge.

Power Holding Company of Nigeria as a case study.

The Power Holding Company of Nigeria (PHCN), formerly the National Electric Power Authority (NEPA) is an organisation governing the use of electricity in Nigeria.

Problems of Power Holding Company of Nigeria.

Power is said to be the engine for growth and development in all economies of the world. Nigeria is one country with the poorest quality of electricity supply. More than 95% of Nigerians cannot boast of 5 hours of electricity supply daily. Many of the businesses in Nigeria depend on electricity but power outages plague these businesses, leading those who can afford them to rely on fossil-fuel-burning generators. A country whose occupants depend on electricity for their daily bread remains poorer and poorer without electricity. People, especially students struggle to read with candle light. It is impossible for our refrigerators to keep food, medicines etc fresh. Those electrical appliances that people have are powered by batteries and private power generating plants, which eat up a large share of their meagre incomes. Moreover, most useful information are stored in file cabinets, people's heads and minds which may be information about how most useful tasks are performed to keep the organisation moving. Experts who have those information may be reluctant or unavailable when the knowledge is needed. It is said that corruption, wastefulness, inconsistency and lack of planning are the problems facing PHCN, and it has been concluded that privatization will be a solution to it.

III. AIMS AND RESEARCH OBJECTIVES

The aim of the project reported in this paper is the identification, extraction, codification and transformation of tacit knowledge into explicit knowledge and on the creation of a repository of such explicit knowledge for an organisation, in a manner that makes the explicit knowledge easily sharable among the workforce.
The following specific objectives are pursued in order to realise the aim of the project.

1. Develop a data capture screen for each unit to match the way they prefer to present the information they have to share and store the captured information in a repository[4].
2. Develop a portal based approach for presenting information to each unit or department such that each unit gets only the information that concerns them when accessing sharable ideas from the repository.
3. Develop a scheme implemented in software for tracking and remunerating contributors or users of best practice.
4. To develop an evaluation model to evaluate the extent of transformation that has taken place in the organizational knowledge at any instant in time.
5. To enhance the quality of customer services through the use of best practices grown through Knowledge Management.

IV. SCOPE OF WORK

This project focuses on the identification, capture, codification and transformation of tacit knowledge into explicit knowledge, for an organization. A platform that facilitates knowledge sharing created as well as a remuneration scheme for those who willingly share knowledge. The system is dynamic so as to always represent effectively, the current operational knowledge in an organization as well as provide a means of measuring knowledge growth in an organization.

V. SIGNIFICANCE OF WORK

In a company, benefits are of two aspects;
1) Individual Aspect and 2) Organizational Aspect.
At the individual aspect level, knowledge management provides employee opportunities to improve in their skills, training and experiences through working together and sharing other people's knowledge and learning from one another, thereby improving personal performance, which leads to better career advancement.
At the organizational aspect level, knowledge management provides many benefits for an organization, such as:
a) Increasing the organization's performance through improved efficiency, enhanced rate of production, quality and innovation.
b) Providing greater access to expert knowledge, they make better decisions, streamline processes, reduce re-work, increase innovation, have higher data integrity and greater collaboration.
c) Increasing the financial value of the organization by treating people's knowledge as an asset similar to traditional assets like inventory and capital facilities.
d) Maintaining competitive edge as well as proprietary knowledge. Retention of intellectual property after an employee/expert leaves, if such knowledge is codified.
f) Reducing training time for new employees. Can avoid re-inventing the wheel, reducing redundant work.

VI. KNOWLEDGE MANAGEMENT AND INFORMATION TECHNOLOGY (IT)

Knowledge management is first and foremost an IT based engineering management discipline that treats intellectual capital as a managed asset. Knowledge Management is an audit of "intellectual assets" that highlights unique sources, critical functions and potential bottlenecks which hinders knowledge flow to the point of use. It protects intellectual assets from decay, seeks opportunities to enhance decisions, services and products through adding intelligence, increasing value and providing flexibility. To serve customers well and remain in business, companies must reduce their cycle time, operate with minimum fixed assets and overhead(people, inventory and facilities), shorten product development time, improve customer service, empower employees, innovate and deliver high quality products, enhance flexibility and adaptation, capture information, create knowledge, share and learn. None of this is possible without the use of IT to drive a continual focus on the creation, updating, availability, quality and use of knowledge by all employees and teams at work. Information Technology provides the framework and enabling technology to support knowledge creation, production, acquisition, aggregation, classification, analysis, filtering, transmission, dissemination, usage and/or retention. A Portal is a fundamental building block of a Knowledge management infrastructure. It provides both the production interface used for knowledge mapping and the consumption interface for accessing that knowledge.

The primary tool in the practice of knowledge management is process engineering and technology, this works in concert to streamline and enhance the capture and flow of an organisation's data, information and knowledge and to deliver it to individuals or groups engaged in accomplishing specific tasks. Information Technology is therefore the knowledge management enabler. It provides the foundation for solutions that automate and centralize the sharing of knowledge and fuelling of the innovative process.

VII. REVIEW OF RELATED LITERATURE

A. Knowledge Management in Texaco Company

Texaco, a company that pumps millions of barrels of oil a day, has discovered a new origin of power, which is the collective knowledge and expertise of all the workers in all the areas of the world. Texaco uses this system to help people share knowledge. One of this system at Texaco is "People Net", this is a search engine for employees on the company's intranet. Employees who have questions can use PeopleNet to see profiles of their colleagues who they think have the right answers[5].

Another tool that Texaco uses to connect its employees is a software system called knowledge mail from Tactile knowledge systems. This software analyses email sent and received by employees to help them make good contacts with colleagues who work on the same issues.

B. Knowledge Management in Commerce Bank

Commerce Bank company realized that the most important asset "knowledge" was locked away in the file cabinets and in the heads of its associates. To support this initiative, Commerce Bank envisioned a solution which is a work flow based knowledge management system that could provide instant answers to customers[5]. To make this vision a reality, Commerce Bank chose to develop a system based on IBM's Lotus Notes, which the bank has been using since 1995, so they used the IBM's Dominus server, the Lotus notes client and an application development tool. Commerce bank created a fully fledged knowledge management system called WoW.Answers Guide. It was introduced in 2000, and provides a central repository of knowledge about all bank transactions, helps employees learn a process and respond to customer inquiries and stores information electronically.

C. Knowledge Management System used to Capture Criminals

To improve in capabilities, the police service has implemented a collaborative, Web-based knowledge management system to improve access and management of case files. Now police can access over 6000,000 case files online, of which the hard copy occupies over nine miles of shelf space.[5] The new system provides officers and support staff with a much faster, more efficient method of tracking down case papers, which can often contain information that will help in new investigation. The system will enable more precise search results, ultimately enabling officers to investigate crimes more effectively, and the complete record are available 24/7.

VIII. METHODOLOGY

There are several definitions of methodology:
1. A system of methods or rules applied in a science.
2. The analysis of the principles of methods, rules and postulates employed by a discipline.
3. The systematic study of methods that are, can be or have been applied within a discipline[6].

It is therefore, a set of methods by which one can follow to arrive to a certain solution.

A. Types of Methodology:

There are several methods that can be applied in a project, they are:

i) Structured analysis and design Method: These are methods for analyzing and converting business requirements into specifications and ultimately, computer programs and related manual procedures[6].

ii) Data Flow Diagrams: A Data Flow Diagram (DFD) is a graphical representation of the flow of data through an information system. It explains the course or movement of information in a process. DFD illustrates this flow of information in a process based on the inputs and outputs.
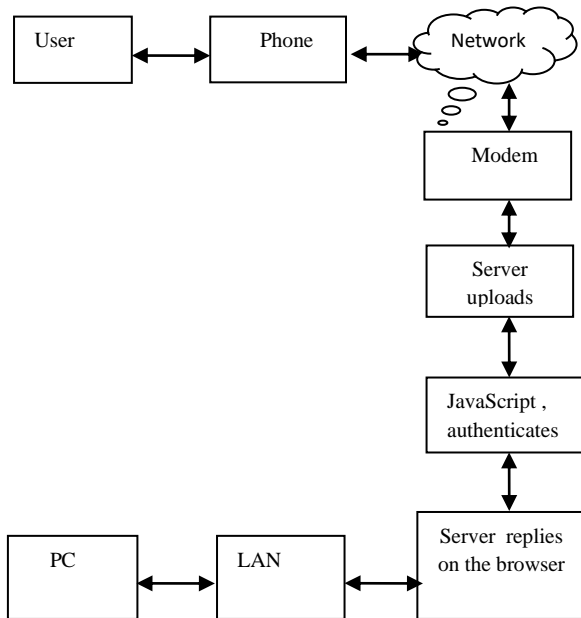
Fig 1: Data Flow diagram of the System

Knowledge can be accessed through a user's mobile phone from any location within and outside Nigeria. Fig 1 depicts the way data flows within the Knowledge Management System, first from the user to Mobile Phone through the network, to the modem that upload the Server. Before one can access the portal, he /she must be a member of the company and will have a valid pin, the JavaScript validates the inputs while PHP authenticates the inputs by the user. SQL queries the database(MongoDB) based on the request of the user, which later replies on the browser. LAN connection could be used to connect other computers to the server.

iii) SSADM: This divides an application development project into modules, stages, steps and provides a framework for describing projects in a fashion suited to managing the project. SSADM's objectives are to:

- Improve project management.
- make more effective use of experienced and inexperienced development staff.
- Develop better quality systems.
- Make projects resilient to the loss of staff.
- Enable projects to be supported by computer -based tools such as computer aided software engineering systems.
- Establish a framework for good communication between participants in a project.

SSADM has two approaches:

a) Top Down Approach: This is a design methodology that proceeds from the general to the particular, and that provides a formal mechanism for breaking complex process designs into functional descriptions, reviewing progress and allowing modifications. It is essentially breaking down a system to gain insight into its compositional sub-systems[7]. In a top-down approach an overview of the system is first formulated, specifying but not detailing any first-level subsystems. Each subsystem is then refined in yet greater detail, sometimes in many additional subsystem levels, until the entire specification is reduced to base elements.

b) Bottom up Approach: In a bottom-up approach the individual base elements of the system are first specified in great detail. These elements are then linked together to form larger subsystems, which then in turn are linked, sometimes in many levels, until a complete top-level system is formed. This strategy often resembles a "seed" model, whereby the beginning are small, but eventually grow in complexity and completeness.

Choice of Design Approach

SSADM is best design approach adopted for the project because it is well documented. Because it has thorough roadmap/guidelines, it is hard to go off-track. High quality system is delivered at the end of the project. Suits hierarchical organisations like government bodies.

IX. DEVELOPMENT PLATFORM/LANGUAGES OF THE SYSTEM

1) Server, a program runner
2) Chrome browser
3) MongoDB
4) MTN Modem
5) User's Phone
6) Protocol Distribution Unit(PDU)
7) AT Command
8) PHP
9) Html
10) JavaScript
11) Windows Operating system
12) Graphic Software used is FIREWORKS (Micro media)
13) Local Host URL- HTTP:// LOCALHOST/KMP/INDEXPhP
14) Internet URL-PHCNPORTAL.NET

The functions of the system are:

- Information upload
- Information Retrieval
- Login Authentication
- Forum Discussion
- E-mail
- Online Consultation

The Home Page of the Portal is thus: Macromedia Fireworks MX –Graphics Design Interface.
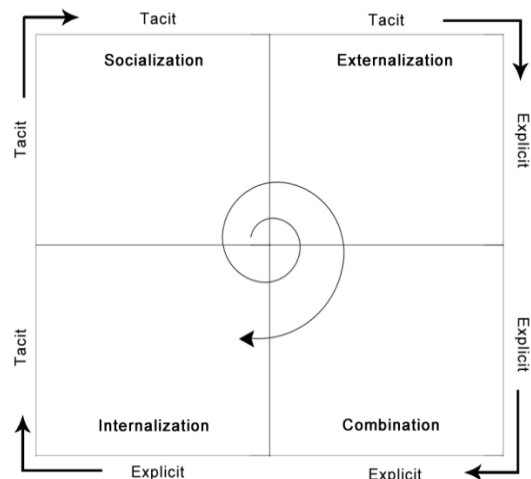

Fig 2: Model of the New System.

Fig 2 illustrates how the four nodes of knowledge form a continual cycle that is shaped by series of shifts between the different modes. It is important to note that the movement through the four modes is not a circle, but rather a spiral. This spiral becomes larger as it moves up the ontological levels from individual to group to organization through inter organization.

Knowledge conversion can be achieved through the processes of: socialisation, externalisation, combination and internalisation For example, through socialisation a PHCN manager can learn the tacit secrets of conducting market research from a senior manager (tacit to tacit) in the same Organisation. Through externalisation, the manager can then translate these secrets into explicit knowledge (tacit to explicit) and communicate it to subordinates (explicit to explicit). The subordinates then standardise this knowledge and put it into a marketing report. Finally, through internalisation, experience gained from conducting market research, enriches the manager's own tacit knowledge base.
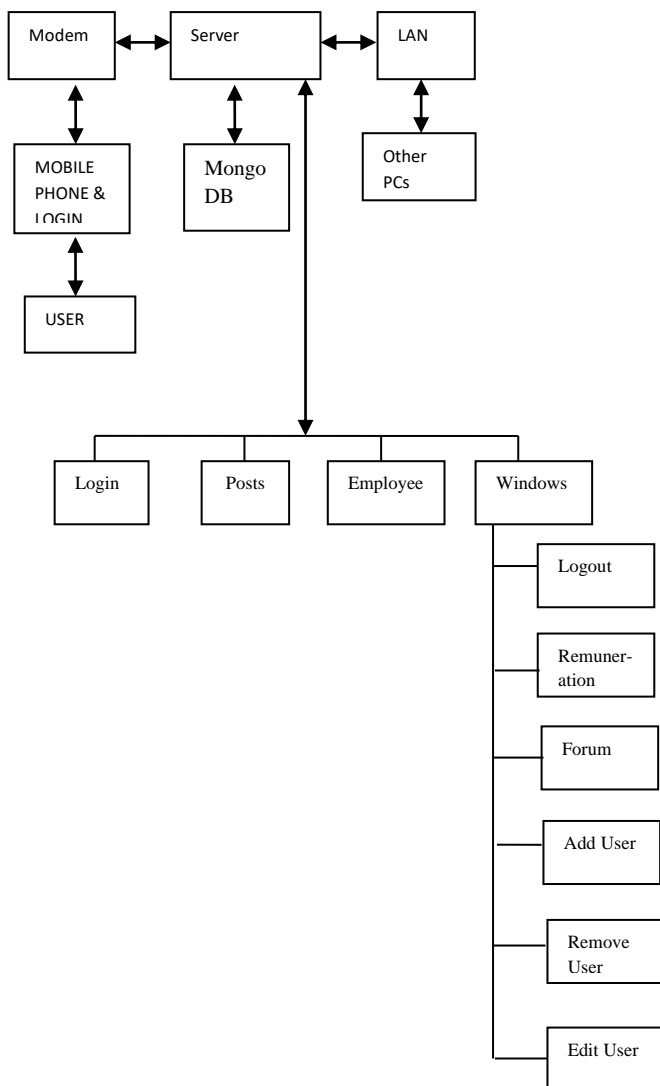
information that concerns him. Examples are posts from his unit, forum and the logout button. The other windows like the edit user, add user, add user and the remuneration are handled an administrative personnel etc. A user can access and contribute using his phone. He enters using the email and pin number on the mobile phone, sends it through a GSM network to a receiving modem that interacts with the sever through AT Commands. The server authenticates it by checking the data in the mongoDB, if he is a genuine member of the company, then access will be allowed else it will be denied. Other Computers can get information from the Server through a LAN connection.

Fig 3: Full Diagram of the System
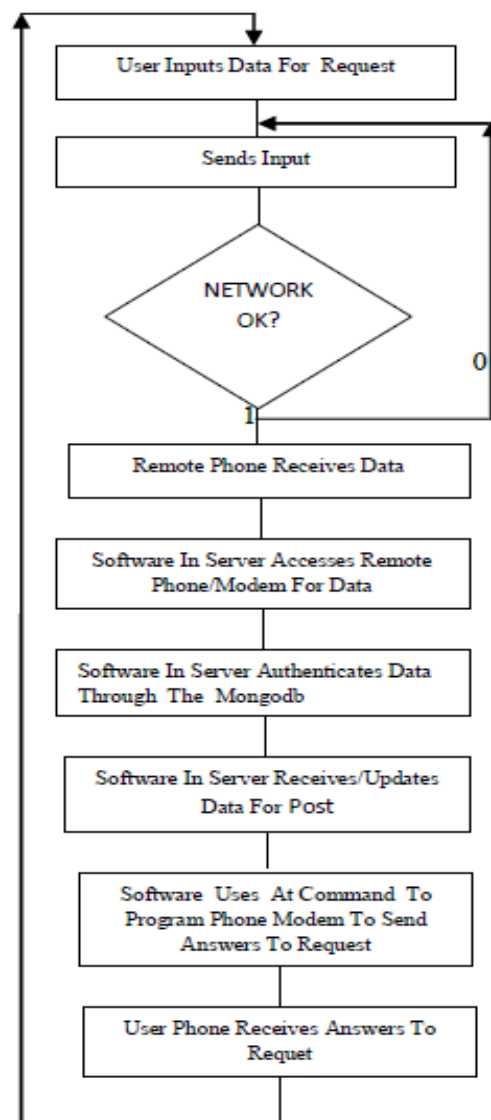
Fig 4: Order of Operations in knowledge Management System

Fig 3 depicts the way data flows within the Knowledge Management System, first a genuine member of a company logs in with his email and pin number, the server authenticates it by checking for its existence in the mongoDB, before the user accesses other post or contributes. Only the server management could see other posts. An employee that uses the Portal, sees only the

Fig 4 is the sequence of operation in a knowledge management system. A user inputs his email address and pin number that will give him access to the portal. It is sent through a network, the modem/phone receives the data, a software in server accesses the modem for data and checks for the authentication of the data through the mongoDB, the software in server receives/updates data for posts and uses AT Command to program modem so as to send answers to the initial request through the user's phone.

X. CHALLENGES IN KNOWLEDGE SHARING

Knowledge sharing constitute a major challenge in the field of knowledge management. The difficulty of knowledge sharing resides in the transference of knowledge from one entity to another. Some employees tend to resist sharing their knowledge because of the notion that knowledge is property; ownership, therefore, becomes very important. In order to counteract this, individuals must be reassured that they will receive some type of incentive for what they create. This may be:

- Basic remuneration is the increase in the employee's salary or wage, which may be computed in several different ways.
- Health insurance: Companies typically pay part of the insurance premium. Health insurance may or may not extend to immediate family members like spouses and minor children. Dental and life insurance could also be offered as part of a remuneration package.
- Additional forms of remuneration that are frequently classed as fringe benefits. Employees might have education costs reimbursed, they could have access to company owned vacation spots, or be given a company credit card. With the exception of education programs, luxury benefits are usually only available to executive employees.

X. KNOWLEDGE MANAGEMENT HAS HELPED TO TRACK THE GROWTH IN THE COMPANY'S KNOWLEDGE BY

1.) Facilitates decision-making capabilities
2.) Builds learning organizations by making learning routine
3.) Stimulates cultural change and innovation.

A. Facilitates Decision-Making Capabilities

Data can offer managers a wealth of information but processing overwhelming amounts can get in the way of achieving high-quality decisions. When there is good decision, the Company Progresses. A company put a knowledge management system in place to help executives cut through the noise, share information, and improve their decision-making. Information overload or needing knowledge from people in other parts of the company for decision-making can handicap managers, putting in place knowledge management systems can facilitate better, more informed decisions.

B. Builds Learning Organizations by Making Learning Routine.

To move ahead, one must often first look behind.An organisation that makes learning a routine works better. This will create a culture where everyone continuously assesses themselves, their units, and their organization, looking for ways to improve. After every important activity or event, each unit/team review assignments, identify successes and failures, and seek ways to perform better the next time. This approach to capturing learning from experience builds knowledge that can then be used to streamline operations and improve processes in a company.

C. Stimulates Cultural Change and Innovation

Actively managing company's knowledge can increase the growth of knowledge in a company by stimulating cultural change and innovation by encouraging the free flow of ideas. In this complex, global business environment, these types of knowledge management programs can help managers embrace change and encourage ideas and insight, which often lead to innovation.

XI. BENEFITS OF THE NEW PRACTICE OF KNOWLEDGE MANAGEMENT OVER THE OLD ONE.

In Nigeria, when there were no computer systems, The then NEPA used manual processing. It started its billing manually, Consumers' consumption serves as input for the billing. The analogue meter measures the amount of electric energy supplied to consumers. It was difficult even for NEPA employees to move from house to house to measure the bills. It was equally difficult to pay bills since each house has a folder. Problems may arise on the equipment which only the experts can rectify and solve, they may not be available or even reluctant to share the Knowledge.

There is a new innovation existing in the company. A prepared meter which can be viewed on the computer system is available. It is no longer difficult to bill customers, when the credit is exhausted, the current goes OFF. Paying of bills is easy. With a Knowledge Management System, employees collaborate and knowledge are shared.

XII. CONCLUSION

An approach to Knowledge capture, storage and dissemination from any location has been designed and implemented, it is adaptable for use in a wide and large range of applications and it is simple and does not need a complicated and complex way of customization. Any Company can use the software, simply by replacing the database tables with those of the new application. As a result the project can be plugged into many applications that require to access their database anywhere in the world with the internet. It serves as an effective front end communication interface that provides access to data in real time data from anywhere.

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