**DESIGN AND IMPLEMENTATION OF A WEB BASED AUTOMATED ASSETS MANAGEMENT SYSTEM**

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**(CSC/2009/136)**

BEING SUBMITTED TO THE DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING, FACULTY OF TECHNOLOGY, OBAFEMI AWOLOWO UNIVERSITY, ILE-IFE

IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE AWARD OF BACHELOR OF SCIENCE (HONS) DEGREE IN COMPUTER SCIENCE WITH MATHEMATICS

**SEPTEMBER 2014.**

# **CHAPTER ONE**

# **INTRODUCTION**

## 1.1 Background

As most information and technology (IT) organizations grow and mature, it becomes more expedient to streamline the process of asset management in order to deliver business or economic value. IT organizations tend to acquire more tools, devices, software and other office equipment which are being shared by multiple people. IT teams are meant to keep track of their resources in terms of software licenses, services, computers and other devices. However, many IT firms continue to struggle with how to efficiently and effectively manage their assets. Assets that need to be replaced from time to time should as well be managed for quick decision making. Many IT organizations in Nigeria are still challenged with the problem of how they can possibly track the lifecycle physical and fiscal information of assets.

According to International Data Corporation (2013), a survey on trends in software pricing and licensing indicates that 30% of the enterprise companies are still using spreadsheet to track their software usage and licenses, and one third of the companies are unhappy with their approach to software asset management.

Apart from tracking an IT organization’s assets, there is a need to control the access of users to those assets and also track the movement of devices from one place to another.

Being able to assess exactly what assets are worth at any given point can be helpful in determine today’s budget and asset management provides such forecast.

Another need for an asset management system arises as IT organizations need to automatically generate detailed assets status report on monthly, quarterly and yearly basis. This would help them to monitory their assets inventory and to make economic decisions.

## 1.2 Statement of Problem

It is a known fact that software asset management has become a major financial risk for some companies. Presently, most small and medium sized IT organizations in Nigeria do not have a means of managing their assets and this has led to problems such as: under deployment and over deployment of software, loss of office equipment, difficulty in budget planning, difficulty in determining business worth, misappropriation of office resources, financial crisis and some other management crisis.

Also, IT organisations using other tools for asset management would prefer to monitor all their assets (i.e. both software, fixed and other) with one tool.

## 1.3 Scope of Study

This study is concerned with the design and implementation of a web based asset management system for small and medium sized IT firms. This system will help IT firms to track their assets, control and monitor the movement of assets from one place to another using its check-in and check-out functionality. The system would be a tool for managing both the software and other form assets of IT firms. It will provide graphical representation of assets data and usage trends of their assets which will in turn aid quality and detailed reporting and real-time decision making.

## Aim

The aim of this study is to develop a scalable web based asset management system for small and medium sized IT firms that will promote efficient and effective management and control for company assets.

## Specific Objectives

The objectives of this study are stated as follows:

1. study and analyze the management of assets by small and medium sized IT firms
2. design a model for capturing organizations’ assets
3. implement a web based system for the design in (b)
4. test the system developed.

## Methodology Overview

Extensive study on the asset management for IT firms using related works will be done. The design of the asset management system will be carried out using the Unified Modelling Language (UML) tools. The implementation of the system will be done using Hypertext Pre-processor (PHP) programming language, JavaScript, cascading style sheet (CSS) and My Structured Query Language (MySQL) and finally, the system will be tested using alpha and beta testing technique.

## Justification

Study has shown that the web platform is the most widely used platform. It is expected that most IT firms can easily access web applications using their web browsers. Existing asset management systems do not have the ability to control user access to assets, track the movement of assets and also generate real-time reports.

## Organization of Thesis

Chapter one introduces the study by explaining the key topical concepts addressed by the project. It discusses the aim of the project, the statement of problem, the objectives, and the employed methodology, the scope of the study and the justification of the project. Chapter two provides the literature review of technologies and related works to the current study exposing their features, pros and cons.

In chapter three the methodology employed in the implementation of the system is discussed. This follows the software development lifecycle (SDLC) which entails planning, analysis, design and implementation. Chapter four provides in detail, the implementation of the system in terms of the design stated in chapter three. In chapter five, the conclusion and recommendation that were noticed after the implementation of the study was discussed.

# **CHAPTER TWO**

# **LITERATURE REVIEW**

## 2.1 Introduction

This chapter consists of the following:

1. A background study of the research work that have been done on the topical concepts involved in this project
2. A review of the concept and methods of Optical Character Recognition
3. A Review of Existing Optical Character Recognition Applications and Projects

## 2.2 Information and Communication Technology (ICT)

The term Information and Communications Technology (ICT) encompasses a wide range of infrastructure, services, content and applications, from traditional telecommunications, the Internet, various media such as Radio & TV broadcasting to advanced Information Technology (IT) equipment and applications. It has shifted from naming the numerous technologiesinvolved into a catch-all phrase encompassing as well all the communication and information applications and servicesenabled through the technologies. (African Connection, 2003).

The expansion of ICT is driving significant changes in many aspects of human endeavor throughout the world. At both microeconomic (individuals and firms) level and macroeconomic (national) level, ICT has increased the effectiveness and reach of development interventions, enhanced good governance and lowered the cost of delivering basic social services. According to Gudmund (2003), there has not been just one but five revolutions in ICT. However these revolutions are interdependent and they are discussed below.

### 2.2.1 Computer

The first revolution started during World War II, with the first large, automatic, general electromechanical calculator, Harvard Mark 1. A couple of years later, Electronic Numerical Integrator and Computer (ENIAC) was presented in Philadelphia, based on radio tubes and practically without any internal memory. Applications also were expanded, from use in academic research to weather forecasting, from airline ticketing to accounting. This development continues; the first ICT revolution is still under way.

### 2.2.2 Size and capacity of computers

The second ICT revolution has its roots in the 1970s, when the first “processors on a chip” and magnetic discs were constructed. This revolution has its roots in the first revolution as computers were developed in the first revolution however the size of the computer reduced the capability and capacity of computers increased. Hence, the advent of Personal Computers (PC). This second ICT revolution continues like the first: the size of computers decrease, the capacities of the computers increase, their applications expand, and the number of people who have access to them multiplies.

### 2.2.3 Microprocessor

The third ICT revolution is the development of microprocessors and the ability to embed them in an ever-widening range of products such as the steering systems of airplanes, the control panels of hydroelectric power stations, domestic air conditioning systems, traffic lights in our streets, to name but a few applications. Microprocessors constantly expand their capacity, applications and users (Freiberger, 2000).

* + 1. **Internet**

The fourth ICT revolution stretches back to the late 1960s, when the U.S. Department of Defense drew up guidelines for a communication network among computers (ARPANET). After a while, universities in and outside the United States were hooked up to it, and some started to use it to send messages. France developed Minitel system, the U.S. National Science Foundation set up its own network among academic institutions that later became part of Internet. In Europe, EARN became a network among academic institutions, This fourth ICT revolution continues like the others as more and more computers are interlinked with an ever-growing number of “servers” and an expanding range of applications. Yet, another significant part of the fourth ICT revolution was its application versatility. Users of various disciplines and interests are able to adapt it to suit their variety of needs. (on the computer networks engineers had constructed, users built social networks to make them useful and effective).

**2.2.5 Wireless links**

The fifth ICT revolution was linking without cables—the new possibilities opened by mobile phones. Linking without cables now takes place not just intercontinentally via satellites, but also via high frequency short-range radio transmitters covering a specific area or cell (hence the name, “cellular phones”) and inside buildings by “Bluetooth” and infrared light.

**2.3 Information System**

Information system is a system, automated or manual, that comprises people , machines, and/or methods organized to collect, process, transmit, and disseminate data that represent user information.

Information system consists of three components, which are human, task and application system (Hirschheim, 1995). In this view, information is defined in terms of the three levels of semiotics.

Data, which can be automatically processed by the application system, corresponds to the syntax level.In the context, an individual that interprets the data that become the information constitutes the semantic level.Information then becomes knowledge when an individual knows (understands) and evaluates the information; which corresponds to the pragmatic level.

* 1. **Web Applications Development**

Web applications are applications whose functionality is processed on a web server, and is delivered to the end users over a network such as the internet or an intranet. The end users use a web browser to run web applications, which knows how to display and execute the data received from the server. In contrast, desktop applications are based on the entire operating system or a virtual machine which does most of the processing (Brinzarea et al., 2006)

A web application has to be made up of three layers:

1. Content (HTML)
2. Presentation (CSS)
3. Behavior (Programming/Scripting)

According to Yank and Adams (2007), when building a web application, the following steps are considered

1. Producing the content in HTML format. This is the base layer, which any visitor using any kind of browser should be able to view.
2. Focusing on making the site look better, by adding a layer of presentation information using CSS. The site will now look good to users able to display CSS styles
3. Lastly, using scripting to introduce an added layer of interactivity and dynamic behavior, which finally makes the site functional.
   * 1. **Web programming basics**

Since the release of Netscape 2, browsers have included support for more than static HTML. They also have permitted web authors to include scripts in their pages. Scripts are basically small programs that can react to events occurring in the browser (e.g. the user clicking a link), or other factors (such as a change in the current date and time) by changing the web page in some way. Scripting languages can be distinguished from fully fledged programming in that they are used in small doses, for specific tasks and the domain usually does not exceed the browser (Lanridge,2005).

The following are categories of web technologies that enable websites to be dynamic.

1. **Client­-side technology:** The various client-side technologies differ in many ways, starting with the way they get loaded and executed by the web client. JavaScript is a scripting language, whose code is written in plain text and can be embedded into the HTML pages to enable the web client to do more interesting things than displaying static documents. JavaScript is supported by all modern web browsers without requiring users to install new components on the system. JavaScript is a language on its own right and it is supported by most web clients under any platform, and it has some object oriented capabilities. JavaScript is the widely embraced client-side scripting language in use today. In contrast to CGI programs and other server side technologies (PHP,ASP,etc.) that are run by a web server before a requested page is sent to the user’s web browser. This allows scripts to react to a richer set of events occurring in the browser without the overhead of having the browser contact the web server to ask what to do every time an event occurs (Brinzarea et al., 2006).
2. **Server-side technology:** On the other hand, server-side scripting is done such that the scripts are executed on the web server and parsed into raw HTML before being served to the browser for rendering i.e. Server side technologies enable the server to store logic to build web pages on the fly. Examples of such technologies are Ruby, PHP, ASP, Perl etc.

Server-side technologies as explained by Langridge (2005) are similar to their client-side counterparts in that they allow the embedding of little programs into the HTML code and when executed, allow control of what appears in the browser window more flexible than just HTML. The difference is that unlike in Java (and other client-side technologies) where the code is executed within the browser after the page has been fully downloaded, the server-side scripts are executed by the web server before the page is sent to the browser and once interpreted, the result of the script will replace the server-side code.

It can thus be said that the development of powerful web applications involves the smart combination of HTML with both a server-side technology and a client-side technology.

* + 1. **The AMP architecture**

The AMP architecture is used to describe the open source web development platform of Apache (as development and production web server), MySQL (as primary database design), ad PHP (as server-side scripting language). The development of any database-driven website on this architecture requires these core components as detailed below:

1. **Apache**

Apache is an open source Web server. Its main use is to parse any file requested by any browser and display the correct results according to the code within that file. Apache is quite powerful and can accomplish virtually any task of a standard web server

The features and server capabilities of Apache includes the following:

1. Password protected pages for multiple users
2. Customized error pages
3. Display of codes in numerous levels of HTML, and capability to determine at what level the browser can accept the content.
4. Usage and error logs in multiple and customized formats
5. Virtual hosting for different IP addresses mapped to the same server
6. Directory index directives to multiple files
7. URL rewriting with no fixed limit

Apache can be used to host a Web site for the general public, or for simply testing pages before they are uploaded to a secure server on another machine (Naramore et al.,2005).

1. **Mysql**

MySQL is an open source Relational Database Management System which has most of the features of high-end commercial database servers, including the ability to manage very large quantities of data. It is designed to managing databases for web applications. According to Naramore et al (2005), it enables PHP and Apache to work together to access display data in a readable format to a browser. It is a Structured Query Language server designed for heavy loads and processing of complex queries.

Some of the features of MySQL as highlighted by Williams and Lane (2004) are as follows:

1. Multiple CPUs usable through kernel threads
2. Multi-platform operation
3. Numerous column types cover virtually every type of data
4. Group functions for mathematical calculations and sorting
5. Function names that do not affect table or column names
6. A password and user verification system for added security
7. International error reporting usable in many different countries

MySQL is the perfect choice for providing data via the internet because of its ability to handle heavy loads and its advanced security measures (Naramore et al., 2005)

1. **Php**

PHP is a recursive acronym that stands for Hypertext Preprocessor. It is an open source scripting language that is usually embedded or combined with the HTML of a web page. When the page is requested, the web server executes the PHP script and substitutes the result back into the page. PHP has many excellent libraries that provide fast, customized access to DBMSs, and it is an ideal tool for developing application logic in the middle tier of a three-tier application (Williams and Lane, 2004)

PHP is the most widely supported and used server-side web scripting language. There are many reasons according to (Naramore et al.,2005), that makes PHP a good choice;

1. **Open source:** Community efforts to maintain and improve it are unconstrained by commercial imperatives
2. **Flexible for integration with HTML:** One or more PHP scripts can be embedded into static HTML files and this makes client tier integration easy.
3. **Suited to complex projects:** It is a fully featured object-oriented programming language, with more than 110b libraries of programming functions for tasks as diverse as mathematics, sorting, PDF documents, and sending email. There are over fifteen libraries for native, fast access to the database tier.
4. **Fast at running scripts:** Using its built-in Zend scripting engine, PHP script execution is fast and all components run within the main memory space of PHP, thus it is faster than other popular scripting tools.
   * 1. **Merits Of web applications**

Despite the act of trying to deliver functionality via the Web, the benefits of web applications when carefully developed, outweigh these experienced drawbacks. Brinzarea et al (2006) explains that even with the current issues of usability accessibility, web applications have acquired extraordinary popularity because they offer a number of major technological advantages over desktop applications as summarized below:

1. **Web applications are easy and inexpensive to deliver:** With web applications, a company can reduce the cost of the IT department that is in charge of installing the software on the user’s machine. With web applications, all that users need is a computer with a working web browser and an internet or intranet connection.
2. **Web applications are easy and inexpensive to upgrade:** Maintenance costs for software have always been significant. As for web application, as soon as the server machine is upgraded, everyone gets the new version.
3. **Web applications make it easier to have a central data store:** When you have several locations that need access to the same data, having all that data stored in one place is much easier than having several databases in each location. This way, you avoid the potential data synchronization operations and lower security risks.

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### 2.5 Obafemi Awolowo University

Obafemi Awolowo University, Nigeria is a government-owned and operated Nigerian university. The university is located in the ancient city of Ile-Ife, Nigeria. The university was founded in 1962 as the University of Ife, and was renamed Obafemi Awolowo University in May 1987 in honor of Chief Obafemi Awolowo (1909-1987); the first Nigerian premier of the Western Region of Nigeria who was also the University’s founding statesman and first Chancellor.

The motto of Obafemi Awolowo University “For Learning and Culture” is apt as the cosmogenic legend of the Yoruba describes Ile-Ife as the center of the world, ascribed in Yoruba mythology, the enviable role of being the site of the earth’s first solid ground in a watery primordial planet. The University has established a reputation for providing a unique and top quality liberal arts education that stretches its students beyond the bounds of their specific academic disciplines. The University takes pride in its well-rounded graduates who are making their mark in Nigeria as well as across the globe.

The alumni and faculty proudly describes Obafemi Awolowo University as “Great Ife”. The term is commonly accepted by others when they do not feel that their loyalty to their own alma mater is compromised.

Obafemi Awolowo University offers undergraduate and post-graduate programme in various fields of specialization spanning the humanities, the arts, the natural sciences, the social sciences ,the medical sciences, engineering and technology.

The University presently has 13 faculties, and two colleges –the Postgraduate College and the college of Health Sciences- administered in more than 60 departments.

The University owns its own VSAT access to the Internet and an Intranet. The University also has a fully computerized library. With these facilities, Obafemi Awolowo University is among the best research-oriented and industry focused universities on the African continent.

* 1. **Existing Lecture Theatre Allocation System and Its Shortcomings**

At the beginning of every session, the school authorities allocate lecture rooms for all the courses being offered by students in the university. One of the most important factors being considered before allocating a lecture theatre for a course is the class capacity of such course, the bigger lecture theatres are most times being reserved for the faculty courses, courses meant for various departments and electives. However, this lecture theatre allocation is always done manually, which gives room for a lot of mistakes and redundancy as one lecture theatre is being allocated for more than one course at a specific time. This leads to a lot of commotion as various lectures clash in the same venue, this leads to a lot of conflict between lecturers and students.

* 1. **Proposed Lecture Theatre Allocation System**

The proposed lecture theatre allocation system is aimed at a web based application for efficiently allocating lecture theatres for all courses at the beginning of every session. This will be done by collating all available lecture theatres in the university and then allocating them as appropriate, considering the size of each class in question.

* 1. **Benefits**

Having an online lecture theatre allocation system will definitely be a more refined method of allocation of lecture theatres. This would have solved the issue of redundancy as well as unnecessary repetitions. Since such system would be scalable, this would give room for addition and even removal of data in the system. This method would make it easier for the school authorities to engage in this exercise every session: since they now have a structure on ground, which only needs to be filed with the necessary information anytime there is a call for it, instead on doing the same thing over and over again, every session