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MANAGEMENT SYSTEM IBRAHIM BABANGIDA LIBRARY,
MODIBBO ADAMA UNIVERSITY YOLA, NIGERIA**

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**CONCEPTUAL FRAMEWORK FOR SMART E-LIBRARY MANAGEMENT SYSTEM
IBRAHIM BABANGIDA LIBRARY, MODIBBO ADAMA UNIVERSITY YOLA,
NIGERIA**

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ABSTRACT

This study investigates the design of a Conceptual framework for Smart E-library Management System for use by the Ibrahim Babangida Library, Modibbo Adama University, Yola. The study is guided by 2 objectives to help in overcoming the current challenges being encountered in the management of eResources and planning. The research study is designed to help staff enhance performance in providing library services electronically; it helps students reduce rigour of manual usage, it will guide ICT directorate develop a blueprint in developing software for libraries and add to existing body of knowledge. This study also evaluated an existing framework that is based on cloud computing and came with a server based Smart E-Library Management System. The study concluded that Smart e-Library Management System is an essential component in the academic library. The study focuses on concept, access, management, services and ease of access via the browser-based platform. This help in obtaining much resources as possible from the users for the library, and this include post graduate theses and dissertations. The design and development of Smart Elibrary Management System if adopted by the Ibrahim Babangida library, it will resolve the current e-resources management crisis.

Keywords: Conceptual Framework, Smart E-Library, Management System, E-library, Information Communication Technology, intellectual library, strategic planning

1.0 INTRODUCTION

The library has been referred by several researchers as a physical or virtual resource environment for the educational institution. It provides information resources to support the academic community's overall academic activities. The library systems are social institutions created to conserve knowledge; preserve the cultural heritage; provide information; undergird and underpin education and research and serve as a fountain of recreation (Aravind, 2017; Chimah & Udo, 2015). It is an essential element in the educational system, which is the society's main arrangement for reducing costly ignorance, to those whose occupational function is searching for new knowledge to societal problems.

The library is an indispensable source of information as they will have at their command a vast array of private, college, university, national, public, school, and special libraries (Chu & Duan, 2018). The reduction of costly ignorance by libraries is achieved through the assistance they provide in formal and informal education and direct assistance they give to scholars and scientists in the extension of the frontiers of knowledge. In the past decades, access to information was usually in the library room, and as technology advances, access is now made online. In recent times, the library has undergone many advancements from the traditional library to the modern library, where contents are in digital form (Edem & Egbe, 2018; Igbo & Imo, 2017). This development has now called the e-library management system (Yohanna, Gambo, Dawha, Camble, 2019; Satrusallya & Wunnava, 2019; Chu & Duan, 2018). The increasing use of smart and mobile technologies have advanced libraries (Joshua & King, 2020; Owolabi, Idowu, Okocha & Ogundare, 2016). The development in smart, intelligent, mobile, and wireless technologies have transformed the way people access resources and services (Pandey, Kazmi, Hayat & Ahmed, 2017; Patel & Patel, 2017; Rahaman, 2016). It is now easier to access library resources on the move anytime and anywhere with mobile computing devices. The library is now described as it now provides intelligent decisions for effective policies.

Furthermore, the smart library system can be built using cloud computing and mobile technologies' superiority and scalability. The limitation of mobile devices such as storage space, processing speed, and battery life span can be minimized with a cloud-based library system (Yang, He, Huang, Ororbia, Zhou, Kifer & Giles, 2017). The library's role is undergoing a fundamental change, and the concept of a smart library is emerging (Wang, 2017; Loerke, Wyatt & McGuire, 2018). The library's smart service is the core part of the smart library system, which runs through

the smart library's construction and operation process (Chu & Duan, 2018). E-library platform has been actualizing on users' need and information communication technologies (ICT) infrastructures. The designs facilitate and include a gateway to various free, subscribed and home databases in a more effective manner.

The library has been a home of knowledge for decades; policies have been formulated many times due to increased volume of physical books and Journals that occupy space even when these are moved to the archives. Knowledge is sometimes kept away in the name of archives. Storage of these books is often done in bad shape (Agyekum & Ossom, 2015). The library is capital insensitive, and much fund is needed to preserve it. Both Student and staff often mishandle physical books and journals; sometimes others result in mutilation and book lost. Indeed, without information, there can't be communication. The emergence of technology has led to the proliferation of electronically available information resources. These resources include CD ROM database, electronic mails, Online Public Access (OPAC), and internet browsing (Agyekum & Ossom, 2015). The Internet, which is prominent in this source, has made possible access to electronic books and journals in various database and search engine.

In this age of globalization, the importance of information and communication technology (ICT) in an academic environment cannot be overemphasized because ICT facilitate quick access to information resources worldwide, through the Internet and other devices. It is now difficult to imagine the world without information technology.

In this digital age, tertiary institutions strive to keep up to date in their curriculum. The provision and use of ICT is part and parcel of the entire system, the Student, faculty, and the institution. It is one thing to recognize the importance of ICT and know if students effectively use them. If (ICT) are put to effective use, the essence of acquiring them is, to a large extent, justified vice-versa (Dolo-Ndlwana, 2013).

Online library management system is a system which maintains the information about the books present in the library, their authors, the members of the library to whom books are issued, library staff and all. Maintenance of all this information manually is a very complex task. Owing to the advancement of technology, organisation of an Online Library becomes much simple. The Online Library Management has been designed to computerize and automate the operations performed over the information about the members, book issues and returns and all other

operations. This computerization of library helps in many instances of its maintenances. It reduces the workload of management as most of the manual work done is reduced

E-library management system is an application which refers to library systems which are generally small or medium in size. Librarian uses it to manage the library using a computerized system where he/she can add new books, videos and page sources. Books and student maintenance modules are also included in this system, keeping track of the students using the library and a detailed description of the library's books. There will be no booking record or member record loss with this computerized system, which generally happens when a non-computerized system is used.

The Electronic information resources offer today's student new opportunities that were not available to the previous generalization. Macondo, Sithole and Chasity (2017) argued that while reading an e-journal is not the same as reading a printed issue; many students now acknowledge that electronic document offers users advanced features and novel forms. Kahn and Underwood (2013) noted that ICT had brought tremendous change in nature, boundaries, and information structure. It is generally agreed that many factors do influence attitudes. Similarly, Loerke, Wyatt and McGuire (2018) noted the advantage of electronic resources overprinted: speed, ease of user ability to access the document from outside the library, etc. According to Dadzie (2005), electronic resources are invaluable research tools that complement traditional libraries' printed ones. These advantages include access to information restricted to the user due to the geographical location, finances, and extensive links to additional resources or related content. However, knowledge of computers and retrieval techniques is needed to effectively search these resources, which has a bearing attitude towards e-resources (Wang, 2017).

Today's library holdings consist of written content, multimedia materials, subscription databases, and open-access resources. Library users in the 21st-century demand access to library facilities and programs from a single access point. The management of both electronic and conventional tools is becoming very challenging for library administrators, given the distorted expenditure, the skills required, and technological problems. Kahle (2017) described three major companies, namely Google, Amazon, and the Internet Archive, who have digitized materials on a large scale to allow consumers to find and purchase resources. Millions of archived books have made advances for libraries, many of which can be accessed from an open-access domain. Yaya and Adeeko (2016) described digitization as "the process of converting analogue educational resources present in the library into digital format to increase access and, where appropriate,

helping to preserve" and "also referred to as the management of new digital format materials. Rafiq and Ameen (2013) noted that "digitization enables creating digital libraries by converting analogue content to digital formats. Patel (2016) noted the steps involved in the catalogue planning process, including the review of the material needs of library members, the design and execution of a selection strategy to fulfil the goals of the library, the procurement of services to ensure a healthy collection, the exchange of resources and the de-selection of policies and activities.

1.1 Aim and Objectives of the Study

The main objective of the research is to develop a conceptual framework for a smart e-library management system, objectives of the study is to:

- i. Model and represent the smart e-library management system.
- ii. Evaluate the performance of the system using a framework for Smart e-library Management system

1.2 Scope of the Study

Smart e-library system analysis has been a focus of concern for many decades; technological frameworks or structures have been developed to incorporate technology into the library system; this is attributed to advancements in technologies that allow these innovations. The smart library system's operation entails a different range of problems, ranging from administrative and technology. This research aimed to build a smart e-library system to address the current challenges in Ibrahim Babangida library.

1.3 Statement of the Problem

The increasing development in smart and mobile technologies is transforming the learning process and includes learning objects to provide ease and flexibility of e-resources. Traditional library systems are now transforming into a smart system to access digitized e-resources to support learning and decision-making. The Ibrahim Babangida library has been at the forefront of digitalization to provide e-resources to the teaming users. A study by Joshua and Kin (2020) on e-resources utilization by the academics and students at Modibbo Adama University (MAU), Yola,

shows a lack of sufficient Internet access for academics and students training and awareness campaigns are major challenges impacting efficient services delivery. One major recommendation from their study is that funding and documented library policy.

2.0 LITERATURE REVIEW

2.1 Smart Library Management System

SMART has been used differently to represent intelligence and efficient resource utilization to meet users' needs. A smart e-library is a physical site or online platform that provides around the clock online access to digitized audio, video, and written material in the library context. It provides free copies of books, journals to authorized users. The online database of digital items is a virtual library or digital collection. A library fitted with smart library technology can be accessible without staff to library users. The technology enables library buildings to be remotely controlled, including automatic gates, lighting, self-service kiosks, and public computers. It helps expand the library opening hours substantially so that more people can sometimes use it (Aithal, S. 2016).

Online libraries provide an effective way to provide students and other users with learning resources with advancements in computer technology and online communications, the idea of a smart library began in the 2000s (Namburi, Sriniivasa, B.N. G, SVKP & Raju, 2020). Smart Library is also referred to as a virtual, digital, and intellectual library. The smart library is a system of substance hardware and software that offers a wide range of opportunities to find and supply essential information to active users in compliance with their demands and specifications. The smart library offers creative, engaging, insightful, imaginative, changeable products of every kind. The main purpose of the smart library is to encourage users of digital technology to receive information. One can store digital content on-site or remotely through computer networks (Aithal, P. S. 2016).

A smart library system involves collecting resources, allocating resources, processing resources, and resource distribution. The electronic library comes first, and then the smart library in library automation with intelligent recommendations. Electronic libraries' benefits include better access and easier preservation of traditional resources and the expansion of library collections. The search capability gives digital materials a huge advantage when a digital version is available. The

smart library is different from the traditional library, with certain characteristics. It has an extensive and precise search system with large volumes of text, images, and sound resources. There is no need for physical space for collecting online libraries, and you can do it from anywhere (Aithal, P. S. 2016).

The smart library concept aims to create content, context and pathways beginning with user's needs. Personal portfolios and tools allow users to tag articles, share links, take notes, and build reading lists. Reading level search, citation generator, spell check, integrated dictionary, and language translation make it easier for different users to research a topic successfully. The move to e-books as the preferred monographic format is beginning to change how libraries think about the long-term availability of books in their collections (Ozeer, Sungkur & Nagowah, 2019).

The rapid advancement of information and communication technology (ICT) has brought a revolutionary change in the information scenario. It has given rise to several options for the users to handle various information sources conveniently and effortlessly. As a result, e-resource has become the lively substance to the modern library's reserved in satisfactory varied need of a student, teachers, researchers, with minimum risk and time. Geetha, Perumal, Hariharan, and Jayakumar (2018) noted that for better planning, it is vital to know the attitude of users toward e-resources. The library user attitude to information is gradually shifting from the printed documents to electronic resources. Thus, it has been their prerogative to know the details of the availability and organisation of e-resource like online journals and databases, electronic thesis and dissertation (ETDs) government publication, online newspaper, etc. It is important to understand how technologically rich environment is influencing student attitude toward e-resource access.

A smart library management system has been developed using different technologies and frameworks to provide flexibility and access to learning resources for different study modes. Liao (2020) developed smart library services by integrating five elements: macro background layer, related factors layer, technology equipment layer, service creating layer and service providing layer, and the theoretical framework of core elements of smart library service. Although the framework is at the proposed stage, it lacks analytic to provide and recommends learning resources to users based on user behavior.

Moreover, Dani and Patil (2020) developed a smart library management system framework using QR Code. This QR code management system relieves some of the human labor otherwise required and barely requires funding or other resources. This management system works through

one application directly accessible to library users. The users can use the application to issue, return, and manage books through the QR code function, with minimal to no employee assistance. Similarly, Yohanna, Gambo, Dawha and Camble (2019) developed a smart library management system framework based on a mobile cloud computing environment in conjunction with a local server proposed for the Nigerian library system. Ozeer, Sungkur and Nagowah (2019) used a smart library management system that integrates IoT and automates a traditional library's core processes will propel the library towards a next-generation library. Users will be able to communicate smartly with IoT devices to perform the relevant task. Similarly, Satrusallya and Wunnava (2019) proposed a smart library system based on RFID (radio frequency identification). The proposed system emphasizes the management system scheme for a university/college/school library centred on RFID, building the hardware and software system environments. More so, Chu and Duan (2018) developed a Smart library and smart services for meeting the increase based on the IoT (Internet of Things) to connect objects for interaction and easy access of library resources with minimum human efforts. Geetha, Perumal, Hariharan and Jayakumar (2018) developed a smart book accessing the system using RFID in Library. The system implementation provided ease and flexibility of access to e-resources for the increasing number of users. Yang, He, Huang, Zhou, Kifer and Giles (2017) proposed a scene text detection and recognition system to identify books in a bookshelf library and build a digital library inventory. Besides, Pandey, Kazmi, Hayat and Ahmed (2017) developed and implemented a smart library system using IoT. The system handled authentication and access to e-resources without a physical presence in the academic library; they are popular with students and are seen as disseminated data for research. Aithal (2016) developed a conceptual model of a future e-library system. The model is based on the delivery of e-resources which is expected to be an innovation in advents of technology to share the intangible information resource between every human being of the world without any barrier. Qin (2016) noted that cloud computing and its applications in e-library services as a model that promotes the availability of resources and creates a powerful distributed computing system with global reach and supercomputing capabilities. The authors further provided a schematic diagram of how a smart library system can be achieved via cloud computing. Similarly, Wasim (2016) developed a digital library based on a cloud computing framework. The layers are divided into three; each performs a certain function of running the system. The allocation of resources, virtualization and scalability, are provided by authentic and monitored services.

3.0 METHODOLOGY

The existing system was a proposed smart library system based on mobile cloud computing. The framework was proposed to work in the presence of cloud server, in which the e-resource materials and other things are available in the cloud for guarantee of availability and security of the services all the time. A local server serving as a database for the library resources situated in-house. The local server operation is always active online with access to information from the cloud library resources via Web services on routine basis for updates.

The existing system saw the need to adopt cloud environment while the new model used a window based local network storage server confirm in the library of the institution to store and keep update of resources.

3.1 Server based smart library management system

This work presented a smart library system that is server based. The framework works on the desktop server, HP ProLiant ML380e Gen8 V2, 18Gb, 4 Terabyte, in which the e-resource materials and other things are available and security of the services all the time not left out.

3.2 The Existing Model: Proposed framework for smart library system based on mobile cloud computing

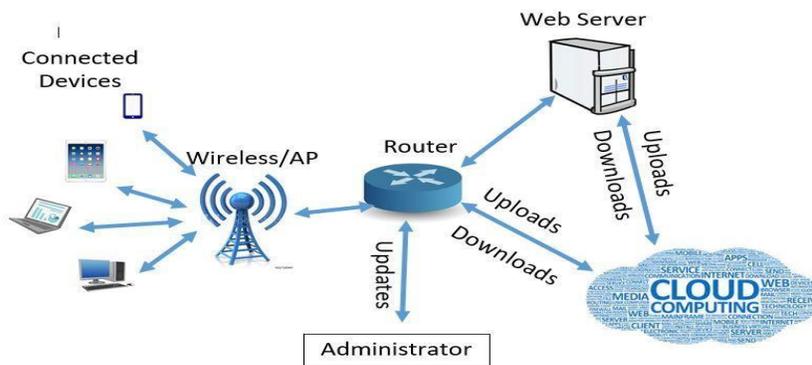
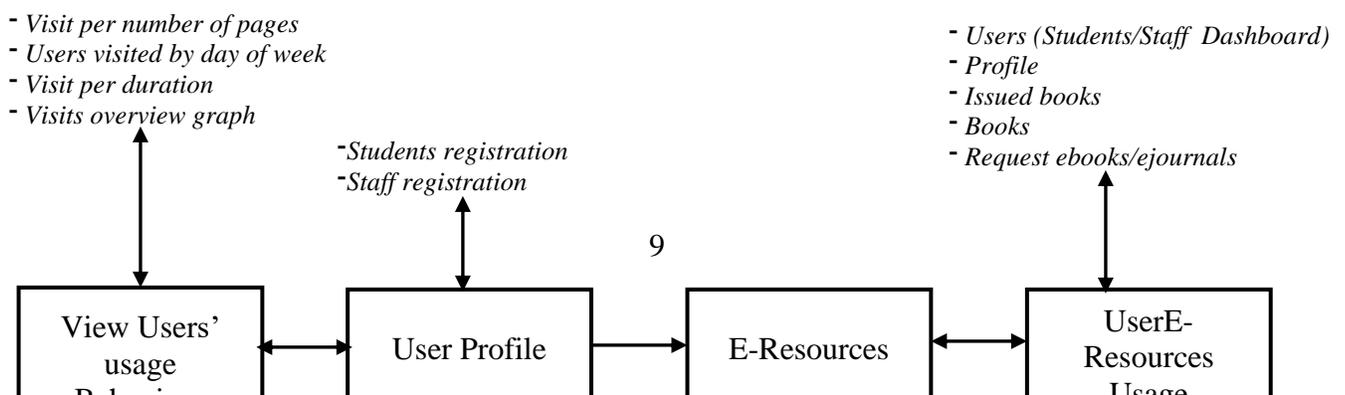


Figure 1: The Existing Model: Proposed Framework for Smart Library System Based on Mobile Cloud Computing (Yohanna, Gambo, Dawha & Camble 2019).

3.3 A Framework for Smart e-library Management System



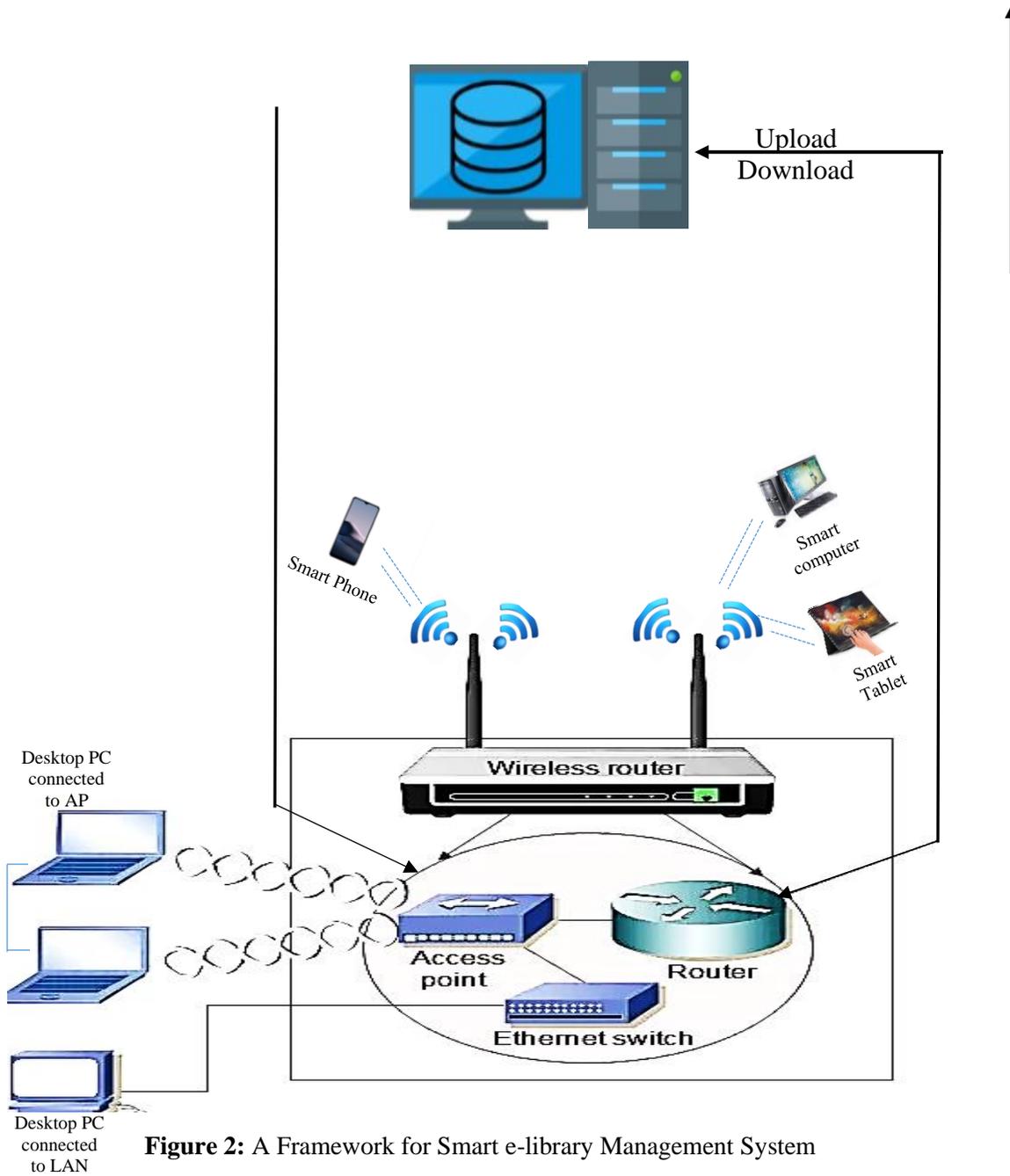


Figure 2: A Framework for Smart e-library Management System
3.3.1 *View users' usage behaviour*

The page displays visit per number of pages, that is the number of pages visited by the students and staff it also show the visits by day of week, visit per duration and visits overview graph that shows the representation of overall activity at its peak and or otherwise.

3.3.2 User profile

The user profile page displays students and staff registration details which include Name of the registered student and staff, username, email address, phone number, address and photograph. The user can update his or her profile and can login and logout.

3.3.3 User eResources usage

This is the user dashboard that contains the profile, issued books, shows the books available in the database and where request for eBooks and eJournals are made.

3.3.4 User eResources recommendation

This is where users recommned or add eResources. The user choices image file of the eResources coverage to upload then choices the eBook/eJournals to upload and the title eresources for sharing amongst users other details to enter are book author category,pages,volume for journals, and abstract,

3.3.5 Administrator

This part of the framework is responsible for managing the entire system and provide security monitoring of the system. The administrator page is the dashboard the contain administrators' profile. The administrator has right to view, update all students' information, all staff information, view overall analytics, manage book, issue book and manage users.

3.3.6 User data analytic

The overall user's behaviour analytic shows the analytics of the whole activity users' behaviour per time, duration, number of eResources pages visited per page, number of eResources pages visited per page per week, number of eResources downloaded per duration.

3.3.7 User mobile devices

Mobile application can be accessed via user devices which are also referred to as station. These are devices that has the capability to connect to wired or wireless network devices. For example, a station may be a laptop, a desktop PC, PDA, tablets or mobile phones. A user device may be fixed or mobile. These technologies allow user to access or request information from the web server through established connection on Access Point. The mobile devices allow user to access, share e-resources and collaborate with each other remotely.

3.3.8 Wireless access point

A Wireless Access Point (WAP) is a hardware device or configured node on a Local Area Network (LAN) that allows wireless capable devices and wired networks to connect through a wireless standard, including Wi-Fi or Bluetooth. WAPs feature radio transmitters and antennae, which facilitate connectivity between devices and the Internet or a network.

3.3.9 Web server

The primary function of a web server is to store, process and deliver web pages to clients. The communication between client and server takes place using the Hypertext Transfer Protocol (HTTP). Pages delivered are most frequently HTML documents, which may include images, style sheets and scripts in addition to the text content.

The Web Server will contain the databases/repositories which store all contents and information that are available and to be accessed by clients through their mobile devices. In that case, the database will be dynamically updated every time whenever any operation is performed on the network.

3.3.10 Storage servers

This are servers with more disk space for storing high volumes of data, archiving, or performing backups. This type of servers is relying on the most efficient and durable disks. The storage range consists of servers with a variety of storage capacity options and write speeds, to cover all uses. It is dedicated with guaranteed resources to optimise the availability of the data, often used to store the data and applications of an organisation. They serve as store houses for data and applications repositories. The storage servers may be in situ or ex situ, i.e. they may be located inside the network premises of the organisation or may be maintained virtually in a cloud network. Some organisations also outsource their storage server requirements to external vendors, to reduce capital expenditures.

4.0 Technologies for Implementation

MySQL: File System: Relational database was used to keep the proposed system's importunate data. MySQL is a well-known relational database management system used to manage the database relationship and interactivity among the database. It is an open-source technology used to create the database used in this project that interacts with Php script to manage the database such as edit, delete, update (Steve, S., & Janet, V. 2013).

5.0 RESULTS AND DISCUSSIONS

5.1 Description of the Application

The application can operate offline and web-based package which gives users information on various e-resources. A user registers and obtains login details via email, view e-resources, search e-resources, request e-resources, share e-resources, view user behaviour, and make recommendation. A user logs on into the application and by performing any of the tasks; the system then queries the database and returns the information for the particular task criterion. User behaviour is the track of activity of the user.

5.2 Design of the Application

As was earlier stated, this project work has been designed to feature components required for Smart eLibrary management System that is offline and web based to access e-resources, keeping mind that the number of pages has to be kept at the minimum in order not to consume unnecessary space and bandwidth while hosted. The application contains an administrator log in page, a dashboard that contains among others.

At designed time however, the use of local host has been extensive in code because, the local host serves as a virtual server for web application in the case of no internet connectivity. The resultant web status is the “local intranet”, to mean working offline as if it were the internet itself.

6.0 CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

The development of framework of smart e-library management system was studied and undertaken. After examining the characteristics of the existing systems and their bottleneck. It was established that such system need improvement in the future especially in the area of processing data. The work is confined to the use of offline and webpage to perform tasks such as viewing e-resources, searching e-resources, requesting e-resources, sharing e-resources, viewing user behaviour, and making recommendations. The said tasks access the database that keep and host e-resources for decision making obtained from the overall users' behaviour.

6.2 Recommendations

The following recommendations are made:

- i. The management of MAU, Yola in future research should include and expand the existing framework to enable it evaluate data.
- ii. PHP and JavaScript were utilized in the production of the system. Microsoft silver light software be used in the next upgrade because of its improved functionalities and flexibility.
- iii. It is strongly recommended that oracle should be used in the next upgrade so as to improve data security.

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