DEVELOPMENT OF AN IMPROVED SCHOOL INFORMATION MANAGEMENT SYSTEM

[1]Ademola O. ADESINA, [2]Sunday A. AJAGBE, [3]Tola J. ODULE, and [4]Kehinde K. AGBELE
[1,3]Olabisi Onabanjo University, OOU, Ago-Iwoye, Nigeria
[2]Ladoke Akintola University of Technology, LAUTECH, Ogbomoso, Nigeria
[4]Elizade University, Ilara-mokin, Ondo State, Nigeria.
Corresponding email: saajagbe@pgschool.lautech.edu.ng

ABSTRACT   Education systems of developing countries are improving with the help of information and communication technology ICT. Recent example is blended learning that is becoming popular in higher institution because of COVID-19. Meanwhile, truancy is becoming a lingering problem in post-primary school in Nigeria contributing to decline in academic performance and increase in social vices. Hence, this paper aimed at developing a post-primary school information management system that will help post-primary schools to keep track of students' attendance and results with an improved computerised system. It was experimented using local server for implementation and hosting, HTML, CSS, PHP, JavaScript and MySQL, CSS JavaScript and php are programming languages, while HTML is a markup language. The developed system granted different privileges were given to different users, and grant access to students and parents or guardian to view and monitor the attendance and the results through a web platform in order to curb truancy among post-primary school students.

KEYWORDS: Attendance's system, Information and communication technology, Local server, School information management, Post-primary, Truancy.

INTRODUCTION

Education system forms the backbone of nation building; hence it is important to provide a solid educational foundation to the younger generation to ensure the development of open-minded global citizens. Advancement in information and communication technology today plays a crucial role in streamlining education-related processes to promote solidarity among students, teachers, parents / caregivers and other staff in post-primary school setting. Education aids development, reduces poverty, ensures equality and lays a solid foundation for sustained economic growth for individual and the nation at large (Mikalefa, Maria Bourab, Lekakosb, & Krogstie, 2020).

The number of students admitted to post-primary schools is enormous and it is strenuous to manually manage information about the students' scores, grading and attendance. As manual system to manage the students' record is becoming more cumbersome and the students themselves are becoming more troublesome by the day, there is no ICT based system platform for parent-teacher reporting or communications. Failure in test and examination scores dropping causes fear for the students thereby hiding their scores from their parents, adding to the fact that parents are busy with their own careers, causing them to be ignorant of their children examinations' or tests' results. The results and report cards are prepared manually by the teachers which waste manpower and much time unnecessarily adding to the fact that parent complains day in day out of scores being allocated to students paying for afterschool classes. Since crime and criminalities are rampant across the world today, and social vices are on the high side, to the extent that some students have joined various gangs. Students at time leave home and will not get to school, and some will fail examinations and will not give their report cards to their parents saying the school management has not given it.

This problem had increased the student dropping out of the school significantly and the ripple effects are on the students themselves, parents, school managements and the society at large. Attendance of students is recorded by the teachers and in order to control absentees, the attendance must be compiled each day which is also time consuming. Teachers may want to associate a student with his parent or guardian for disciplinary measures which need searching of the students' record in the record office. It has been laborious to search from thousands of such records and observe that students can take any person claiming that he/she is their parent which creates problem in control of students. Having delved into the inadequacies and bottlenecks that the existing system adopts the needs for the implementation of school management system in order to efficiently handle students' attendance and report cards arises. Due to the inefficiency of the current manual system and its effects on the academic performance of the students, there is a need to efficiently handle students' attendance, and report cards and ease the work load of teachers and management staffs becomes inevitable (Zalat, Hamed, & Bolbo, 2021; Ajagbe, Adesina, & Oladosu, 2019).

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Despite the popularity of ICT in other areas of human endeavour, the government or public schools in Nigeria are using paper-based register and document for their documentations ignoring inherent benefits of ICT thereby waste manpower efforts and time. Summarily, the present manual method of keeping students' attendance and academic records has been found by researches to be disadvantageous. This is due to the problems which are identified as follows:

i. Loss of records by students (intentional and unintentional).
ii. Delay in giving parents and caregivers the performance of their wards and
iii. Reduced the efficiency of staffs

The creation and management of accurate, up-to-date information regarding students' academic reports as well as their attendance are critically important in the attainment of these milestones by student. Student information system deals with all kind of student details, academic related reports, examination details, attendance details and other resource related details. To help promote students' moral achievement and academic success, school management must avail parent timely information about their wards. School Information Management System that has all kind of details in the school management, such as; academic reports, students' attendance, college and students' details, details of the subjects, extra curriculum activities, and other related details. It tracks all the details of a student and management from day one in the school to the end of his program, this can be used for all reporting purpose, tracking of attendance of both students and staffs, students' academic performance, completed term and session, final examination result and any other assigned duties that are meant for monitoring students' academics and moral growth. Many educational institutions perform management of education resources online especially with the coming of the internet. Although, some are not online and making use of available ICT facilities for effective managements. Wachiuri, et al, (2017) observed that worldwide, the use of computerised school management system has become very important for the management of educational organisations.

Qazi, et al., (2021) described school management information systems as "a management information system that is meant for the structure, task management, instructional processes and other needs of the school". Contributions of the information management systems to schools was described as a way of making the teaching and learning process more effective, enabling teachers to exchange their experiences in a more systematic ways, determining the needs of the students and disseminate their performance promptly to their parents to support the effort of the teacher just as (Idowu & Adeniji, 2018) developed the performances, effectiveness and efficiencies for school management system but the work focused on staffs.

Many educational institutions including post-primary schools are constantly trying to improve the quality of education and one of the aspects of such improvement is the management of school resources (Fulmer, 1995). The explosive growth of computer-based technologies has left a tremendous impact on educational institutions (Manju, 2014). Technology has had an increasingly significant impact and broad implications for everyone-individuals, institutions and the entire nation alike. A school management system is a collection of computer instructions, to manage the day-to-day administrative tasks of schools (Gray & Smith, 2007). School management systems allow schools to digitally monitor their daily activities along with managing all their resources and information on a single platform. School management system have multiple applications throughout the education cycle; they are capable of eliminating increased work load on school's finances and general administration. School management system is meant to enhance the performance of secondary schools with the use of some materials for effective service delivery (Majlinda & Bekins, 2013).

The administrators can track everything that happens within the school easily if the school information system is automated to improve budgeting, staffing issues, and student management. When parents are involved, student education improves. When parent have access to records of their wards, they become more engaged in the educational advancement of their wards. School management system helps to achieve overall educational goals. Kornelis & Ock, (2014). Teachers can promptly report the absenteeism of the students to parents for prompt action. Students and parents can access individual records to find discrepancies and note issues that should be addressed.

To assist in promoting school achievements and successes, schools must have complete, accurate and timely information about the students (Kornelis & Ock, 2014). The design of this system will be web-based type, so the user can directly use the system connecting it to the internet. The user of this system will be classified into three groups; the administrators, the teachers and the parents and students. The functions of the administrators and teachers are to read, write and edit while the parents and students will only be allowed to read and write. The proposed system will be more usable than the existing system; the system will replace the paper-based data management and information exchange because the new presented system will focus on the development of database that includes information on student's attendance, grades and other data

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needed in the school. In management system, in order to ensure the efficiency and effectiveness of school administration the design of right management system is important (Majlinda & Bekins, 2013).

Contributions of (Alsalhi, Eltahir, & Al-Qatawneh, 2019) to school information management system focused on enabling teachers to exchange their experiences in a more systematic ways, the area of students' attendance and grades were not looked into. To design and implement school information management system successfully, there are important components for its implementation.

Current Schools Information Management System in Nigeria

The current school information management system is a manual one, especially in public school, while few private schools automate their information management system. According to the Annual School Census published by the Ministry of Education, Oyo State, Nigeria in 2020, it is recorded that there are 190,809 and 177,408 students in Junior Secondary School and Senior Secondary School in Oyo State respectively with over 2,000 public schools (Oyediran, Omoare, Owoyemi, Adejobi, & Fasasi, 2020). The management of data in the post-primary schools like any other organisation is a recurring process that involves the teachers, administrators and students.

Manual school management system is a system which does not need any computer device; all the data is stored manually in form of paper (Demir, 2006). Although it is widely held that retaining and maintaining paper-based document is unnecessarily unmanageable and costly, manual paper-based system has been used ever since paper was originated. In manual school management system, using pen and paper for attendance record is so cumbersome and strenuous. Also, paper documentations are often incomplete, because often times the forms are not filled completely and appropriately. Managing scores and grades is done manually by the teachers which sometimes result into some irregularities and errors (Atef & Medhat, 2015).

Yi & Ping-guang, (2010) observed that managing school effectively and efficiently needs further attention given the vital roles education plays in the development of a country. Sangrà & González-Sanmamed, (2010) says automation is the utilisation of every technology to substitute human with machine that can function more quickly. Therefore, the manual way of delivery is unmanageable and waste energy and it does not save time and money due to lot of paper work involved that results to inconsistency and redundancy in the system.

Student Evaluation of Teaching (SET)

The Student Evaluation of Teaching (SET) is a paper or electronic questionnaire, which requires a written or selected response answer to a series of questions in order to evaluate the instruction of a given subject. Over the past century, student rating of teaching activities have continued to take precedence in teaching evaluation systems in many part of the world. However, this is not the case with many Nigerian schools (Amingad, Poornima, & Arpitha, 2017). A key strength this work is the provision of a systematic way of making sure that each student participates in evaluating a subject – teacher before his/her academic results are released. This will enable school administrator as well as teachers to improve student learning and teaching motivation. The idea is to integrate both the subject teachers and parents evaluation, so as to have both the academic records as well as the subject teacher evaluation records thus improving student's participation.

Kornelis & Ock, (2014) proposed and developed School Management Information System (SMIS) using Architecture of Integrated Information System (ARIS) and Unified Modeling Language (UML) to manage SMIS, it was developed for Indonesian National Education Standards to help schools run efficiently. The new system conforms to the education rules of the Indonesia government. Meanwhile, there was no feedback mechanism to bring parents on board as to the management of their wards. Zhao & Sun, (2014). Umaru Musa Yar'adua College Katsina system by a computerised system that was developed by Oduntan & Ojoawo, (2018). The purpose of the system is to centralize information, providing clear mapping and clear language. Subject management, sending short texts or emails to parents and student attendance were introduced too but the limitations set in when parents began to complain about not receiving texts or messages from the school.

Amingad, Poornima, & Arpitha, (2017) developed a web-based student academic records information system which implements a wide range of students' functionality. Limitations of this work include: only students use the system; no roles for administrative staffs and parent.

Rashid & Rashid, (2012) presented a distributed system for student result processing. Their system emphasizes advantages of distributed system and allows each department to maintain its database. Limitations of this system include lack of roles for students, parents and staffs. Their system was also difficult to manage, maintain and upgrade because their was no mechanism for ease of use and parents were not given access to the system.

Jiugen & Ruonan, (2016) addressed the problems arising from result processing on the intranet, which focuses on speeding up collection of students' academic data to expedite processing of results and

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testimonials at various levels. It also allows online access of results for students. Limitation of their system include only two services (result processing and library resources management) were supported, no subject management, no means of monitoring students' attendance and scores and roles for administrators and staff have not been implemented. In response to the aforementioned limitations, therefore, this work aimed at designing and developing School Information Management System in post primary school system to:

i.   Computerise students' attendance and results and;

ii.   allow parents and caregivers access their wards' attendance and results through a web platform.

Organisation of the paper

This work is divided into four sections: Section one gives a broad introduction to the study, motivation for the study, organisation of the work. Sections two talks about the methodology and detailed descriptions of the design and development of the work. Section three captured the implementation of the proposed design, implementation environment, software and hardware requirement, architecture of the proposed design and results gathered. Section four gives summary, conclusion and recommendations for further study.

METHODOLOGY

System Design

The attendance and score monitoring system app in this study is a web-based design, an extension of the three-tier client server architecture. It offers an improved performance with scalability, decreased coupling, and replication of component within a tier. The system provides platform for both the management, staffs, parents / caregivers and students to see the performance of the students in terms of punctuality and academic results. This section presents how the three distinct objectives in this study were addressed. The objectives are to:

i.   design a system that will compute and monitor students' attendance and scores and;

ii.   allow parents and caregivers access their wards' attendance and score.

The post-primary school information management system developed in this study was aimed at improving record keeping and information dissemination between parents and students and management. This minimizes the challenges of truancy among students and problems of poor academic performance by providing parents prompt and regular record of activities of their wards. The solution proffered in this study provide parents and students access to students' information, specifically, students' attendance and examinations scores or grades. So that parent and indeed students can track of students' attendance and academic performance.

The program was designed using HTML, CSS, PHP, JavaScript and MySQL, JavaScript and php are programming languages, while HTML is a markup language; CSS is the stylesheet used i.e the color scheme design and the layout, and mysql is the database used i.e where all the data were stored. To develop the system, local server application was used to delivery management system.

Use Case Diagram for Attendance-Results School Information Management System

The use case diagram of post-primary school information management system illustrates the unit of functionality provided by the system. It helps to develop and visualize the users' active roles including the relationship of the key actors in school information management system. Figure 1 described the system and summarizes the functions of each identified users with their inter relationships and communications. There are four types of users namely; admin (super admin), sub admins (teachers), students and parents. The role and functions of each user is clearly described in the use case diagram of Figure 1
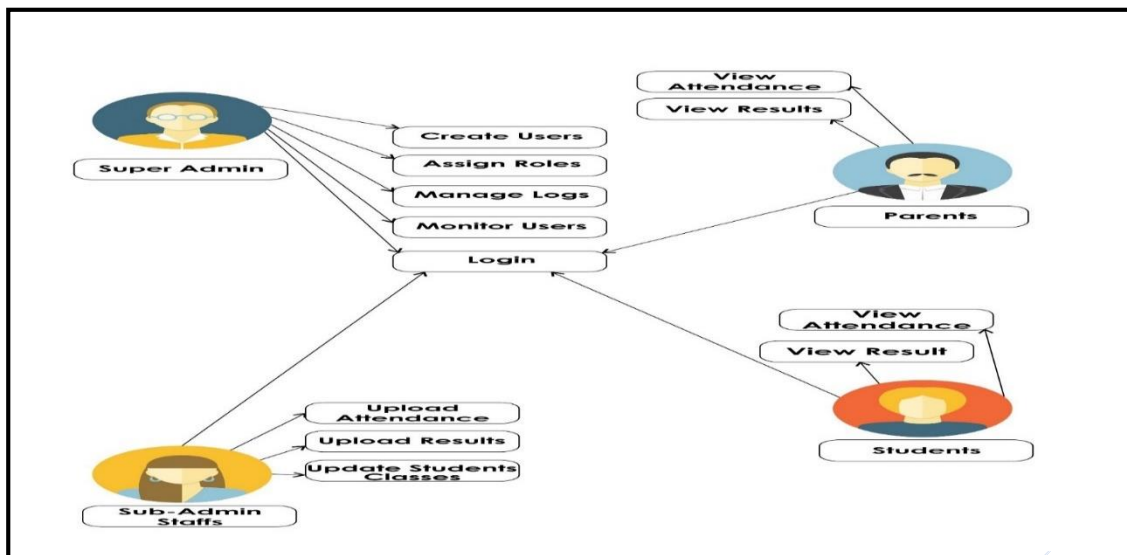
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Figure 1: Use case diagram for Attendance-Result School Information Management System

IMPLEMENTATION AND DISCUSSION

Implementation

The implementation of this was done using the instrumentality of the local server for local hosting (xampp, wampp, lampp etc). The local server was installed on the system, the system files were copied to the root folder of the local server, and the database was installed, to do the necessary configurations. Then, the program was run using the web browser (either google chrome, Firefox, ucbrowser, Microsoft edge). Figure 2 shows the Local server execution environment. The site was also developed using the stated tools, to support redesigning that may be added to the interface of the entire system (as indicated). The implementation of this project also took care of users' needs and system functional requirements analysis using explorative research method and object-oriented technology for data gathering and data analysis. Three types of requirements essential for efficient and effective operation of the school information management system in this study are; hardware, software and people (personnel).
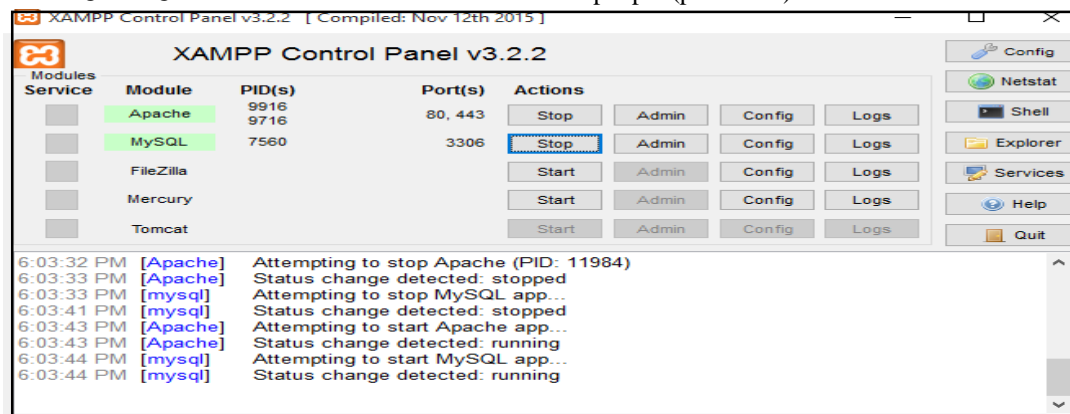

Figure 2: Local server execution environment

Hardware Requirements

The hardware requirements include: Intel Core 2 Duo Processor, 320GB Hard Drive,3GB RAM on Packard bell computer system. Operating system - Windows 10.

System Structure

Figure 3 shows that the adapted system structure for school information management system in this project allows the registered users to login to the system and access the information on the system based on their assigned roles. For instance, the staffs/ sub-admin will upload the attendance, upload the results and update the students' classes, while the students and parents will view the attendance, and results when they login.
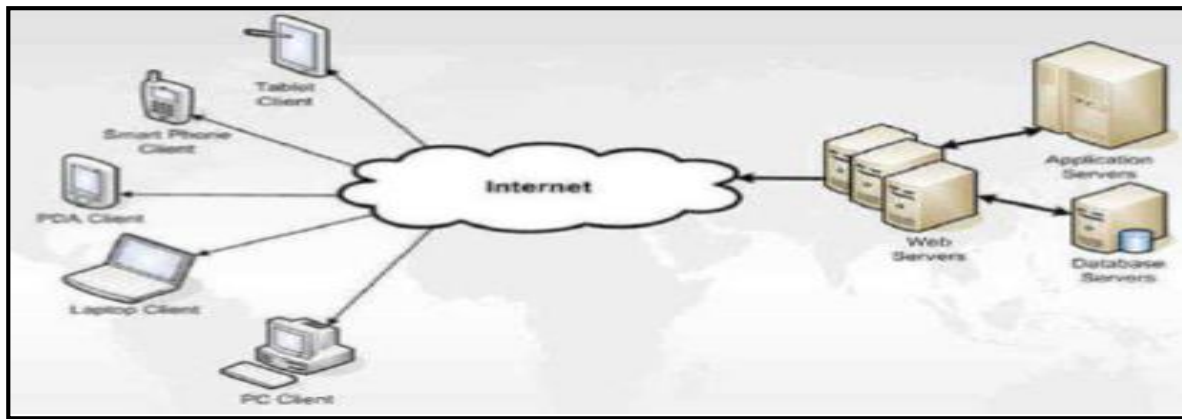
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Figure 3: Adapted System Structure for School Information Management System

Software Requirement

Xampp (provides the needed web application platform that is necessary for the system to communicate), Apache Web server (the web browser display the source code in a user-friendly ways), Mysql database, PHP (Hypertext Preprocessor) programming language, HTML (Hypertext markup language), CSS (Cascading Stylesheet), JavaScript (The text editor is being used to edit and create new source code).

3.2.2 Design Architecture

The school information management system in this project offers the required services through the instrumentality of the tools and equipment detailed in its architecture. Figure 4 show the architecture of school information management system in this project. The main components of the system are:

1. the client system that entails the users of the system.
2. the application server that entails web server and local server that produce the web interface.

a. Web server

This is responsible for requests from web browsers and upon receiving the request for a file, sends it back to the browser. It hosts the application and controls information for the system.

b. Web interface

A web interface allows the user to interact with content or software running on a remote server through a local server. The content is downloaded from the system and the user can interact or view the content in the system. The distributed nature allows the content to be stored on a local server, while the ubiquitous nature of the web browser permits a convenient access to the content.

3. Microsoft SQL database is a relational database management system developed by Microsoft. The data server presents a typical standard database interface such SQL which can be accessed via database driver appropriate for the programming in use. This was used in the development of database table and database design view in figure 5 and figure 6 respectively.
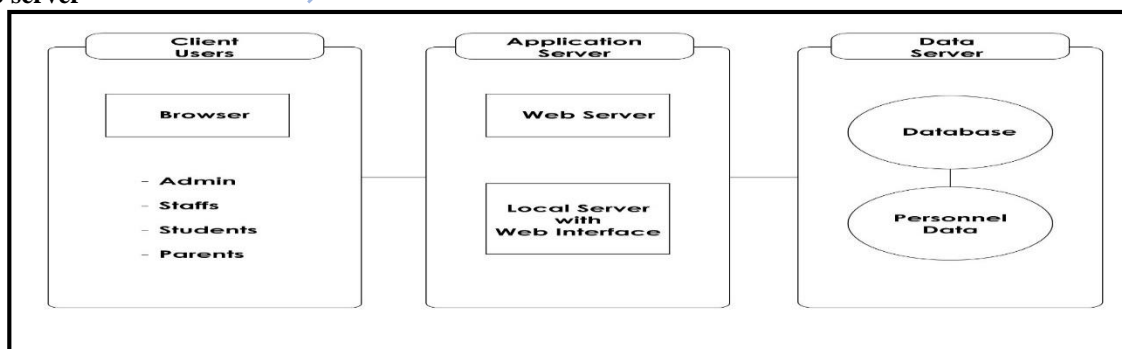

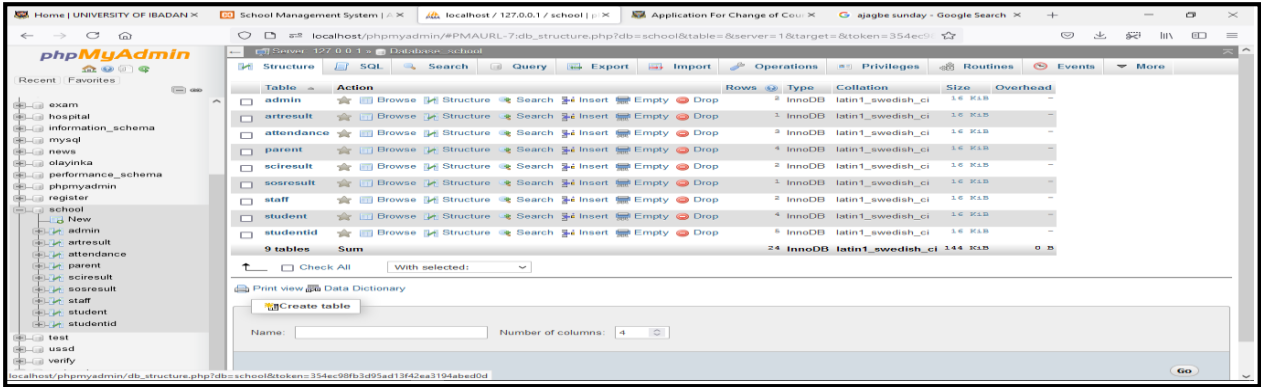Figure 4: Architecture of school information management system

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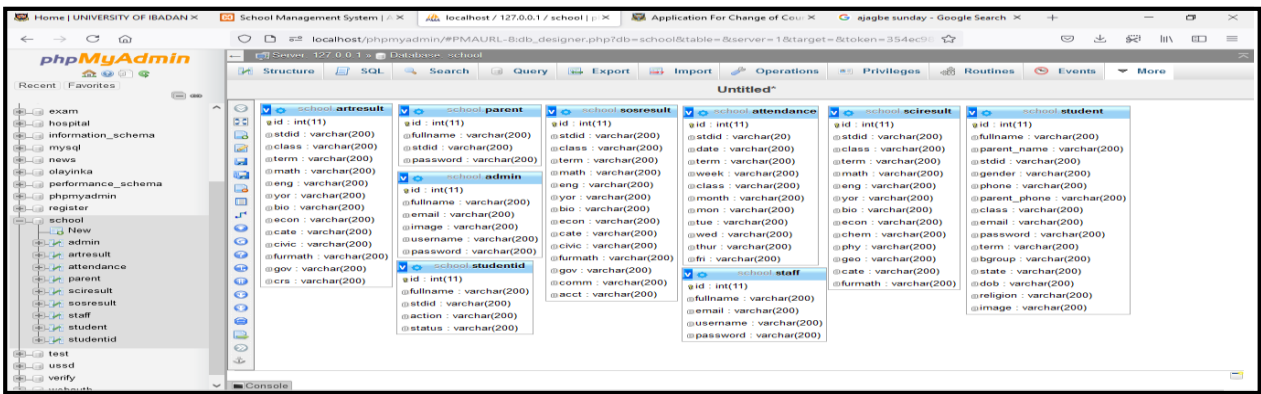
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Figure 5: Database Tables

Figure 6: Database Design View

The personnel

In this project, four categories of personnel are required, namely; school principal who may also be represented by another senior staff, as admin (super admin), sub-admin teachers / staffs students and parents.

Admin Dashboard

The school principal or senior staff serve as admin (super admin), admin will be responsible for creation profile for sub-admin (teachers) who are staff of the school, the new students as well as their parents. They are assign roles with controlled access to the users, monitor and manage account of all the users, all these are done by login to the system. The roles of the staff are to upload the students' attendance and scores on daily basis, while the roles of students and their respective patents is just to view the attendance and scores uploaded. Super admin can also deregister any transferred staffs or students, and in case of termination of appointment of staff (s). Figure 7, figure 8, figure 9, and figure 10 show admin homepage, admin dashboard, staff registration page, register new students respectively.
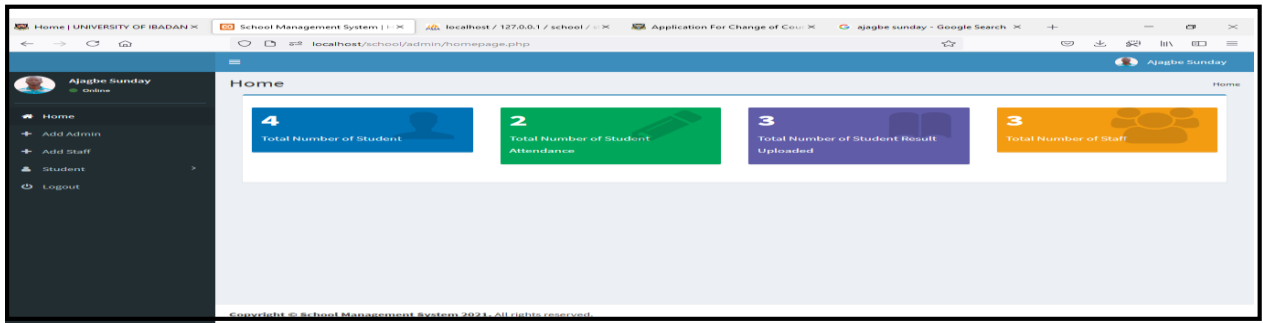

Figure 7: Admin Homepage

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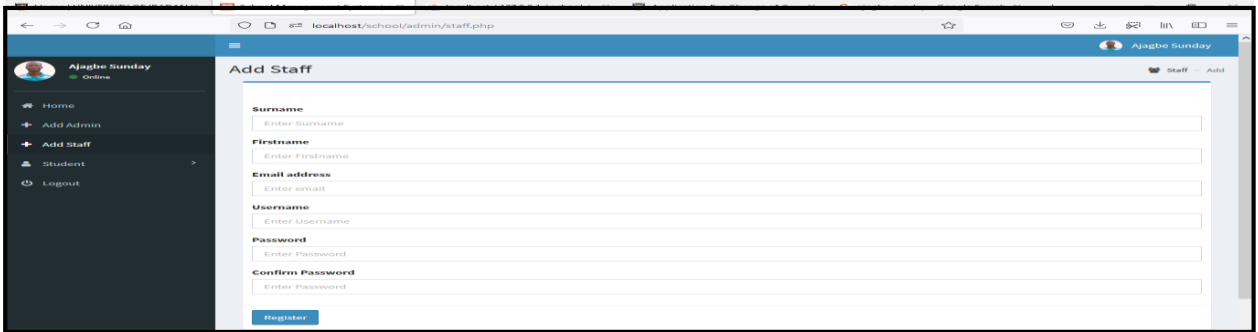
Figure 8: Admin Dashboard

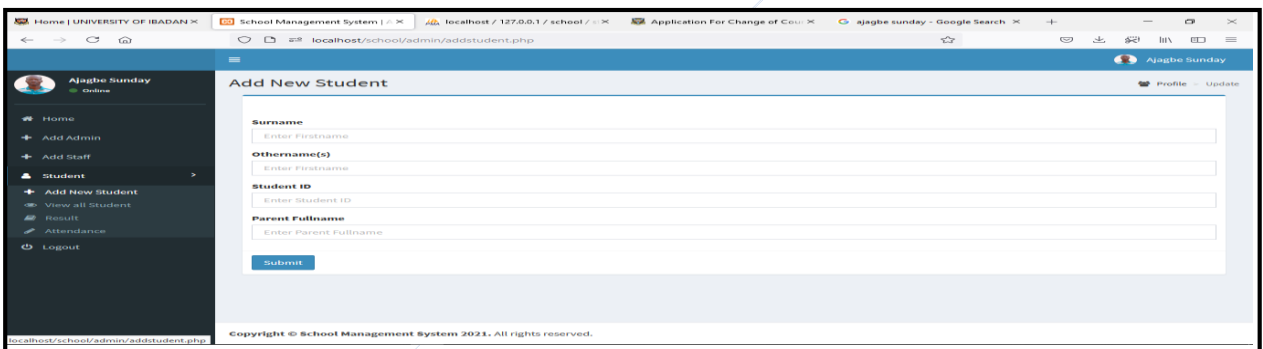
Figure 9: Staff Registration

Figure 10: Student Registration

Sub Admin/ Staff

The school sub admin are the teachers, and they are responsible for uploading and updating of students' profile such as changing of class, attendance register, and score update. This is done by login to the system and perform various activities or roles that sub admin who are staffs/ teachers can play in this system are depicted in figure 11 staff dashboard, figure 12 Upload Student Attendance Page, figure 13 Upload Student Result Page, Figure 14 Update Student Information Page such as change of classes.
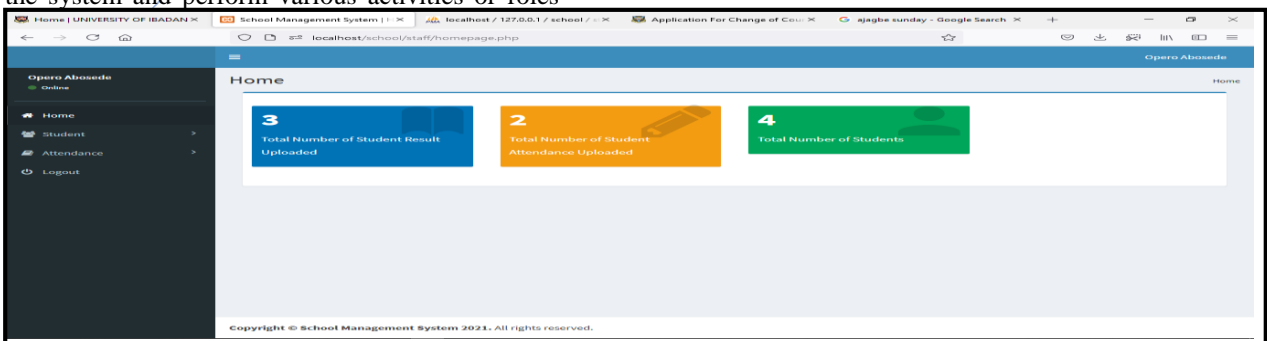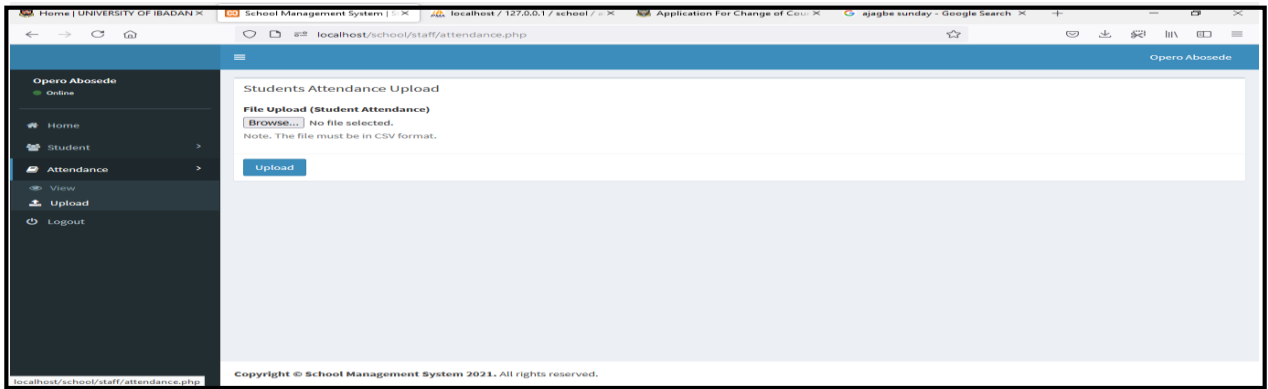

Figure 11: Staff Dashboard

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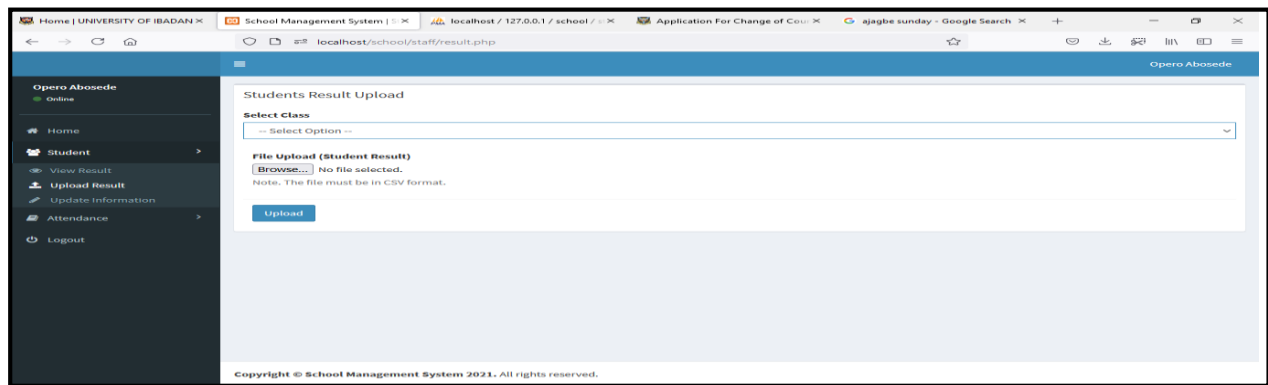
Figure 12: Upload Student Attendance Page

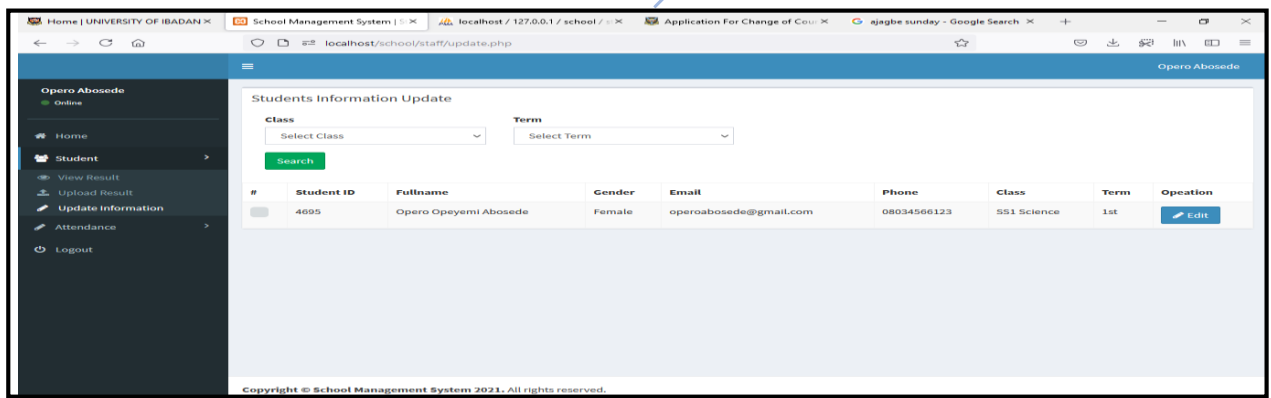Figure 13: Upload Student Result Page

Figure 14: Update Student Information Page

Parents Dashboard

In this dashboard, parents can login to view their wards' attendance and grades, this will help the parents to know how their wards are faring so that appropriate action can be taken in time. Figure 15 shows student result page view, and Figure 16 show student attendance page view
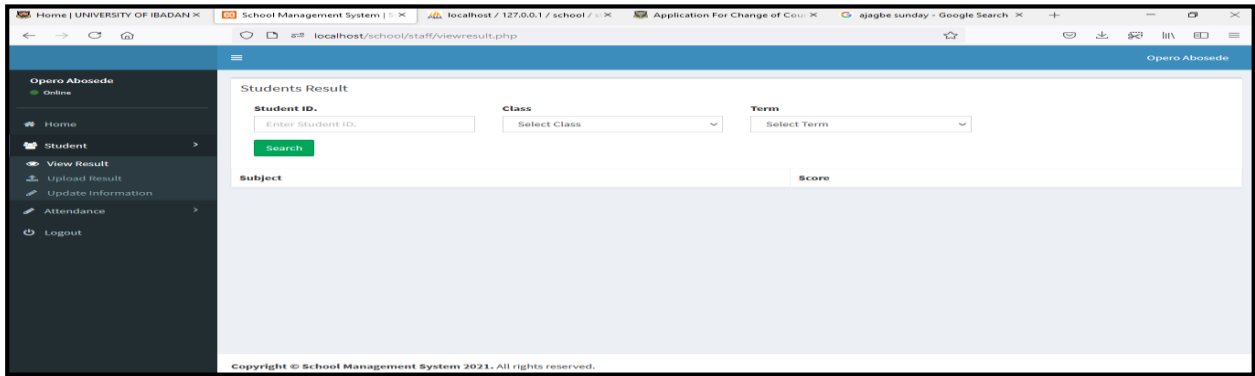
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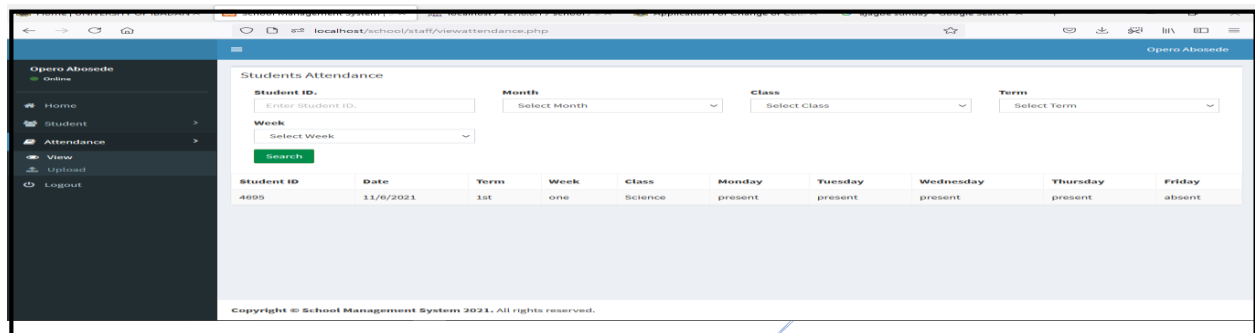
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Figure 15: Student Result Page View

Figure 16: Student Attendance Page View

Student Dashboard

In the student dashboard, students login to view their attendance, examination scores and their profile. Students' attendance view page on the system is shown in figure 17 and figure 18 is the student result view menu.
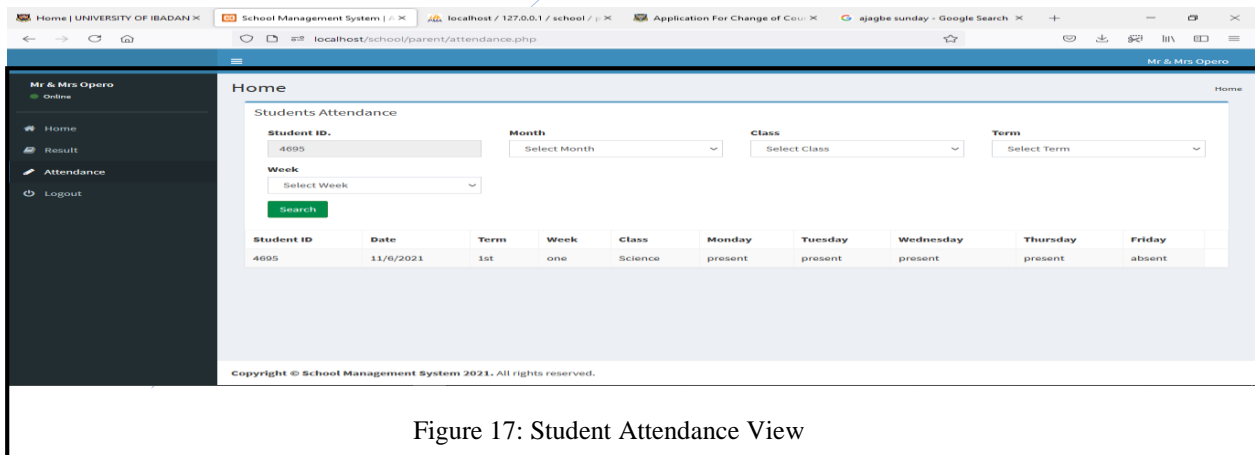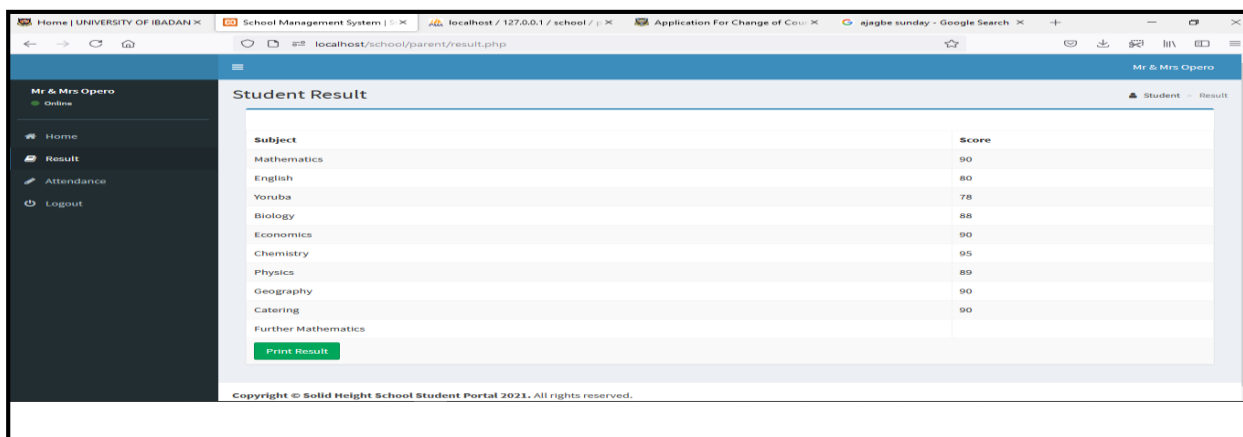

Figure 17: Student Attendance View

Figure 18: Student Result View

SUMMARY, CONCLUSION AND RECOMMENDATIONS
Summary

The use of a manual approach to monitor the attendance and disseminate results by school administrators is very tedious, and time consuming. It has not been yielding expected results for both the post-primary school administrators, teacher and parents since they could not ascertain the position of their ward/students in time. This project has shown how attendance and results of students can be monitored with less difficulty for informed decision-making. The newly designed computerized system that brings parents and caregivers on board in a reliable and more interactive manner, proffer solutions to the problems of existing system. This project will also eliminate paperwork and filing, boost productivity and afford parents easy and remote access.

School Management Information System (SMIS) in this project carries some tasks such as students' registration, attendance record keeping that check absenteeism, assist teachers in report results preparation, and grant parents access to monitor their wards. Also, it improves the efficiency of staff, reduce tedious work of teachers. It will also provide a faster way of disseminating students results and attendance status of post-primary school students to their parents and caregivers. It helps parents to know the moral and academic status of their children in time rather than waiting till the end of the term. It improves data security and efficiency.

Conclusion

In conclusion therefore, the post-primary School Information Management System, is deemed necessary to ensure the promotion of computerized School Information Management System especially in the monitoring of the students' attendance and scores. This helped in attending to students that are lagging in their academic pursuit and addressing truancy. This project has proposed and implemented a school information management system for post-primary school system, using web architecture to address this problem. The implementation was done on local server, Xampp control panel and other tools to actively engage post-primary school management, staff, parents and students. It enhances intended learning outcomes as the parents have unrestricted access to the attendance and grades of their wards anytime and anywhere. It can also be concluded that this is a blended system that has successfully brought parents to the management of the affairs of their wards in school through web interface.

Recommendation

The study recommends that government through the school administrator, should implement School Information Management System in all post-primary schools setting in Nigeria, so as to effectively monitor students' attendance and score and consequently the improve education system, reduce poverty and develop the nation. The implementation of this system will also bring parents on board to play their roles as stakeholder in the academic attainment of their wards. In addition, the integration of multimedia database, SMS and MMS notification server and SQL database will make the APP to be more robust, flexible, friendly and engaging. Hence, future studies should look in this direction. It is also hope that biometric fingerprint attendance management system will be considered in future.

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