A Collaborative Students' Industrial Work Experience Scheme (SIWES) Supervision and Management Platform: A Cloud-Based Solution

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Abstract: The quest to bridge the gap between industrial practices and academics practices has remained the driving force behind the continual support for internship; providing the students with adequate start-up knowledge of work environment. In this research, a cloud-based system is proposed for the management and supervision of such internship scheme called Students' Industrial Work Experience Scheme (SIWES) in the Nigerian context where the research was taken. The system is cloud-based and hosted on Google Compute Engine trial version at http://104.197.108.118/, would allow for near real-time collaborative supervision of students' experience during SIWES and recommendations can be made; proper management of the processes by the Institutions, Industries, and Industrial Training Fund (ITF); students can report their daily activities and also upload picture of themselves in such sessions; and both the ITF, Industrial, and Institution-based supervisors can monitor and make recommendations to the students.

Keywords: Internship, SIWES Portal, Cloud computing, ITF, Supervision, Management

I. INTRODUCTION

The continuous quest to bridge the gap between industrial work practices and the knowledge gained in institutions has remained the major driving force in supporting Internships. This as a result of the fact that students graduate with little or no working knowledge of the industry practices thereby finding it difficult to cope once employed. This is especially true for science and technical oriented courses. Therefore, the need to acquire the relevant experiences from industries before graduating from institutions becomes a necessity before graduating from institutions.

Nigeria, faced with same challenges of graduating students no being suitable for employment, in 1973 developed an internship program, Students' Industrial Work Experience Scheme (SIWES) to be headed and managed by Industrial Training Find (ITF). ITF as a body was charged with such responsibility and with backing from the Nigerian constitution of Decree 47 of 1971 to judiciously utilize the funds that would from time to time be allocated to it for ensuring that students of tertiary institutions in Nigeria acquire good working experience before graduating (Adetiba, Victor, Egunjobi, & Oladije, 2012). The result of such scheme was hopefully to train self-reliant Nigerian students who would bring the positive impact and change in the economic situation of the nation. The success of the scheme requires collaboration between ITF, Industries, and the Tertiary institutions of the country and the constitution provided for such. It also required that such experience be a pre-requisite for the award of Diploma, Nigerian Certificate in Education, and Degree certificates in the country. Therefore, objective of the scheme since its establishment has been achieved to a reasonable extent.

The extent of objective realization and acceptability of SIWES in Nigeria has been described in several researches that assess the impact and challenges of the scheme. In (Ukwueze, 2011) it was shown that the scheme has positive impact on students as they showed employability skills after participating in the SIWES; also in (Oyeniyi, 2012) it was shown that graduates demonstrated the significant impact of the scheme in terms of skills acquisition and utilization; research also shows that students, having participated in the scheme, show acceptability of the scheme and encourage continuous support of it by the relevant bodies and Government (Nse, 2012). However, the scheme is still faced with several challenges that inhibit the full realization of the objective of the scheme. Among many are challenges associated with proper supervision and coordination of the process, non-compliance by industries to accept such students (Nse, 2012); fuzzy job specification for the different courses, students' interest in participating in a skill oriented projects, and inadequate supervision (Olabiyi & Okarfor, 2012); other challenges included finances, students' placements, irregular academic calendars (Ojokulu, Emeahara, Aboyade, & Chris-Israel, 2015). These and several other researches show that coordination and supervision has remained the biggest challenges towards the full realization of SIWES scheme in Nigeria. Therefore, this research proposes a cloud-based solution to enhance an effective collaboration between Industries, Institutions, ITF, and Students on SIWES to interact in a collaborative manner; thus, leading to proper coordination and real-time supervision of the students on SIWES.

Cloud-based solutions are designed and implemented based on Cloud Computing Architectures and Models. Cloud Computing involves the use of remote servers hosted on internet for purpose of storage, management, and processing of data and applications. That is, the storage and processing power is provided for by the dedicated servers and users pay as they use; instead of relying on their local machines or local servers for such tasks which have proven to be inefficient in different respect. Cloud Computing services may be categorized as being a Private, or Public cloud services; and may be Infrastructure As A Service (IAAS),

Platform As A Service (PAAS) or Software As A Service (SAAS). It provides such benefits as self-service provisioning where users can widen computing resources for different types of workload on-demand; scalability through elasticity where users can scale up and down resources based on needs; and pay-per-use where users Computing resources are measured at a granular level, allowing users to pay only for the resources and workloads they use.

In the paper, section two provides relevant works, sections three discusses the system analysis and design of the proposed system, section four, the system implementation and testing and section five, the conclusion.

II. RELATED WORKS

From the establishment of ITF and SIWES scheme, the management and supervision of students on SIWES has been manual. That is, ITF teams, institution supervisors have to travel across the nation to supervise students on SIWES. Students have to travel to their institutions to submit their acceptance letters from their employer industry. The challenges and the risks involved have made this process very stressful and inadequate leading to the inability of the full realization of the said objective of the scheme.

Several researches have been carried out in an attempt to solve the challenge of coordination and supervision of SIWES Scheme to ensure full realization of the set objective. Here, related systems are presented and compared with the proposed system.

A blogspot designed and hosted by Federal Polytechnic OkoAnambra, Nigeria – SIWESFEDPOLYOKO, for the purpose of helping students on SIWES scheme to have access to information regarding the institution while away. They learn of what is required of them in the institution. That is, this system does not support any form of supervision but only provides information for students' consumption so as to act accordingly (FEDPOLYOKO, 2012).

In (Adetiba, Victor, Egunjobi, & Oladije, 2012), an e-SIWES portal was developed for Covenant University, Nigeria to automate and enhance the processes of SIWES activities such as registration, dissemination of information, filling of log book, day-to-day activities as well as supervision and assessment of students on SIWES by lecturers and industry based supervisors. The web-based portal implemented online log book and assessment forms used during SIWES for logging by students and assessment by institution based supervisor (lecturer); it also supports notifications broadcast to all students on SIWES.

In (Babalola, Adeyemo, & B., 2015), a web-based portal was developed for the AfeBabalola University, Nigeria following the challenges faced by the manual processes involved in the university when it comes to SIWES. For supervision, assessment and mentoring, lecturers are required to travel to all the industry where students are trained which makes the process very tedious and ineffective. Therefore, the system implemented was to solve such problems.

A host of other institutions in Nigeria (UNIOSUN, 2015; UNIZIK, 2014; UNILAG, 2015; UNILORIN, 2016) have also implemented SIWES portals to enable them manage the processes efficient. These systems, to the best of our knowledge, have not being published on any literatures.

These solutions, as described above would only help in advancing the degree of the realization of the overall SIWES objectives to some extent due to the limitations associated with the researches. They include:

➤ These systems are implemented and managed by particular institutions. This implies that only such institutions with such system actively oversee the SIWES processes; ITF and Industries do not take part in the processes. Thus, no collaboration between the elements that must collaborate to ensure the success of the scheme.

➤ Being web-based systems, they do not enjoy the benefits cloud-based systems and services offers which in part may be accountable for limitation of the collaboration.

Following the limitations of existing systems, a cloud-based solution that would enhance collaborative management and real-time supervision of students on SIWES as well as allowing students to report their daily activities. It also allows students to submit their account details for payment of allowances by the ITF which has been a concern hitherto.

III. SYSTEM REQUIREMENT ANALYSIS AND DESIGN

System requirement is a fundamental part of every system to be designed. It states the input and output required of the system; describing what such a system is expected to achieve or its purpose. The cloud-based system proposed in this research considers ITF team (Administrator and staff), Institutions-based supervisors (lecturers) and SIWES coordinators (administrators), Industry-based supervisors (Staff) and Administrators (SIWES Officer), and Students due for or at SIWES. Therefore, it has the following requirements:

ITF Administrator/Staff
➤ View, approve, disapprove, and/or suspend Industry.
➤ Views and Approve Institutions.
➤ View and/or comment on student daily progress reports.
➤ Views and prints students account details for allowance payment purpose.
➤ Add new, suspend existing staff/Administrator.
➤ Logon and edit login credentials.
➤ Post announcements on the system or send mails to students, ITF, Institution, and industry staff.
➤ Archive students reports

Institution Administrator/Staff
➤ Administrator uploads or creates profiles of students due for SIWES.
➤ Administrator assigns, change students' institution based supervisor.
➤ Administrators can send emails to communicate vital information to students of their institution
➤ Administrator can declare a student to have completed SIWES Scheme.
➤ Staff views, commentsand grade students' daily progress reports.
➤ Staff and Administrator can view industry-based supervisor's emails for communication purposes.

➢ Staff and Administrators can view students' emails and other relevant contact information for communication purposes.
➢ Staff and Administrators can logon and edit their login credentials.

Industry Administrator/Staff
➢ Administrator submits an application to ITF using the system for incorporation into the scheme.
➢ Administrators and staff can logon and edit their login credentials.
➢ Administrator assigns and change industry-based supervisor to SIWES students in the industry as the need may arise.
➢ Administrators and staff can view students' institution staff and email administrator contact for communication purposes.
➢ Staff can view and comment on student's daily progress reports.

Students
➢ Login and edit login credentials.
➢ Submit bank details.
➢ Submit and upload picture of daily progress report.
➢ Create blog topics for collaborative discussion among themselves irrespective of institution or industry attached.
➢ Update personal information

➢ View industry and institution-based supervisor contact details for communication purposes.

General Requirements of the system
➢ Automatic generation of complex password and sending of email notification to newly registered persons and as the need may arise.
➢ Automatic logging of activities such as termination of student's SIWES scheme by Institution Administrator.

Once a system requirements have been specified, design is the next stage in system development. System design models system components and their interrelationship based on the requirements. For the purpose of the proposed system, use case diagram, sequence diagram and activity diagrams are used to design the proposed system.

A. Use Case Diagrams

The purpose of use case diagramming technique of Unified Modeling Language (UML) is to consider and design the dynamic aspects of a system thereby helping in the gathering of requirements and getting better understanding of systems while identifying the external and internal factors that influences system as well as to show the interaction between the various actors/users of the system and the different functionalities provided in the system. Fig.1 shows the use case diagram of the proposed system.
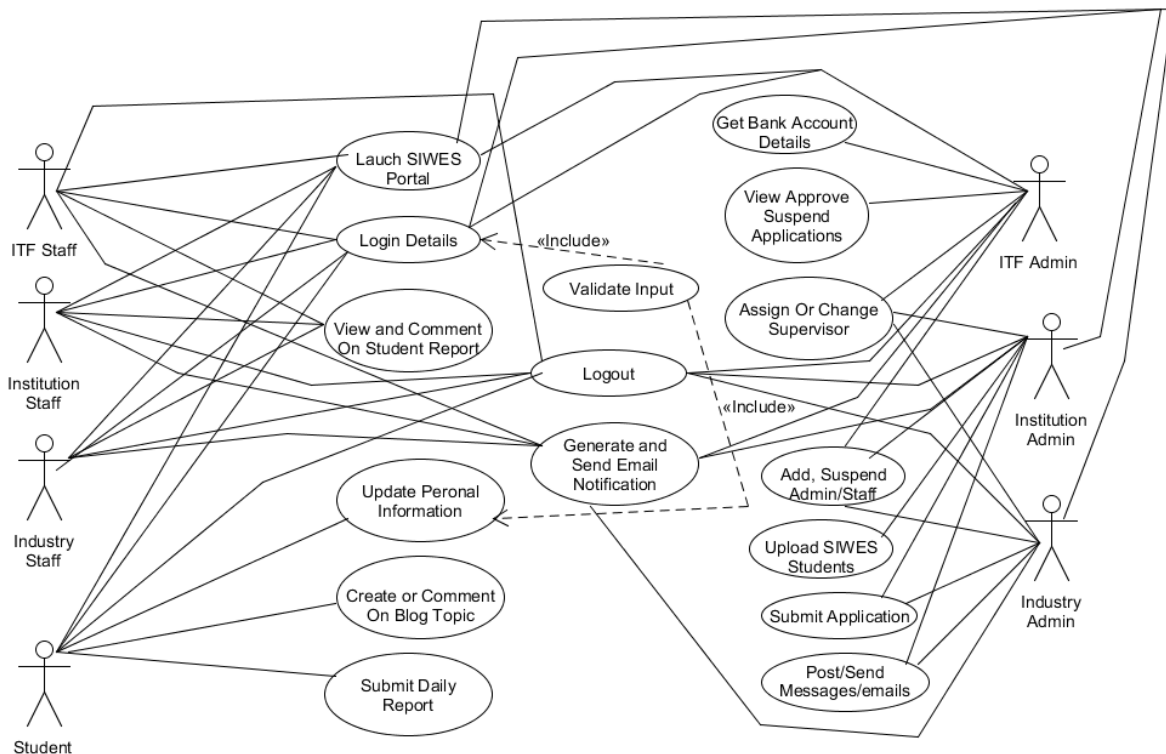

Fig.1: Collaborative SIWES Portal Use Case Diagram

B. Sequence Diagram

The purpose of sequence diagramming technique of UML is to model the logical flow of system in a visual manner, therefore, facilitating documentation and validation of the logic. They are used to model usage scenarios, methods, and services logic; showing the relationships between objects/actors and functionalities of use case diagram. Fig.

2A, B, C and D provide the use case diagram of the prosed system for the Student, ITF Administrator, Institution/SIWES Coordinator, ITF, Industry and Institution staff.

C. Class Diagram

The purpose of Class diagramming technique of UML is to describe the specific static view of a system. It consists of class name, states/attributes list, and operations that can manipulate the states. It helps in the analysis and design of a system view, description of responsibilities, forward and reverse engineering of systems, as well as serving as the base for component and deployment diagrams. Therefore, it is the most commonly used technique of UML for system analysis and design. For the proposed system, the class diagram is presented in Fig.3
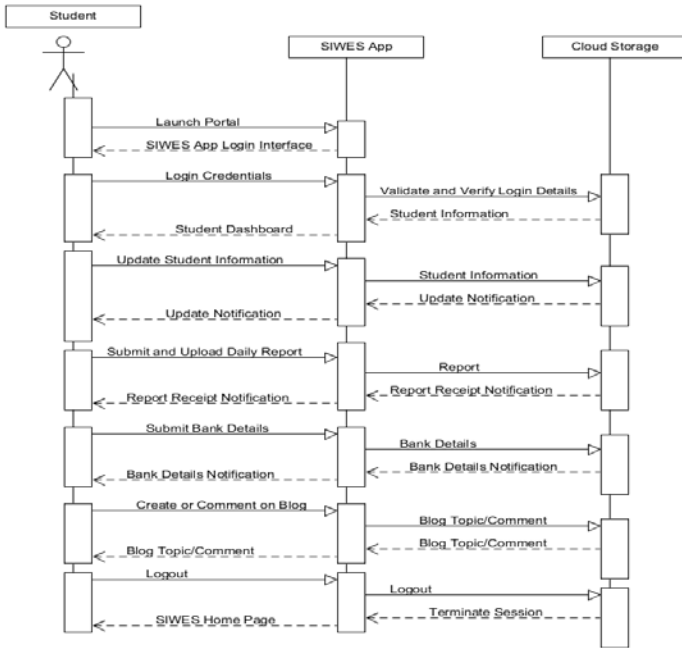
Fig.2A: Student Sequence Diagram
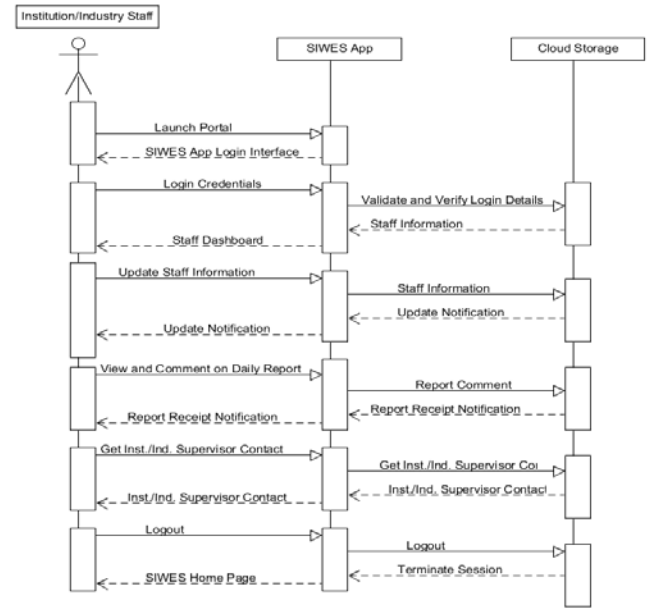
Fig.2B: Institution and Industry Staff Use Case Diagram
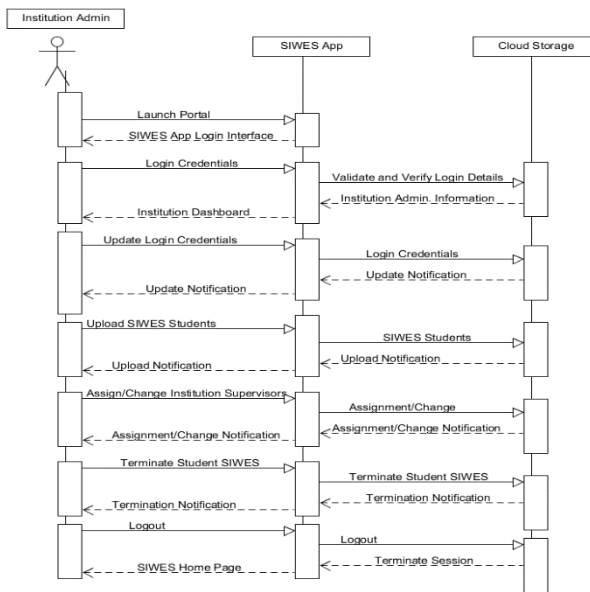
Fig.2C: Institution Admin Use Case Diagram
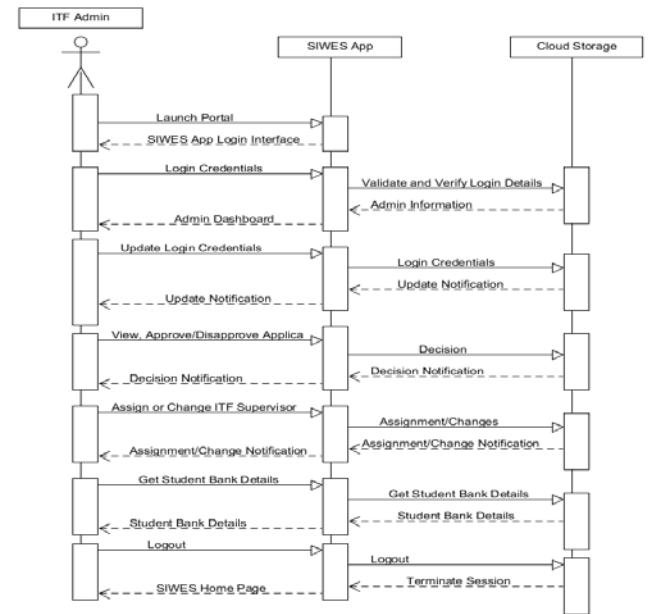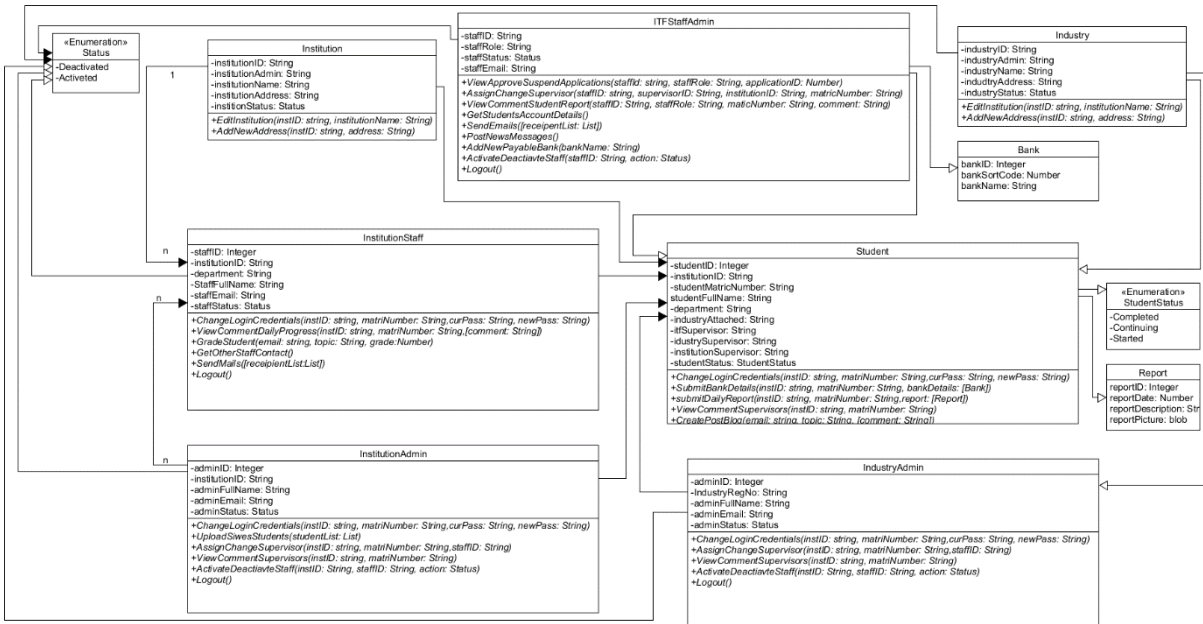

Fig.2D: ITF Admin Use Case Diagram

Fig.3: Proposed System Class Diagram

IV. SYSTEM IMPLEMENTATION AND TEST RESULT

The cloud-based SIWES App was implemented using PHP, Javascript, CSS, Ajax technologies, MySQL Database, and hosted on Google Cloud Infrastructure as a Service (IAAS), the Compute Engine – A trial option provided by Google. The url of the SIWES App was http://104.197.108.118/ and underwent testing between February, 2016 and March, 2016. The SIWES App is meant to be managed by ITF. Thus, it uses the same templates as on the ITF official website (ITF, 2016) . The SIWES App provides for collaborative management of the major aspect of SIWES processes from login, uploading of students due for SIWES by Institution SIWES Admin, uploading and submission of daily progress report by students, collaborative supervision in real-time thereby enabling the mentoring of students on skills being acquired and better recommendations from both the Institution, Industry, and ITF Staff. The following describes some of the functionalities of the system. Fig. 4.1 shows the home page of the ITF website from where SIWES App/Portal is integrated.

Fig.4.1: ITF Home Page

Fig.4.2 shows the SIWES App Home/Login page. Here, students, staff and Administrators login and are taken to their respective Dashboards. Also, from here, industries and Institutions alike can submit an application/Request through the App for incorporation into the scheme as shown in Fig. 4.3
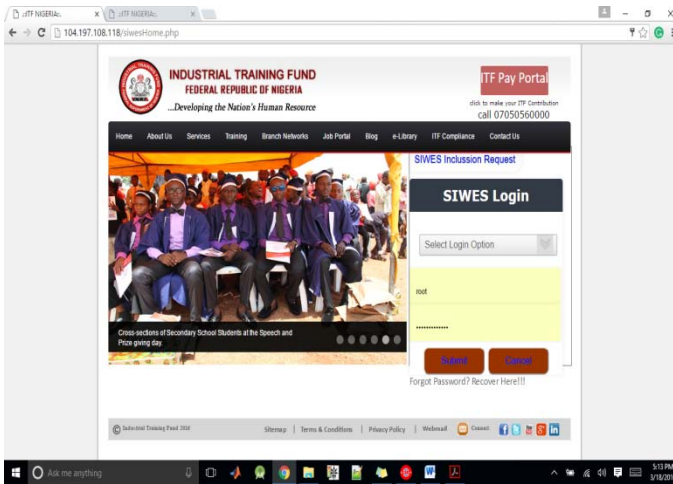
Fig.4.2: SIWES App Login Page

Fig.4.3: SIWES Inclusion Request Page

ITF Admin Dashboard is shown in Fig.4.4 and one of the tasks shown in Fig.4.5, Viewing, Disapproving, and/or Approving Industrial Applications/Request for inclusion in

the scheme. This is necessary to ensure that students are trained by registered professional industries only.
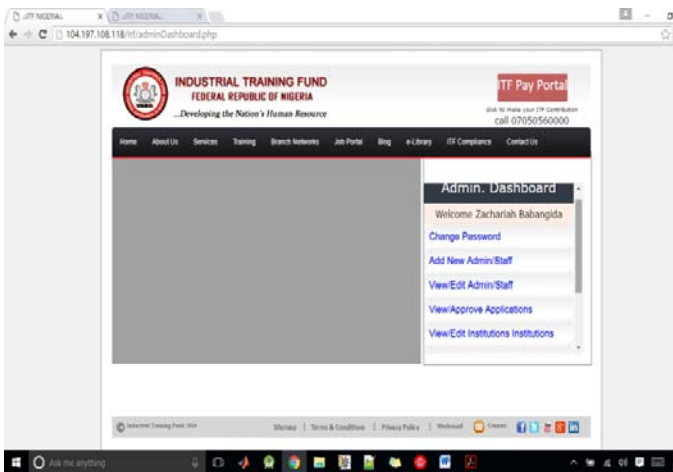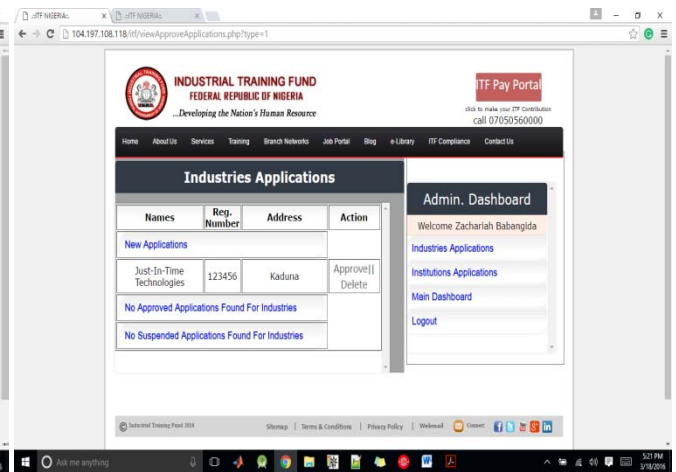

Fig.4.4: Admin Dashboard

Fig.4.5: View, Disapprove or Approve Industries Application

Once an inclusion request is made, an email notification is sent to the admin, and at approval, the system generates a password for login and send to the admin. The institution admin on receipt of this information may logon and create students profiles or download a Comma Separated Value (CSV) file for use in Microsoft Excel to fill in the information of students and upload such to the system which then automatically creates each students profile. This is shown in Fig.4.6

Students are notified by emails of the creation of their profiles and also automatic password for login is generated

for each student. The student on logon can update personal information, search approved industries, apply to such industry, such industry is notified, on approval of their request, they are notified and also institution supervisor; and SIWES is said to have begun. Students can also submit daily progress report using the app as shown in Fig.4.7 and the supervisors can view and comment on such reports as in Fig.4.8. A sample notification from the system is shown in Fig.4.9
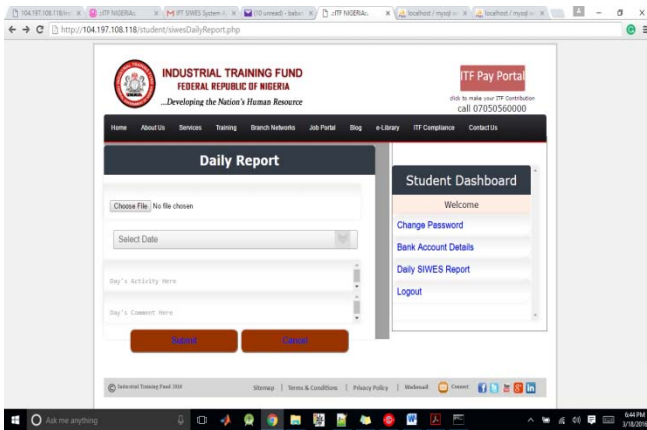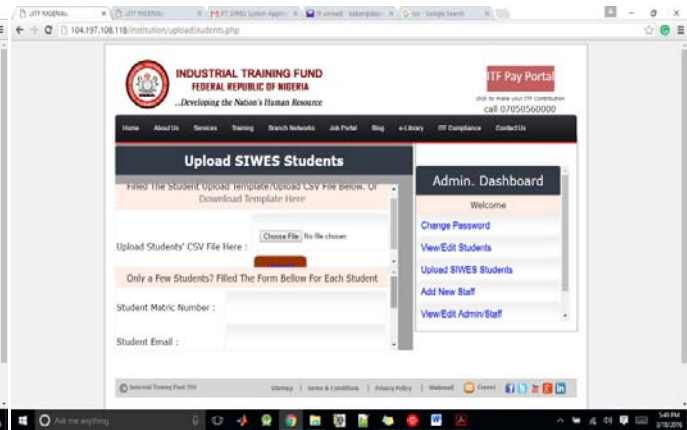
Fig.4.6: Student Profile Creation
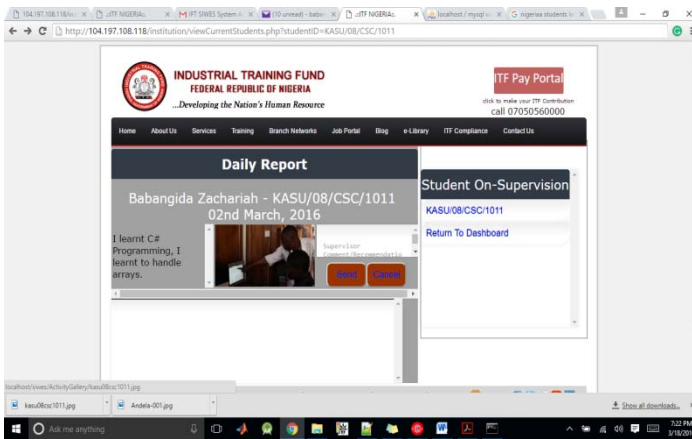

Fig.4.7: Daily Report Submission By Student

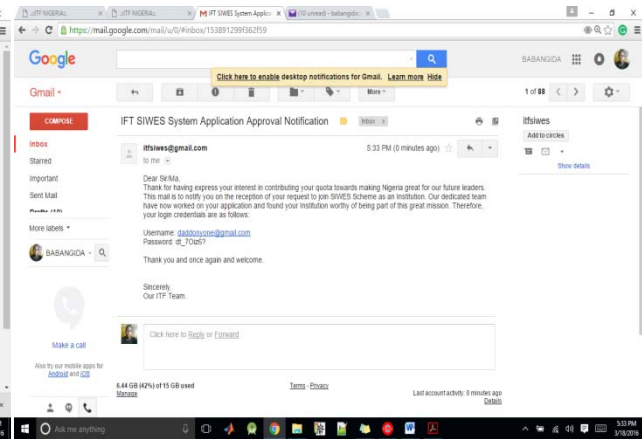
Fig.4.8: Supervisor Supervision/Comment

Fig.4.9: Sample Notification

V. CONCLUSION AND RECOMMENDATION

The major focus of this research was to develop cloud-based SIWES App that will facilitate collaborative management and supervision of students on SIWES and other SIWES related activities. The system was designed, developed and implemented on Google Cloud which demonstrated the realization of the objective of the research. Having implemented the system on cloud, the system can easily be modified for scallibility and incorporation of more functionalities. The system if adopted, shall reduce the challenges of coordination and supervision of students on SIWES which usually require concerned supervisors to travel long distances. Therefore, we encourage the adoption of the system and that more research could be done to check other areas the researchers may not have considered for better achievement of the overall objective.

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