

# **A Mobile Application System for Remote Monitoring of Employees in Organizations**

Student No: 100696

Group B.

An Information Systems Project Documentation Submitted to the Faculty of Information Technology in partial fulfillment of the requirements for the award of a Degree in Business Information Technology

**Declaration**

I declare that this work has not been previously submitted and approved for the award of a degree by this or any other University. To the best of my knowledge and belief, the research documentation contains no material previously published or written by another person except where due reference is made in the research documentation itself.

Student Signature:

Sign: \_\_\_\_\_ Date: \_\_\_\_\_

Supervisor's Name: Benard Ochieng Alaka

Sign:

A handwritten signature in blue ink, consisting of several overlapping loops and a long horizontal stroke at the bottom.

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## **Abstract**

Various challenges are experienced in different organizations when employees have to work from home or other environments. Mothers on maternity leave are mostly forced to stay home and take care of their babies for a couple of months before resuming work. Viral disease outbreak like what is currently happening globally on COVID has also greatly influenced a lot of organizations to encourage work from home and lastly long business trips by certain employers brings about working on the go which changes the environment at which work is performed. All this issues cause challenges that include a delay in tasks given to employees or sometimes issues with how poorly the work is done due to lack of adequate supervision by employers. This often causes a delay in the progress of work in the company which may end up bringing negative results. Some employees may make someone else work for them for a pay or simply because they may be too occupied with other things, most employers are never aware of such cases. This brings a loss on the employers end since they always have to pay their employees who may not be productive from their end. These problems can be solved by creating a system that helps employers to monitor the work progress of their employees based on the tasks and deliverables given. The system should allow employers to set deadlines for certain tasks to be performed. Notifications will be sent to employees to ensure that this will be properly achieved. The system should also provide a communication platform where employees of various departments coordinate with each other and another where employees meet one on one with their employer to discuss on the tasks performed. This will help the employer track both active and dormant members. The system should be able to provide a separate platform (AOB) that will inform the employer about the individual problems of employees that may make them unable to work from home or other unforeseen locations for example; unstable network, lack of internet access and power supply issues. The research methodology will be qualitative. Object Oriented Analysis will be the design methodology used and the development methodology used will be software prototyping.

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## **Chapter 1: Introduction**

### **1.1 Background**

Most employers barely distinguish active employees from inactive ones mostly in large organizations. This mainly occurs when employees are forced to work from home due to various circumstances such as viral disease outbreaks like what is currently happening globally on COVID and mothers who have to take care of their newborn babies before having to resume work. According to (Kallman, Electronic Monitoring of Employees , 2016), electronic monitoring results in the ability of employers to use electronic gadgets like phones, laptops and tablets to monitor, supervise and evaluate employee performances electrically. This therefore enables employers to keep track of a large number of employee performance easily and distinguish the active from the passive ones.

Electronic monitoring is important to employers as it enables employer supervision and delivery of tasks assigned to every employee. It enables the employer to control work processes in various departments. According to (Markov, 2017) electronic management increases productivity in

organizations. This monitoring also enhances growth and better performance of organizations hence promoting hard work among different colleagues.

In conjunction with remote monitoring, self-efficacy assessments play a critical role in influencing remote work effectiveness, perceived productivity, job satisfaction and ability to cope. According to (D.S, 2018), self-efficacy theory can be used to incorporate a variety of aspects that are particularly important in a remote work setting into a single model. Drivers of effective remote work in organizations include; effective communication between the manager and employee, experience and training with remote management and remote working arrangement and finally effective management practices including the establishment of realistic expectations about the amount of face-to-face time that will be available and the setting of performance expectations. (A, 2017) Defined self-efficacy as a judgment of one's ability to execute a particular behavior pattern. (R, 2017) Expanded upon this definition by suggesting that self-efficacy beliefs form a central role in the regulatory process through which an individual's motivation and performance attainments are governed. Self-efficacy judgments also determine how much effort people will spend on a task and how long they will persist with it.

## **1.2 Problem Statement**

Certain developed systems work on the basis of prioritization in that the first ones to key information in the systems get responses and any responses received later are ignored or not responded to. Some systems do not allow employees to be aware of their supervision, most of them end up figuring out about it at a later date. This causes panic on the employee side which deteriorates their performance. Most existing systems have been designed in a complex manner that most employees find it difficult using it. It then becomes hard for employers to keep track of the work being done by employees.

## **1.3 Aim**

The purpose of the system is to help employers monitor the work progress of their employees based on the tasks and deliverables given. The system allows employers to set deadlines for certain tasks to be performed. Notifications are sent to employees to ensure that they are reminded of the deadlines set and are informed of tasks given as well.

#### **1.4 Specific Objectives**

- i. To investigate the current remote monitoring systems of employees
- ii. To review any existing remote monitoring systems
- iii. To design an application that will aid in the monitoring of tasks issued to employees
- iv. To test the proposed mobile application.

#### **1.5 Justification**

Remote monitoring of employees is an issue that is frequently experienced by most organizations and unfortunately most employers are unable to rate the performances of their employees. The system below makes it easier for employers to easily rate the performance and their employees which enables them to make certain decisions that will influence the organization positively. Large organizations will be the greatest beneficiaries of the system since they deal with large number of employees and it mostly becomes tiresome to keep track of each employee and the tasks they perform.

#### **1.6 Scope/Limitation**

The system focuses on ensuring that employees are able to perform their tasks and deliverables within a certain period of time since there are deadlines set by employers for every task issued. Notifications are sent to employees to remind them of the due date and time of the tasks issued and also inform them of the tasks assigned. However, the system is to be used by smart phone users. It only cover employers and employees who work in the corporate sector.

## **Chapter 2: Literature Review**

### **2.1 Introduction.**

This chapter focuses on the work done in accordance to remote monitoring of employees. It entails both the technical and non-technical approaches that have been applied in the supervision of employee performance on the tasks issued to them.

### **2.2 Current remote monitoring systems of employees**

#### **2.2.1 Performance management system**

One of the systems that exist in remote monitoring of employees is the performance management system. It is used for identifying, differentiating, and rewarding performance of an employee. It comprises of a means for communicating performance status to the employee; means for communicating to the employee differences between the communicated performance status and a performance standard associated with the employee; and means for developing a prescriptive path for the employee to adjust the communicated performance status in response to said performance standard (Neville, 2018). The system, including flexible tools for assessing and grouping, includes means for evaluating performance of employee. For the method and system further include steps for planning the employee performance. The system and method of the present invention further includes means for reviewing employee performance for ensuring optimal achievement relative to stated performance objectives. (Dickerson, 2017)

#### **2.2.2 Networked system**

In addition, an invention presents a networked system for communicating information to an individual and for remotely monitoring the individual. The system includes a server and a remote interface for entering in the server a set of queries to be answered by the individual. The server is preferably a web server and the remote interface is preferably a personal computer or remote terminal connected to the server via the Internet (Connor, 2018). The system also includes a remotely programmable apparatus connected to the server via a communication network, preferably the Internet. The apparatus interacts with the individual in accordance with a script program received from the server. The server includes a script generator for generating the script program from the set of queries entered through the remote interface. The script program is received

and executed by the apparatus to communicate the queries to the individual, to receive responses to the queries, and to transmit the responses from the apparatus to the server. (Brown, 2018)

### **2.2.3 Work site monitoring and employee time tracking system**

There is also work site monitoring and employee time tracking system that includes a work site Internet connection having a broadband modem in communication with a router for transporting data to and from the work site and a work site IP camera in communication with the router for transporting images from the work site to client computers in communication with the Internet (Chen, 2016). A biometric fingerprint scanner for identifying and clocking-in and clocking-out work site workers is also included. The biometric scanner is in communication with the router for transmitting identification, clock-in and clock-out data to a server computer in communication with the Internet. The present invention provides a system and method that addresses the tracking of employee work-time at work sites such as residential home construction sites along with the remote monitoring of the work site using sensors adapted to transmit data over the Internet (Mulally, 2017). There is also a work site low power radio system having a variety transceivers interfaced with sensors for detecting physical and/or chemical properties of the work site environment and an Internet bridge device for transporting sensor data from said sensors to said server computer. (Chen, 2016)

## **2.3 Gaps in Existing Remote Monitoring Systems**

### **2.3.1 Performance range**

One of the systems that exist in remote monitoring of employees is the performance management system which is used for identifying, differentiating, and rewarding performance of an employee. It is important to note that different employees have different capabilities and as much as it would be important to reward those whose performance are best, there may be some who may struggle with certain tasks. The system however does not offer a platform where the manager can coach their employees on performance improvement. The system could offer guidance on steps to improve by offering the skills or actions to raise employment potential. The system should be able to allow the employer to complete an individual development plan with their employees if the employee requires coaching for their benefit. (Reimer, 2017)

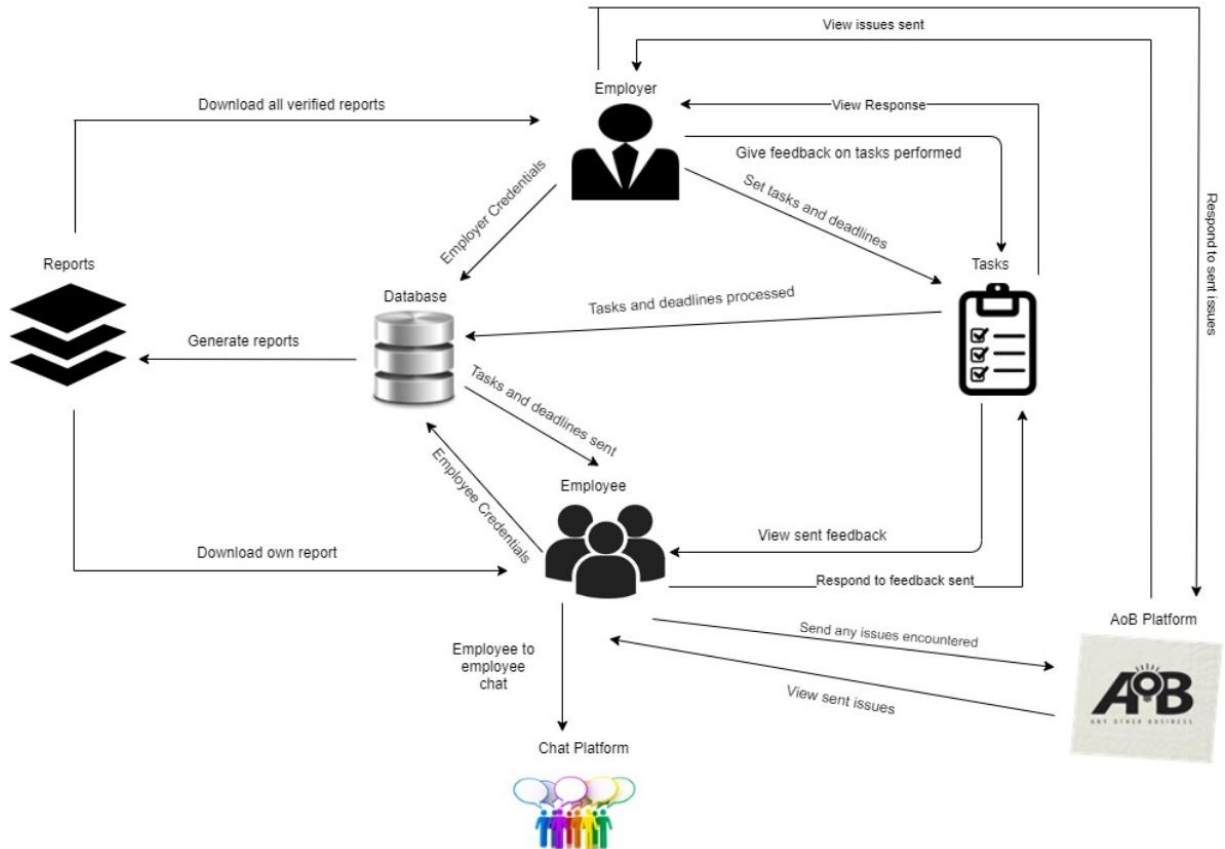
### **2.3.2 Poor network connectivity**

On the networked system for communicating information to an individual and for remotely monitoring the individual, the system may experience low internet connection which may cause the workplace not to capture the data required. The system has not identified a way of capturing data consistently in case of poor network connectivity. The system does not also have a way of uniquely identifying each employee who answers the queries sent by the servers. This causes unreliability of data collected by the system to employers. (Glass, 2018)

### **2.3.3 Utility of time spent at work.**

On the work site monitoring and employee time tracking system, it ensures that employees avail themselves to work but does not keep a record of the tasks each employee performs. This means that an employee might show up to work but fail to carry out the tasks required of them on a specific day. The system should therefore be able to tell whether employees who show up to work carry out their tasks for the day and whether they perform their tasks to their level best. (Harvey, 2017)

## 2.4 Conceptual Framework



**Figure 1: Conceptual Framework**

The main users of the system are employers and employees of organizations. The system enables registration of both employers and employees with unique identifiers of each company's membership. After registration, there are different modules accessed by employers and employees and platforms for both communication of employees among themselves and any other business that is only viewed by the employer. There is a task module where employers set tasks and deadlines for the tasks to be performed. The module contains a section where the employer communicates with their employees on a one on one basis concerning the tasks and deliverables issued and how the tasks are performed. The module on the employees end enables them to view the tasks issued

to them and the duration of time it takes for them to perform their tasks. Once tasks are created, a notification is sent to the employee to notify them on the tasks issued and the deadline for submission of the task. There is also another platform, Any other Business (AOB) platform, where the employer views issues the employees face that may not enable them to deliver the tasks issued on time. This module enables creation of the different titles of issues faced and from there employers and employees can converse on the same under the various categories. Lastly, there is a communication platform for employees of various departments to enable coordination. This platform shows the person who sent the message and the department they are from. This is a mobile application hence, smartphone users greatly benefit from the system and those who work in corporate sectors.

## **Chapter 3: System Development Methodology**

### **3.1 Introduction**

A methodology is a repeatable process with project-specific methods, best practices, rules, guidelines, templates, checklists, and other features for building quality systems that are manageable and deliver value to people or an organization (Silver, 2017). This chapter intends to explain the type of methodology to be used by the developed system. The system uses software prototyping as the system development methodology because feedback can be obtained from the intended users which enables the requirements specification for the system to be updated to reflect feedback hence increasing confidence in the final system. It also enables investigation of particular problem areas or certain implications of alternative design or implementation decisions.

### **3.2 Analysis**

The system uses Object Oriented Analysis and Design approach since it allows breaking down of the system into smaller units, objects that can stand on their own and can be changed without affecting other objects. This makes it easy to add functionality and behavior allowing the system to accept change.

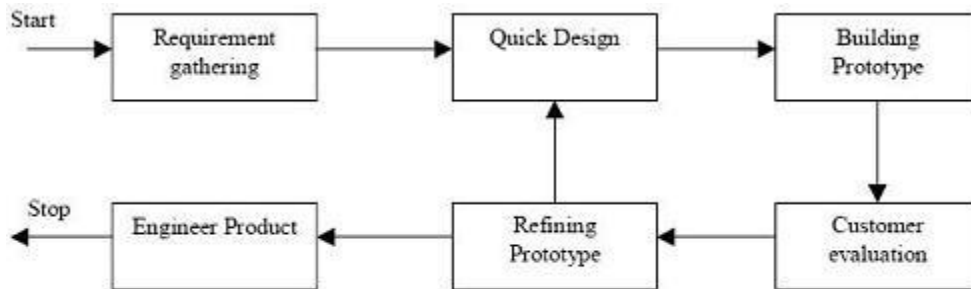
### **3.3 Design**

System design is the process of designing the elements of a system such as the architecture, modules and components, the different interfaces of those components and the data that goes through the system. The diagrams used include a use case diagram which shows the interaction between the system and the users of the system. A class diagram is also used to show the different objects, their

relationship, behavior and attributes. A sequence diagram shows the interactions between the different objects in the system and also between the actors and objects in the system.

### 3.4 Software Prototyping

It refers to the process of implementing the presumed software requirements with an intention to learn more about the actual requirements or the alternative design that satisfies the set of actual requirements. The prototyping model has the following phases.



**Figure 2 Prototyping model**

#### 3.4.1 Requirement gathering

The requirements of the system are defined in detail in this phase. During the process, the users of the system are interviewed so as to know what they expect from the system.

#### 3.4.2 Quick Design

The second phase is a preliminary design or a quick design. In this stage, a simple design of the system is created. However, it is not a complete design. It gives a brief idea of the system to the user. The quick design helps in developing the prototype.

#### 3.4.3 Building prototype

In this phase, an actual prototype is designed based on the information gathered from quick design. It is a small working model of the required system

#### **3.4.4 Customer evaluation**

In this stage, the proposed system is presented to the client for an initial evaluation. It helps to find out the strengths and weaknesses of the working model. Comments and suggestions are collected from the customer and provided to the developer.

#### **3.4.5 Refining prototype**

If the user is not happy with the current prototype, it will need to be refined according to the user's feedback and suggestions. This phase does not finish until all the requirements specified by the user are met. Once the user is satisfied with the developed prototype, a final system is developed based on the approved final prototype.

#### **3.4.6 Engineer Product and Maintain**

Once the final system is developed based on the final prototype, it will be thoroughly tested and deployed for production. The system undergoes routine maintenance for minimizing downtime and prevent large-scale failures.

### **3.5 System Development Tools and Techniques**

The IDE used to create the developed system is Android Studio. Java has been used as the programming language in the creation of different modules of the system and also the different functionalities to be performed by the system of mobile. PHP has been used as the server language. MySQL is the tool used as the central database of the system to save any critical information required to be saved.

### **3.6 Method to be used to test the developed system**

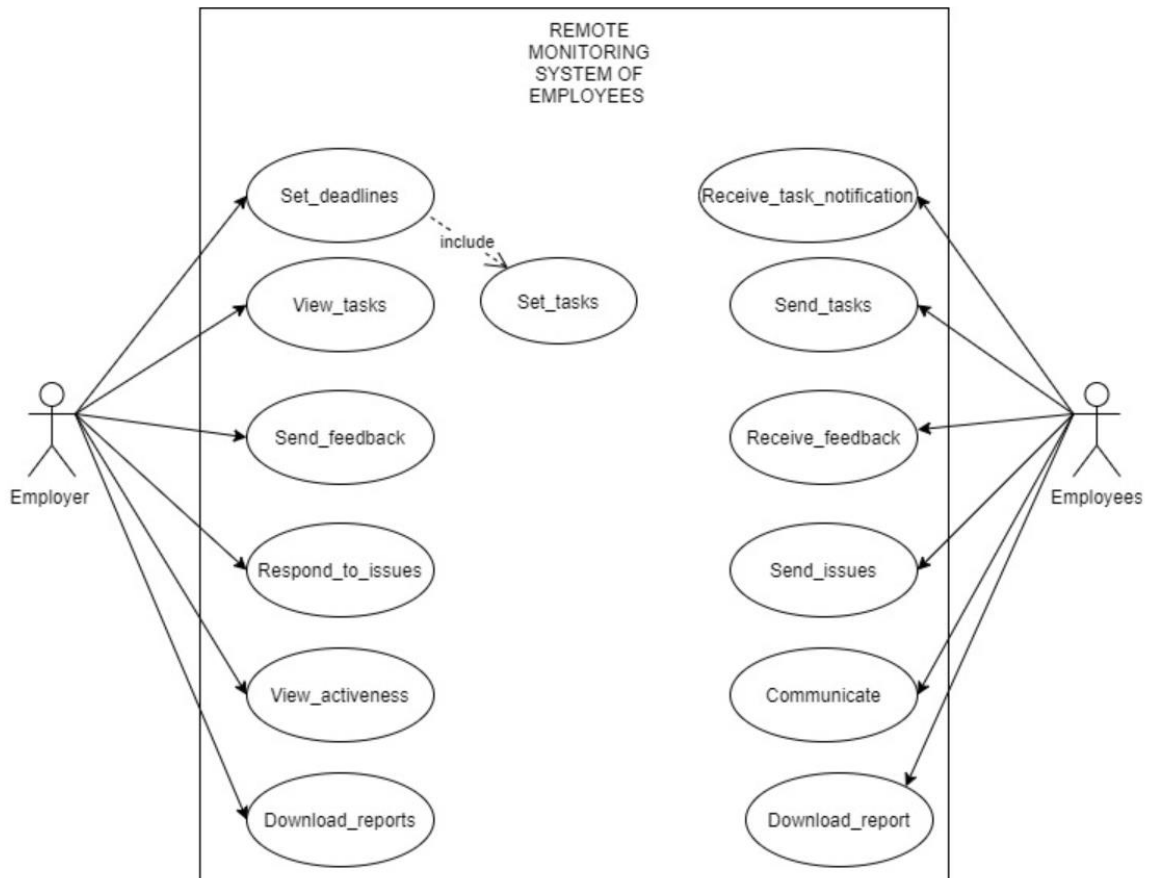
The developed system will be tested using black-box and white-box testing. Black-box testing is carried out to test the functionality of the system. In this testing method, the design and structure of the code is not known to those testing the program and the end users. On the other hand, white-box testing is conducted to test the system and its implementation in order to improve code efficiency or the structure. In this testing method, the design and structure of the code is known to the tester. The developers of the system conduct this test on the code.

### 3.7 Domain of Execution

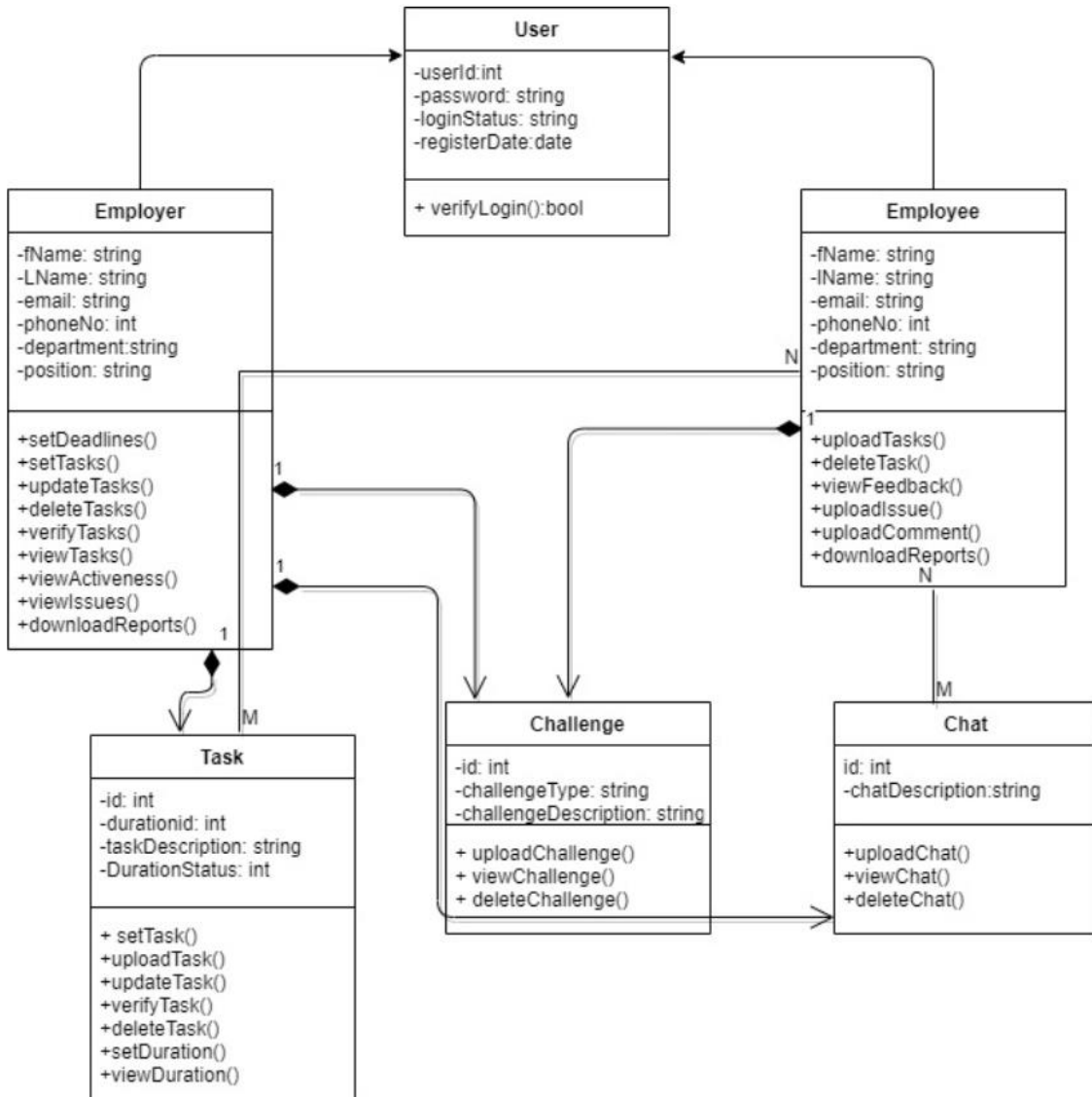
The systems domain of execution is mobile based since most people both locally and globally own smartphones making the application easily accessible at any time and wherever a user of the system may be.

## Chapter 4: System Analysis and Design

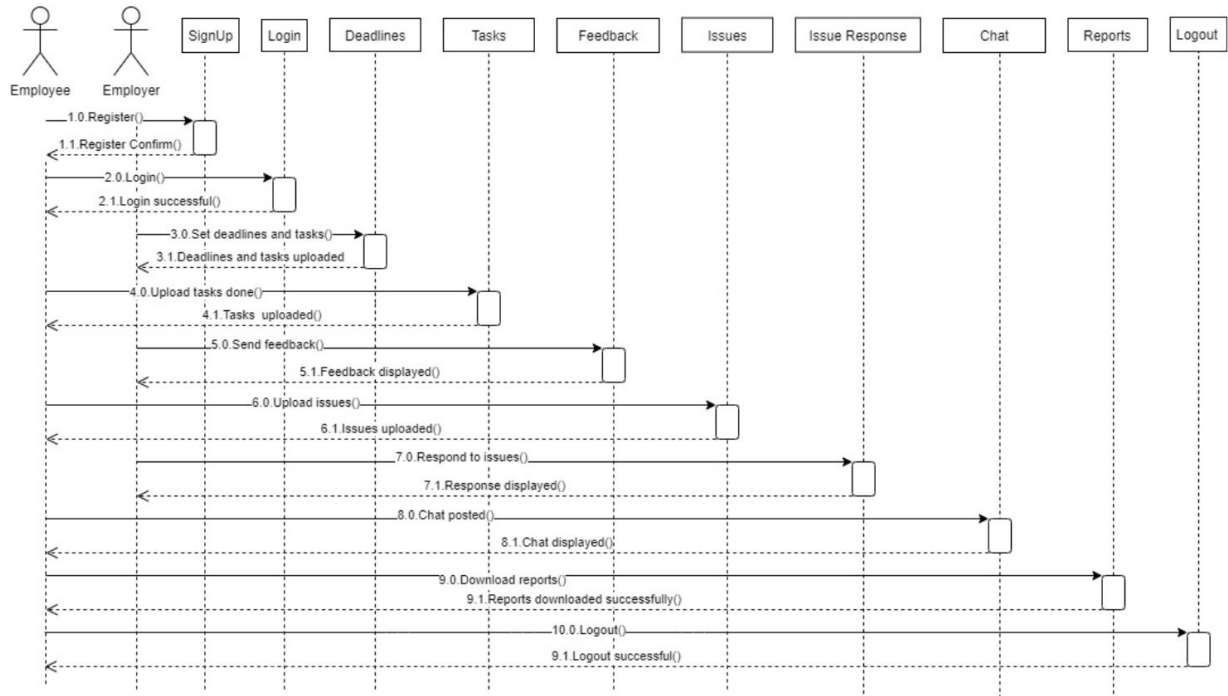
### 4.1 Use Case Diagram



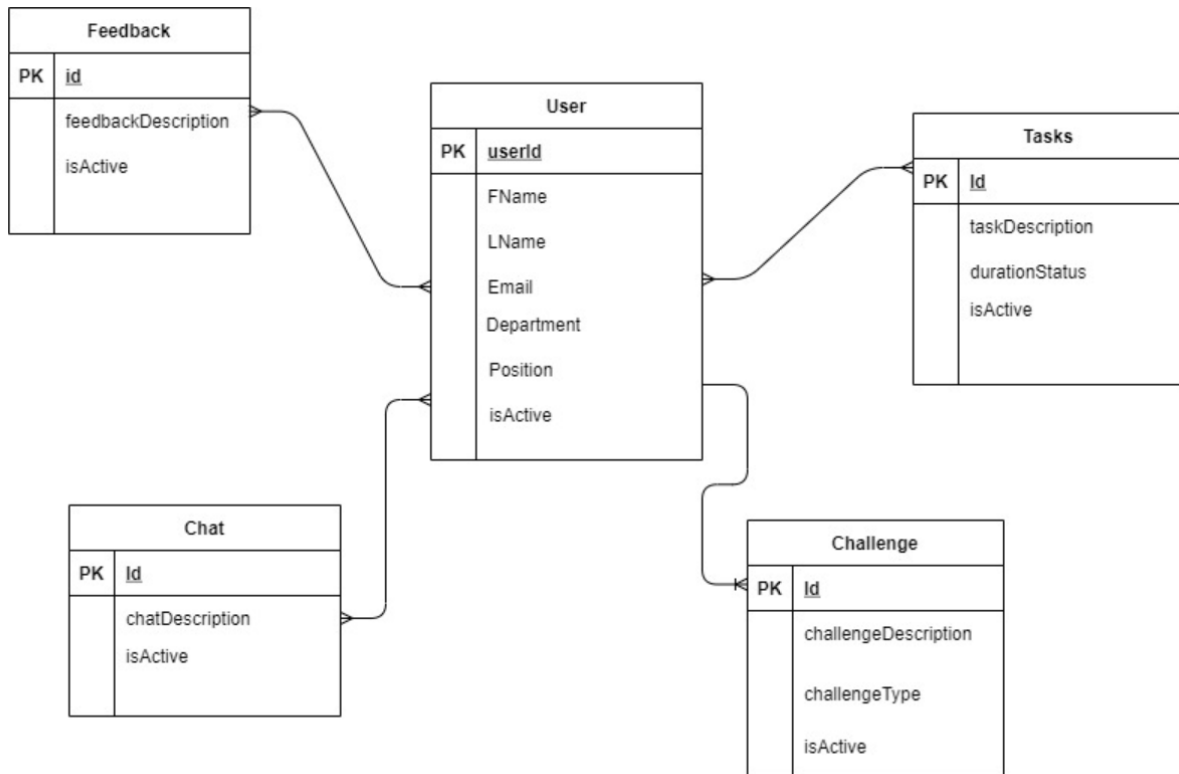
## 4.2 Class Diagram



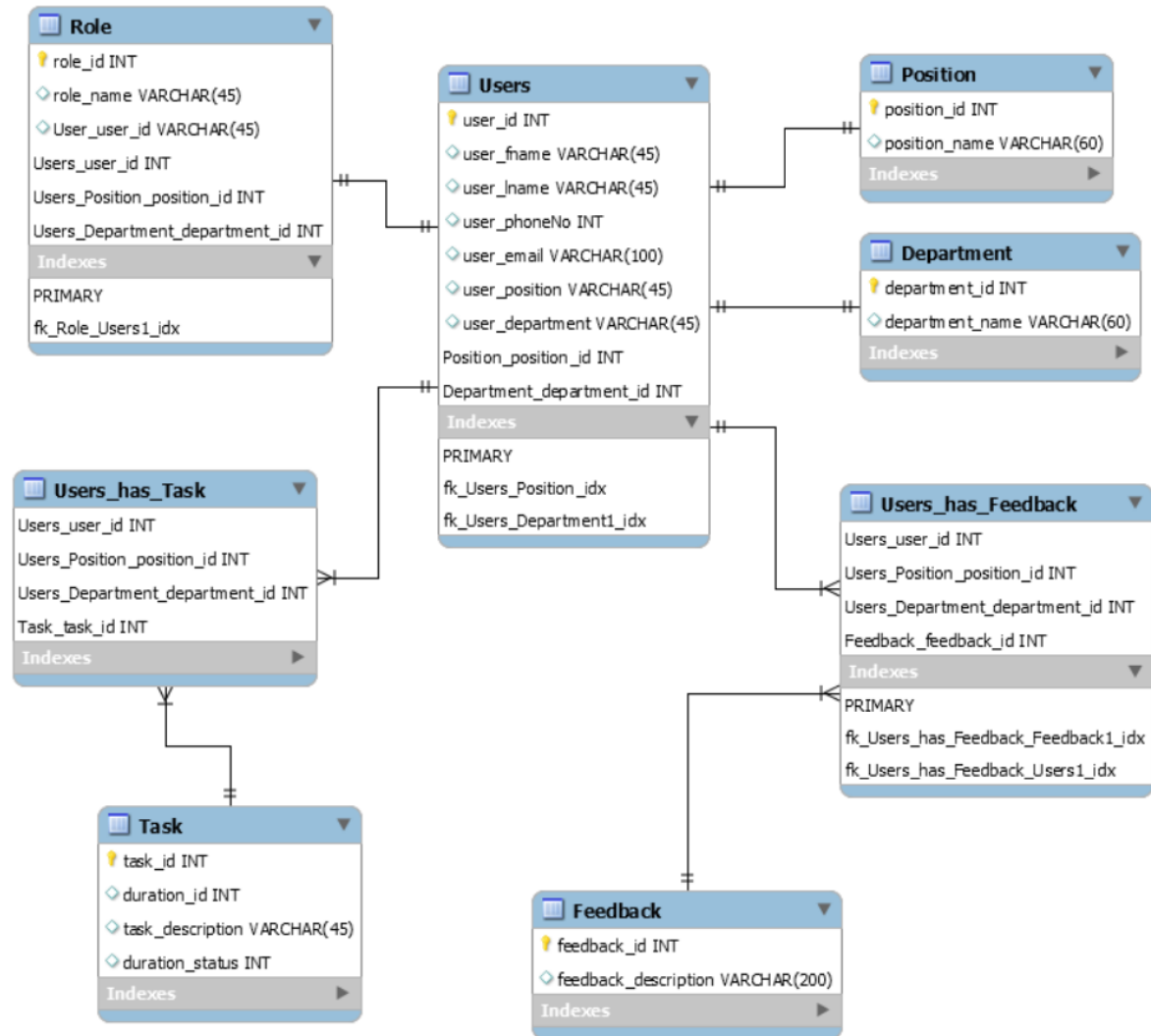
### 4.3 Sequence Diagram



## 4.4 Entity Relationship Diagram



## 4.5 Database Schema



## **Chapter 5: System Implementation and Testing**

### **5.1 Introduction**

This chapter pursues what the system entails and the purpose of various sections of the system. It also centers on system testing and the different parts of the system that have succeeded in functionality. System failures are detected to enable discovery of defects before implementation of the system. The system has been implemented in order to find out whether it works as expected and test it to know if it performs according to how it should.

### **5.2 System Implementation**

The system development begins with the identification of the different actors that have been involved in the use of the system. They include the employers and employees of different organizations. The next stage of the system development is the identification of the different modules that have been used by the main actors of the system who each have different modules that they use to carry out their activities. The most important activity of the employers is to set tasks and deadlines for the employees, send feedback after the tasks are performed and also view the employee's activeness on a platform. They can also be able to generate reports for the tasks done. Employers are able to update and delete the tasks to be assigned to the employees. The construction and development of the system has been done using Android Studio which is the most suitable Integrated Development Environment for the development of mobile based systems. The database development has been done using MySQL and Realtime Database for messaging purposes. The different types of design diagrams in chapter 4 makes it easy to identify how the

system works and how the processes flow throughout the system which aids in a quick understanding of how the system has been developed. Using the system development methodology made it easier to construct each module and the system as a whole. The modules have been linked to come up with the system keeping in mind to maintain the logic of the system.

### 5.3 System Testing

This section focuses on what the system does, that is the functionality of the system. It aims to detect the parts of the system that have succeeded, those that have failed and any defects in the system before it can be implemented to users.

Test ID	Related Requirement	Inspection Check	Pre-Condition	Test data	Priority level
T1	Registration of Company	Does the system allow the owner of the company to register the company on the application	The system should be able to recognize the company using the application	First name : Zack Last name: Owino Email: <a href="mailto:owino@gmail.com">owino@gmail.com</a> Phone number:0722732615 Founder ID:1010 Company Name: Ciroc Password: 2020 Confirm Password:2020	High
T2	Authentication	Does the system allow users to sign up	The users of the system,	First name: Effie	High

		and their data saved in the database	that is employers and employees should be able to sign into the system	LastName: Okoth Phone number:0789765645 Email:effy@gmail.com Company: Ciroc Department: IT ID:3020 Password: 123456 Confirm password:123456	
T3	Validation of authentication	Does the system allow authorized(registered ) users to log in	The users of the system should be able to login if their registration was successfull y	Email:effy@gmail.com Password:123456	High
T4	Saving user details to the MySQL	Does the system save the user details in the firebase once they register and login	The system should save user details in the Firebase	“Logged in Successfully”	High

			once users have successfully logged into the system		
T5	Loading of correct dashboards once users have successfully logged in	Does the user go to the correct dashboard once they are logged in	After logging in the users should be taken to their respective dashboard according to how they registered themselves that is employers to the Employer Dashboard and employees to the Employee dashboard	“Employer Dashboard” “Employee Dashboard”	High

T6	Setting of tasks and deadlines by the employer	Does the system allow employers to set tasks and deadlines of the tasks to be performed?	The system should enable employers to set tasks and deadlines for the tasks to be performed	“Tasks created successfully	
T7	Saving tasks done correctly in the Firebase	Does the system allow for saving of tasks done correctly by the employees	The system should save the tasks approved by employers in the database	The tasks saved should be seen on the Firebase	High
T8	Commenting on the tasks done	Does the system allow both employers and employees to send and receive feedback in terms of messaging	The system should allow both employers and employees to send and respond to the feedback on	“Message sent”	High

			the tasks performed		
T9	Updating the tasks sent to employees	Does the system allow employers to update the tasks set for their employees	The system should allow employers to update the tasks set for employees	“Task updated”	High
T10	Deleting tasks sent to both employers and employees	Does the system allow users to delete the tasks set or done	The system should allow users to delete the tasks set or done	“Task deleted”	High
T11	Sending any other business messages by employees	Does the system allow both employers and employees to send and receive messages	The system should allow both employers and employees to send and receive messages	“Message sent”	High
T12	Group communication of both users	Does the system allow users to send messages on one	The system should allow	“Message sent”	High

		platform and can it identify the specific person who has sent the message	different employees and employers to send messages on one platform and show the specific person who has sent the message		
T13	Generation of reports	Can the system allow users to download reports on the tasks saved on Firebase	The system should allow users to download reports on the tasks done	“Download successful”	High
T14	Logging out from the system	Are the users able to logout of the system successfully	Users should be able to logout of the system successfully	“Logout successful”	High

## **Chapter 6: Discussion, conclusion and recommendations**

### **6.1 Introduction**

This chapter covers what the system has been able to achieve, what it has not been able to achieve and recommendations on the future works that can be achieved by similar systems that aim to solve the same problem. It will also involve the formation of the system as a whole and in summary cover all aspects that were undertaken in the formation of the system. Discussions will be on the system modules and what each of them was able to do on the completion of the project.

### **6.2 Discussion**

As described in chapter 2 above, the various remote monitoring techniques employed included performance management system used for identifying, differentiating, and rewarding performance of an employee. Other remote monitoring techniques, include network system for communicating information to an individual and for remotely monitoring the individual and work site monitoring and employee time tracking system. In addition to that, an analysis of these techniques showed that a number of challenges still arose such as different employees having different capabilities of performing tasks, poor internet connection and uncertainty of workers not performing their tasks despite them showing up to work. There were a few factors to consider for the remote monitoring of employees which included registration of different companies on the system. This was helpful in distinguishing the different companies using the application. On the other hand, in terms of each employee receiving their exact task, the department to which each employee belongs to was identified and their emails were used to send the tasks. The modules of the system consisted of registration, login, tasks, comments, AoB, communication and reporting modules. The registration module was for registration of different companies to the system and also for each employer and employee of the company to the system. The login module was for logging in the users of the system into the system. The task module was for setting the tasks and deadlines for the tasks, saving

the tasks once set and updating them in case any changes were made. The comments module was for sending feedback to the employees once the tasks were done. AoB module was for the communication between employers and employees on the problems an employee faced that made them not perform their tasks on time. The communication module was for communication between different employees of the different departments regarding the work issued to them or any other business that they found suitable to talk about. Lastly, the reports module was for employees to download reports on the tasks that were performed well.

### **6.3 Conclusions**

The application will be very beneficial to employees by keeping them in check to ensure that they perform their tasks on time. Notifications have acted as reminders of the tasks set hence making employees aware of what they should do and the time they have to carry out the tasks. The communication platform that allows different employees to communicate amongst themselves has been helpful in that it allows them to know each other better and make it comfortable for them to communicate freely without hindrances. This has enabled employers to keep track of the active employees from the dormant ones.

### **6.4 Recommendations**

For the remote monitoring system to work efficiently, the devices used by the users of the system while accessing it should be any portable device for example smartphones, tablets or iPads. This is because it will be easy for employers of various organizations to monitor the work progress of their employees as they work on the go. For the employees, it will assist them to work easily on the go without necessarily going to the office. However, this will only apply for employers and employees who work in the corporate sector.

### **6.5 Future work**

Despite this research aiming to solve problems arising while setting tasks and deadlines to be performed, not all areas have been able to be addressed due to the scope of the project. Therefore,

the future work to enhance the research can involve sorting tasks that will enable employees prepare in advance on what they should do instead of offering one task at a time. The system can be integrated to recognize those employees that perform their task earlier than the set deadlines hence helping employers to rate the most hardworking employees and reward them fairly. Additionally, it can enable employers to recognize those employees on leave or those who have taken days off work by including buttons with certain colors that explain the same.

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## Appendix A

This is a representation of the project duration

