

MAKERERE



UNIVERSITY

COLLEGE OF COMPUTING AND INFORMATION SCIENCES

**AN ONLINE APPOINTMENT MANAGEMENT SYSTEM FOR MENG'O
HOSPITAL**

Department of Information Systems
School of Computing and Informatics Technology

A Final Year Report Submitted to the College of Computing and Information
Sciences in Partial fulfillment of the Requirements for the Award of a Degree of
Bachelors of Information Systems and Technology of Makerere University

Option: Systems Security

Supervisor: Dr. Ruth Mutebi Mbabazi
Department of Networks
School of Computing and Informatics Technology
Email: ruthmutebiclasses@gmail.com

Signature.....*[Signature]*.....

DATE.....*16 Aug 2023*.....

July 2023

DECLARATION

We hereby declare that the information provided in this report is our own original work which involves recording of activities that we carried out as our Research for a Final year project under the supervision of **Dr. Ruth Mutebi Mbabazi** during the period of May 2022 to July 2023 and has never been submitted to any other University or institution of higher learning for the award of a degree or a diploma. Except for Citations, Quotations and References to other peoples' work used where otherwise acknowledged.

NAME	REG.NO	STUDENT NO.	SIGNATURE
BALINONYE TREVOR MARK	20/U/3464/PS	2000703464	
ARYET DAVID	20/U/3469/PS	2000703469	
MAKIKA MULONGO SARAH	20/U/3432/PS	2000703432	
MUNYAGWE EDGAR	19/U/19117/PS	1900719117	
NATOSHA SARAH	20/U/22615	2000722615	

DEDICATION

We dedicate this beautiful work to our supervisor, Dr Ruth Mbabazi Mutebi, who has dedicatedly surrendered her time towards achieving this.

We also congratulate each other, for the efforts, time, hard work, encouragement everyone has put in coming up with this piece, and most importantly for being a source of inspiration.

ACKNOWLEDGEMENT

We would like to thank our academic supervisor Dr. Ruth Mutebi Mbabazi for her consistent support and guidance towards our research and the progress of our project from the very initial phases to the last one. She ably directed us to having a clear objective, understanding and suitably come up with a functional and easy-to-implement but yet unique VMS.

In addition, we would like to thank all the various stakeholders who participated in our research and contributed towards its advancement and the implementation of the whole project.

Table of Contents

1.0	Chapter One: Introduction	1
1.1	Introduction.....	1
1.2	Background	2
1.3	Statement of the Problem	3
1.4	Objectives.....	4
1.4.1	General Objectives.....	4
1.4.2	Specific Objectives	4
1.5	Scope.....	5
1.5.1	Conceptual Scope	5
1.5.2	Geographical Scope.....	5
1.5.3	Time Scope.....	5
1.6	Significance of Study.....	5
1.6.1	Stakeholder 1	5
1.6.2	Stakeholder 2	5
1.6.3	Stakeholder 3	5
2.0	Chapter Two: Literature Review	6
2.1	Introduction.....	6
2.2	Visitor Management Systems.....	6
2.3	Comparison of Similar systems to this one that also apply the same solution.	7
2.3.1	Features of this visitor management system	8
3.0	Chapter Three: Research Methodology and Design.....	9
3.1	Research Design	9
3.2	Data Collection Methods	9
3.3	Data Analysis	10
3.4	System Development	10
4.0	Chapter Four: Systems Analysis and Design.....	12
4.1	Introduction.....	12
4.2	Description of the Designed System	13
4.3	Data analysis and results	14
4.3.1	Methods used to analyze data	14
4.3.2	Presentation of findings	15
4.3.3	Demographics of the respondents.....	15
4.3.4	Findings.....	16
4.4	System user requirements	20
4.5	Functional and Non-functional Requirements	21

4.5.1 Functional Requirements	21
Access Control	21
Usability	21
Instant badge printing	22
Visitor photo capture	22
Instant Notification for Hosts	22
Accessibility	23
Generate a report	23
4.5.2 Non-functional Requirements	23
Performance	23
Security	24
5.1.1 System forms and outputs	29
5.2 The programming languages used	39
5.3 The Tools	39
5.4. System Testing	40
5.4.1 Scope and Relevance of tests	40
5.4.2 Levels of tests	41
5.4.3 Types of tests	41
6.0 Chapter Six: Discussion, Recommendations, Future work and Conclusions	47
6.1 Discussion	47
6.2 Limitations	48
6.3 Recommendations Future work	48
6.4 Conclusion	49
REFERENCES	52
APPENDICES	53

LIST OF TABLES

Table 2 Showing languages used in implementation and their purpose	39
Table 3 Showing tools used during design and implementation of the application.....	39
Table 4 Showing summary of steps taken to verify implementation and testing of the application.....	44
Table 5 Inspection steps for testing the application	46

LIST OF FIGURES

Figure 1 Showing overview of screen images of the application.....	30
Figure 2 Showing calendar used for booking.....	31
Figure 3 Confirming time of booking	32
Figure 4 Showing interaction page for users.....	33
Figure 5 Showing doctor's interface	34
Figure 6 Showing sample appointment booking language using a customized user language.....	35
Figure 7 Showing patient appointment details	36
Figure 8 Showing User Dashboard, that is , Patient.....	37
Figure 9 Showing available doctors	38

APPENDIX LIST

Appendix A:.....	51
Appendix B:.....	52
Appendix C:.....	55

LIST OF ACRONYMS

1. OAMS - Online Appointment Management System
2. SDLC - System Development Life-cycle

ABSTRACT

With the enhancement in technology, so many aspects in different fields are also embracing and advancing in new technology. We managed to work on a system that automates the visitor's appointment management process in hospitals, identifying our case study as Mengo hospital Uganda. This hospital already has a manual system in place which records visitors information manually, and with this kind of operation, of course we expect so many vulnerabilities here and there not forgetting inefficiencies.

The purpose of this research proposal is to deliver an online appointment management system for hospitals like Mengo, and this proposed system will enhance building security, improve visitor experience, and effectively monitor, track, and record visitor information.

In order to achieve the above objectives, our system is exclusively enhanced with features such as pre-registration, contactless check-in, real-time monitoring and tracking, advanced security features including health screening measures.

1.0 Chapter One: Introduction

1.1 Introduction

An Appointment Management System is a software application designed to facilitate the scheduling, tracking, and organization of appointments and meetings. It streamlines the process of setting up appointments, coordinating between multiple parties, and ensuring efficient resource allocation.(Research Gate, Article 2012- Online Appointment Management System). The traditional process of managing and tracking visitors, which relies on manually collecting and storing visitor information in a paper-based sign-in book, can create security vulnerabilities and inefficiencies (Greetly Digital Receptionist, 2021). With the rise of contagious diseases such as COVID-19, it is more important than ever to implement a secure and reliable online appointment management system that can efficiently handle a large number of visitors while ensuring the health and safety of both employees and visitors.

The purpose of this project was to deliver an online Appointment Management System for hospitals. The system will enhance building security, improve visitor experience, and effectively monitor, track, and record visitor information. This research aimed to address the issues associated with the conventional visitor management system, such as poor security, lack of health measures, and inefficiency in handling a large number of visitors (Greetly Digital Receptionist, 2021, Qmatic Appointment Management Solutions, 2023)

This report provides an overview of the key features, benefits, implementation considerations, and potential challenges associated with an Appointment Management System. It is divided into several sections including the research problem, objectives, methodology, system design, implementation, evaluation, and conclusion. The complete system is designed to integrate with other systems such as security cameras and access control systems, provide advanced reporting capabilities, customizable access levels, mobile compatibility, self-registration, health measures, and contactless check-in/check-out. Additionally, the system also includes advanced security features such as encryption, two-factor authentication, and access control, and will be regularly audited and updated to ensure the safety and security of visitor data.

This system is a tailor-made software for Clinics, Hospitals, and Doctors allowing a smooth flow in the operations, thereby replacing the manual work with ease and comfort through medical software.(Docplus.com). And it provides a significant contribution to the field of visitor appointment management by providing a practical solution that utilizes technology to

improve the overall visitor management process in healthcare facilities (Greetly Digital Receptionist, 2021). The system helps hospitals to enhance the security and safety of their facilities, as well as to improve the experience of visitors.

1.2 Background

Mengo Hospital in Kampala, Uganda, like many healthcare facilities, faces the challenge of managing a large number of visitors while ensuring the safety and security of patients, employees, and the facility itself. The traditional process of managing and tracking visitors, which relies on manually collecting and storing visitor information in a paper-based sign-in book, can create security vulnerabilities and inefficiencies. Additionally, with the rise of contagious diseases such as COVID-19, it is increasingly important to have a system in place that can prevent the spread of infection among visitors and employees (CDC, 2021).

The current visitor management system in place at Mengo Hospital is manual and paper-based, which has its own set of challenges. This process can be tedious and time-consuming, as well as being prone to errors and inaccuracies. Additionally, manual systems lack the ability to provide real-time monitoring and tracking of visitors, which can put the hospital at risk in case of security breaches or other emergencies. Given the previous situation with the COVID-19 pandemic, an appointment system allows to spread out patient visits throughout the day to maintain social distancing and avoid crowding.

With an appointment management system solution, given it's self check-in and access badges, patients can even check themselves in upon arrival, without any interaction with staff; the non-urgent patients can schedule their consultation in advance. As this eliminates wait times upon arrival, it has a significant impact on the patient experience. The patient can better plan their day as it eliminates the uncertainty of waiting times, the hospital can automatically send confirmations and reminders to patients, which makes them more likely to show up.

Nevertheless, an appointment system helps you manage appointments and seamlessly check in patients to see consultants on arrival. Therefore, staff can focus on meeting and supporting patients to deliver a better all-around experience.(Qmatic Appointment Management Solutions, 2023)

In recent years, there has been a growing trend towards the use of technology to automate and streamline the visitor management process. One solution that has gained popularity is the use of online appointment management software. These systems provide a range of features such as

pre-registering visitors, effective communication, express check-in, interactive mapping, and efficient visitor management workflows.

Despite the growing use of Appointment Management Systems, Mengo Hospital still relies on a manual system. This is due to a lack of awareness of the benefits of an OAMS, as well as the perceived cost and complexity of implementation. There is a need for an online appointment management system that addresses the challenges associated with the traditional manual systems and provides a more efficient and effective solution for managing visitors at Mengo Hospital. This system will not only enhance building security, improve visitor experience, and effectively monitor, track, and record visitor information but also includes health measures such as health status, and COVID-19 vaccination records. This research proposal aims to address the limitations of the current manual visitor management system at Mengo Hospital and provide a practical solution for managing visitors in the facility.

It is important to note that the proposed system will also adhere to the visiting hours and guidelines set by Mengo Hospital, such as limiting the number of visitors allowed at any one time to ensure a peaceful and calm environment for patients to recover, and only allowing visitors to bring in meals during lunch hours. The proposed system will also take into consideration the need to prioritize patients and their needs, such as giving them priority when using lifts and providing them with more privacy by using visitor rather than patient washrooms. Additionally, the proposed system will also include a feature for visitors to request an interpreter in advance, ensuring that the needs of all visitors are met. Overall, the proposed system will not only improve the efficiency and security of the visitor management process at Mengo Hospital, but also enhance the overall visitor experience by adhering to the guidelines and policies set by the facility.

1.3 Statement of the Problem

The traditional manual visitor appointment management system at Mengo Hospital in Kampala, Uganda, poses several challenges that negatively impact the safety, security, and efficiency of the facility. These challenges include:

Inadequate security measures: The manual system lacks the ability to provide real-time monitoring and tracking of visitors, which can put the hospital at risk in case of security breaches or other emergencies.

Health risks: The manual system does not have the capability to integrate health screening measures such as temperature check, health status, and COVID-19 vaccination records which increases the risk of spreading contagious diseases among visitors and employees.

Inefficiency: The manual process of collecting and storing visitor information is time-consuming, prone to errors, and lacks the ability to efficiently handle a large number of visitors.

Poor visitor experience: The manual system does not provide a personalized and efficient check-in process, which can negatively impact the visitor experience.

The proposed research aimed to address these challenges by developing a secure and reliable contactless express visitor management system for Mengo Hospital that can enhance building security, improve visitor experience, and effectively monitor, track, and record visitor information while integrating health screening measures.

1.4 Objectives

1.4.1 General Objectives

The main objective of this research was to develop and implement an Online Appointment Management System for Mengo Hospital in Kampala, Uganda, to improve the safety, security, and efficiency of the facility while providing a better visitor experience.

1.4.2 Specific Objectives

1. To define the various features of the appointment management system in order to enhance the building's security; such as encryption, two-factor authentication, access control and among others, so as to enable real-time monitoring and tracking of visitors.
2. To design a prototype of the appointment management system, thereby improving the visitor experience by providing a personalized and efficient check-in process, as well as giving visitors different levels of access permissions.
3. To implement and put to test this online appointment Management System to effectively monitor, track, and record visitor information while integrating health screening measures such as health status, and COVID-19 vaccination records to prevent the spread of contagious diseases among visitors and employees.

1.5 Scope

1.5.1 Conceptual Scope

The research involved an in-depth investigation of the current manual visitor appointment management system in place at Mengo Hospital, its limitations, and the needs of the facility in terms of safety, security, and efficiency. The research also involved the study of existing VMS solutions and the identification of the most suitable one for the facility.

1.5.2 Geographical Scope

The research was focused on Mengo Hospital in Kampala, Uganda, as the main case study. The sample size included the hospital staff, patients, and visitors who would be involved in the testing and evaluation of the system.

1.5.3 Time Scope

The research was conducted over a period of 12 months, which included the design, development, implementation, testing and evaluation phases.

1.6 Significance of Study

1.6.1 Stakeholder 1

The system improves the visitor experience by providing a personalized and efficient check-in process, as well as gives visitors different levels of access permissions. This increases customer satisfaction and enhances the hospital's reputation.

1.6.2 Stakeholder 2

The system enhances building security by implementing real-time monitoring and tracking of visitors, as well as advanced security features such as encryption, two-factor authentication, and access control. This reduces the risk of security breaches and other emergencies, ensuring the safety of patients, employees, and the facility itself.

1.6.3 Stakeholder 3

The system creates new knowledge and provides a valuable solution for managing visitors in healthcare facilities, with the potential to be replicated in other hospitals and organizations.

This will have a positive socio-economic impact on the community by ensuring the safety, security, and well-being of patients, employees, and visitors.

2.0 Chapter Two: Literature Review

2.1 Introduction

This section conducts a review of research work from internet sources, books, reports, journals and individual studies regarding Visitor Management. This section involves describing the challenges that have held the adoption of modern technologies in healthcare system on large scale and the current solutions that have been enforced to counter them. It criticizes the already existing solutions/systems while stressing out their strengths and weakness which will help us identify why they have not been efficient enough.

2.2. Online Appointment Management System

An appointment management system is a software used by companies and service providers to streamline their service appointments. By using the system, visitors can know and choose their preferred appointment times according to the services available from the hospital and the available time slots. These systems use technology to monitor and track visitors for security purposes and record visitor information. They have gained popularity in recent years as a way to improve the safety, security, and efficiency of facilities while providing a better visitor experience.

OAMS typically include features such as pre-registering visitors, effective communication, express check-in, interactive mapping, and efficient visitor management workflows. Some systems also include hardware and databases that can enhance security, such as facial recognition, temperature check, and access control systems. These features allow organizations to better monitor and track visitors, improve security, and increase efficiency.

Appointment Management Systems continue to evolve based on current trends. Integration with other software systems, such as Customer Relationship Management (CRM) or Electronic Health Records (EHR), is becoming increasingly popular, offering comprehensive solutions for managing customer interactions. Mobile app integration is on the rise, catering to the demand for convenient on-the-go scheduling. The application of Artificial Intelligence (AI) and Machine Learning (ML) techniques to optimize appointment scheduling algorithms and predict customer behavior is an emerging area.

Appointment setting is one of the most professional cold-calling methods businesses employ to make their presence known to their visitors/clients on a more personal level. When done right, it leaves a lasting, positive impression of your business in the minds of your prospects, giving them more reason to consider receiving services from you.(Magellan Solutions;Article:The Wonders Of Appointment Setting And What It Can Do For Your Business)

Another study by the International Journal of Computer Applications in Technology found that OAMS can improve the visitor experience by providing a personalized and efficient check-in process, as well as giving visitors different levels of access permissions (Jain et al., 2018). With an efficient scheduling process working in the background, your office staff can spend time on more important tasks, and your field team can accomplish more each day.(Commusoft Feb 15, 2023)

Additionally, in the current context of COVID-19 pandemic, an OAMS can be used to integrate health screening measures such as, health status, and COVID-19 vaccination records, which can prevent the spread of contagious diseases among visitors and employees (CDC, 2021).

In conclusion, OAMS are a valuable solution for managing visitors in organizations, providing improved security, efficiency, and visitor experience. They can also be used to integrate health screening measures in the context of a pandemic such as COVID-19.

2.3 Comparison of Similar systems to this one that also apply the same solution.

System/Website	Strengths	Weaknesses
Lobbipad	The web portal is great and the settings are easy to manage. Helps relieve unnecessary work for front desk.	Updates should happen automatically, or be limited to out of business hours.
	Easy and intuitive GUI, without any unwanted or unused features that must be paid. It just does what it should do.	Can be time consuming when taking a photo and issuing personalized badges at the entrance.
Greetly	Easy to set up with plenty of support along the way.	

	It is also much cost effective as some other systems we shortlisted were overly complicated for people's needs.	There is no one there to tell a guest if the host if they delayed or in a meeting.

2.3.1 Features of this visitor management system

1. Pre-registration: Visitors are able to pre-register their information before arriving at the facility, reducing the wait time at the check-in process.
2. Contactless check-in: Visitors are able to check-in using a self-service kiosk or through their mobile device, reducing the need for physical contact and increasing the efficiency of the check-in process.
3. Real-time monitoring and tracking: The system provides real-time monitoring and tracking of visitors, allowing the facility to keep track of who is on the premises at all times.
4. Advanced security features: The system includes advanced security features such as encryption, two-factor authentication, sensors and access control, to ensure the safety and security of the facility.
5. Personalized and efficient check-in process: The system provides a personalized and efficient check-in process for visitors, with the ability to give different levels of access permission.
6. Visitor information management: The system allows for the effective monitoring, tracking, and recording of visitor information, such as contact information and purpose of visit, for the facility's records.
7. Reporting and Analytics: The system provides real-time and historical reporting and analytics capabilities, to help the facility understand who is visiting, when they are visiting, and how long they are staying.
8. Integration: The system is integrated with other systems, such as access control and, security cameras and proximity sensors, to provide a more comprehensive solution.
9. Scalability: The system will be scalable, to accommodate a large number of visitors and adapt to the growth of the facility.

3.0 Chapter Three: Research Methodology and Design

3.1 Research Design

The proposed research used a system development life cycle (SDLC) model, specifically the Waterfall model, to guide the design, development, and implementation of the online appointment management system (OAMS) for Mengo Hospital in Kampala, Uganda. The Waterfall model was appropriate for this project as it provided a clear and defined sequence of phases, with each phase building upon the previous one, and it is suitable for well-defined, non-iterative, and non-experimental projects (Boehm, 1981).

The phases of the Waterfall model that were used in this research are:

1. Requirements analysis: This phase involved gathering and documenting the requirements of the OAMS, including the needs of the hospital and the stakeholders, such as staff, patients, and visitors. The requirements were collected through interviews and surveys.
2. System design: This phase involved the design of the VMS, including the system architecture, user interface, and database design. The design will be based on the requirements collected in the previous phase.
3. Implementation: This phase involved the implementation of the VMS, including the development of the system, the database, and the integration of security and health screening measures.
4. Testing and validation: This phase involved testing and validating the OAMS to ensure its functionality, usability, and reliability. The testing also included both unit testing and acceptance testing.
5. Deployment: This phase involved the deployment of the VMS in Mengo Hospital. This included training the staff on how to use the system, and providing support during the transition period.
6. Maintenance and updates: This phase involved maintaining and updating the OAMS as needed. This included addressing any issues that arose, and making improvements to the system based on feedback from users.

3.2 Data Collection Methods

The research will use a combination of quantitative and qualitative research methods to collect data. The data collection methods will include:

1. Surveys: Surveys were used to gather information on the requirements of the OAMS, the currently manual visitors' appointment management system in place, and the needs of the hospital and stakeholders. Surveys were administered to staff, patients, and visitors.
2. Interviews: Interviews were conducted with staff and visitors to gather more in-depth information on the requirements of the OAMS, the current

manual visitor appointment management system in place, and the needs of the hospital and stakeholders.

3. Case studies: Case studies were also conducted to gather information on the effectiveness of the OAMS in improving the safety, security, and efficiency of the facility, as well as the visitor experience.

3.3 Data Analysis

The data collected was organized and analyzed to identify the requirements of the OAMS, the limitations of the current manual visitors' appointment management system in place, and the needs of the hospital and stakeholders. The data was analyzed using statistical techniques, such as frequency analysis, chi-square test, and regression analysis.

3.4 System Development

The system development involved the design, development, and implementation of the OAMS, including:

1. System design: This involved the design of the system architecture, user interface, and database design, based on the requirements and needs that were identified in the previous phases.
2. Programming: This involved the actual coding of the system, using programming languages such as C#, Java or Python.
3. Database development: This involved the development of the database to store and manage the visitor information.
4. Testing and validation: This involved testing and validating the system to ensure its functionality, usability, and reliability. The testing included both unit testing and acceptance testing.
5. Deployment: This involved the deployment of the system in Mengo Hospital. It also included training the staff on how to use the system, and providing support during the transition period. Along with the deployment, the hospital's visiting hours, patient privacy and cleanliness policies will be communicated to the visitors via the system and also displayed on the hospital's website (<https://mengohospital.org/patientprivacy/>). This would ensure that the visitors were aware of the hospital's rules and regulations, and also help in maintaining a peaceful and calm environment for the patients.
6. Maintenance and updates: This involved maintaining and updating the system as needed. This included addressing any issues that arose, and making improvements to the system based on feedback from users.

7. Security Measures: This involved the implementation of security measures such as encryption, two-factor authentication, and access control, to ensure the safety and security of the facility.

4.0 Chapter Four: Systems Analysis and Design

4.1 Introduction

Due to the current visitors' appointment management system in place at Mengo Hospital which is manual and paper-based and therefore having many flaws associated to it, with regards to ensuring the building security, improved visitor experience, and effectively monitoring, tracking, and recording visitor information, our proposed online appointment management system will provide a practical solution that utilizes technology to improve the overall visitor management process at Mengo Hospital. The purpose of this section is to outline the overall architecture of our proposed system, by providing a detailed description of the system's design, including its components and interactions as elaborated within the various sections. Therefore, it will ensure the success of our system development project by enabling key prospects such as;

- **Communication;** as a communication tool between the development team, stakeholders, and other interested parties; by providing a common understanding of the system's design and helps to ensure that everyone is on the same page.
- **Evaluation;** in order to evaluate the system's design against the requirements and specifications. It helps to ensure the system's design which meets the user's stakeholders' needs.
- **Planning;** this report helps to plan the development process by providing a road-map for the development team, and also to identify potential issues and risks early on in the development process.
- **Documentation;** it provides a detailed description of the system's architecture, which can be used for future reference and maintenance.
- **Scalability;** by outlining the system's components and interactions, which helps to identify potential bottlenecks and issues

4.2 Description of the Designed System

Our Online Appointment Management System (OAMS) is a software solution that will allow Mengo Hospital to streamline and automate their visitor management process.

The proposed system will provide a significant contribution to the field of visitor management by providing a practical solution that utilizes technology to improve the overall visitor management process in Mengo Hospital. The system will help the hospital have efficient visitor management workflows, increased overall efficiency and productivity, enhance the security and safety of their facility through access control systems, and ensuring compliance with regulations. As well as to improve the experience of visitors by providing a personalized and efficient check-in process, as well as giving visitors different levels of access permissions.

Consequently, the implementation of our OAMS will have significant benefits for the safety, security, and efficiency of the facility, as well as for the visitors themselves, through the following functional features;

- I. **Pre-registration:** Visitors will be able to pre-register their information before arriving at the facility, reducing the wait time at the check-in process.
- II. **Contact-less check-in:** Visitors will be able to check-in using a self-service kiosk or through their mobile device, reducing the need for physical contact and increasing the efficiency of the check-in process.
- III. **Real-time monitoring and tracking:** The system will provide real-time monitoring and tracking of visitors, allowing the facility to keep track of who is on the premises at all times.
- IV. **Advanced security features:** The system will include advanced security features such as encryption, two-factor authentication, sensors and access control, to ensure the safety and security of the facility.

- V. **Personalized and efficient check-in process:** The system will provide a personalized and efficient check-in process for visitors, with the ability to give different levels of access permission.
- VI. **Visitor information management:** The system will allow for the effective monitoring, tracking, and recording of visitor information, such as contact information and purpose of visit, for the facility's records.
- VII. **Reporting and Analytics:** The system will provide real-time and historical reporting and analytics capabilities, to help the facility understand who is visiting, when they are visiting, and how long they are staying.
- VIII. **Instant Notification for Hosts:** When visitors check in at the reception, their hosts (or doctors or persons with whom they made the appointment) should be immediately notified, no matter where they are. Our system will have the capability to send a variety of different kinds of notifications: SMS, email, push notification or even a phone call.
- IX. **Scalability:** The system will be scalable, to accommodate a large number of visitors and adapt to the growth of the facility

4.3 Data analysis and results

4.3.1 Methods used to analyze data

Below are the methods that were used to analyze the data:

Statistical analysis: Collected data was analyzed using frequency distribution, mean, mode, median, standard deviation and so on.

Data visualization: Here, the data was analyzed in the form of graphs, charts, bar charts, and maps.

Comparative analysis: Visitor data was compared over a long period of time so as to identify areas of improvement, shortfalls, optimize visitor flow and to detect security threats.

Survey analysis: The data was used to analyze the performance of different events or venues. Surveys were used to gather feedback from visitors about their experiences, preferences, or areas of improvement. The data collected was analyzed to identify insights that help to optimize the visitor experience.

4.3.2 Presentation of findings

4.3.3 Demographics of the respondents

The respondents interviewed and given questionnaires amounted to 100 of which 75% were literate and 25% were illiterate. These were grouped as staff, patients and visiting individuals. Their ages had a median value of 29.4 and the ladies amounted to 84% of the respondents. Below is a graphical representation of the distribution of respondents. Among the staff we had the medical personnel, the security personnel, i.e. the employees of the hospital.

Types of Respondents

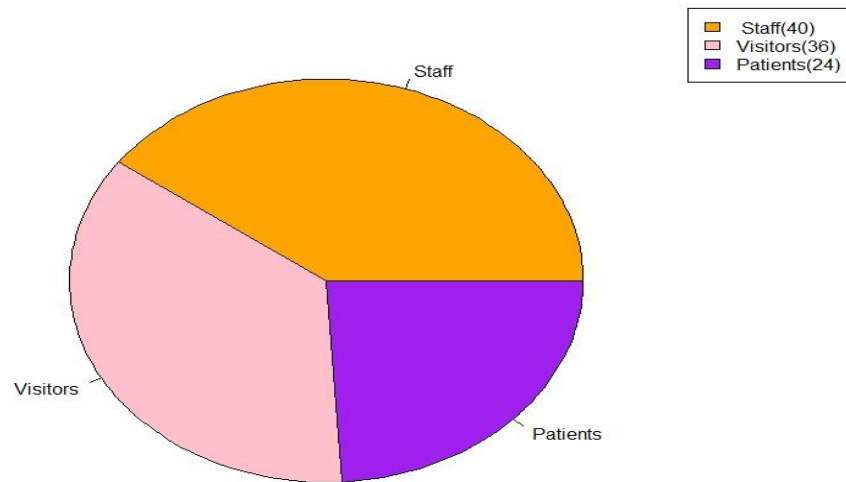


Figure 1

The above pie-chart (Figure 1) shows the different strata i.e. staff, patients, and visitors, from whom we gathered viable information on the requirements of the proposed OAMS for Mengo Hospital, the current manual visitor management system in place, and the needs of the hospital and stakeholders.

4.3.4 Findings

We analyzed the data collected from the interviews, surveys, questionnaires and through observation, and afterwards scrutinized it in order to have the requirement specifications of our system clearly drawn out and eliminate any kind of errors, incorrectness or bias from the information gathered from our respondents. Thus, ensuring the feasibility and a proper satisfying functional system of our OAMS once implemented, as our major prospective.

First and far most, we were reliably informed that the current visitor management system in use at Mengo Hospital is the conventional one or manual system for checking in of visitors hence the need for our proposed

Online Appointment Management System (OAMS). And also given the fact that the conventional system has or is becoming obsolete at a high speed in many different organizations, due to the broad benefits of an OAMS

Nevertheless, we were able to find out the major challenges faced by visitors at Mengo hospital in spite of the existing conventional system

Long waiting hours: This challenge is faced by most of the visitors at Mengo hospital i.e. while signing in (creating an appointment through the receptionist) and also due to the fact of many visitors in the queue and few personnel to check them in or attend to them.

Security concerns: Unidentified or unauthorized persons can easily get into the hospital since the conventional visitor management system gives no provision to ensure proper identification and authorization (i.e. granting access levels), hence you could have criminals into the hospital.

And also, visitor information or records are not reliably kept and managed, thus visitors cannot be easily be tracked in case of a security alarm.

Navigation to rooms: Given the fact that Mengo Hospital is relatively big, you could have visitors wandering about in the facility with no proper directions to the wards, rooms, or places in the hospital that they should go to; thus, our proposed system would also provide the hospital plan clearly drawn out for proper direction guidelines.

It's these challenges enlisted above among other challenges that are commonly faced by the visitors at Mengo Hospital, most especially given the fact of the existing conventional visitor management system. Hence our OAMS will highly be of importance to Mengo Hospital since it solves all the above problems and has more benefits attached.

Since our proposed Online Appointment Management System, once implemented, would require mainly the literates (or those knowledgeable about using computers) to use it; we took the initiative to also find out how satisfied the respective stakeholders would be (i.e. the staff, visitors and patients) in using it; given its defined functions and services it would offer. And we found out that most or all of them would be however satisfied and pleased with it

Consequently, confirming how satisfied our system's intended users would be in using it, proves to us their willingness to adopt to it and participation in its proper implementation where needed be, thus taking their information about it as suitably viable.

Importance of an Online Appointment Management System

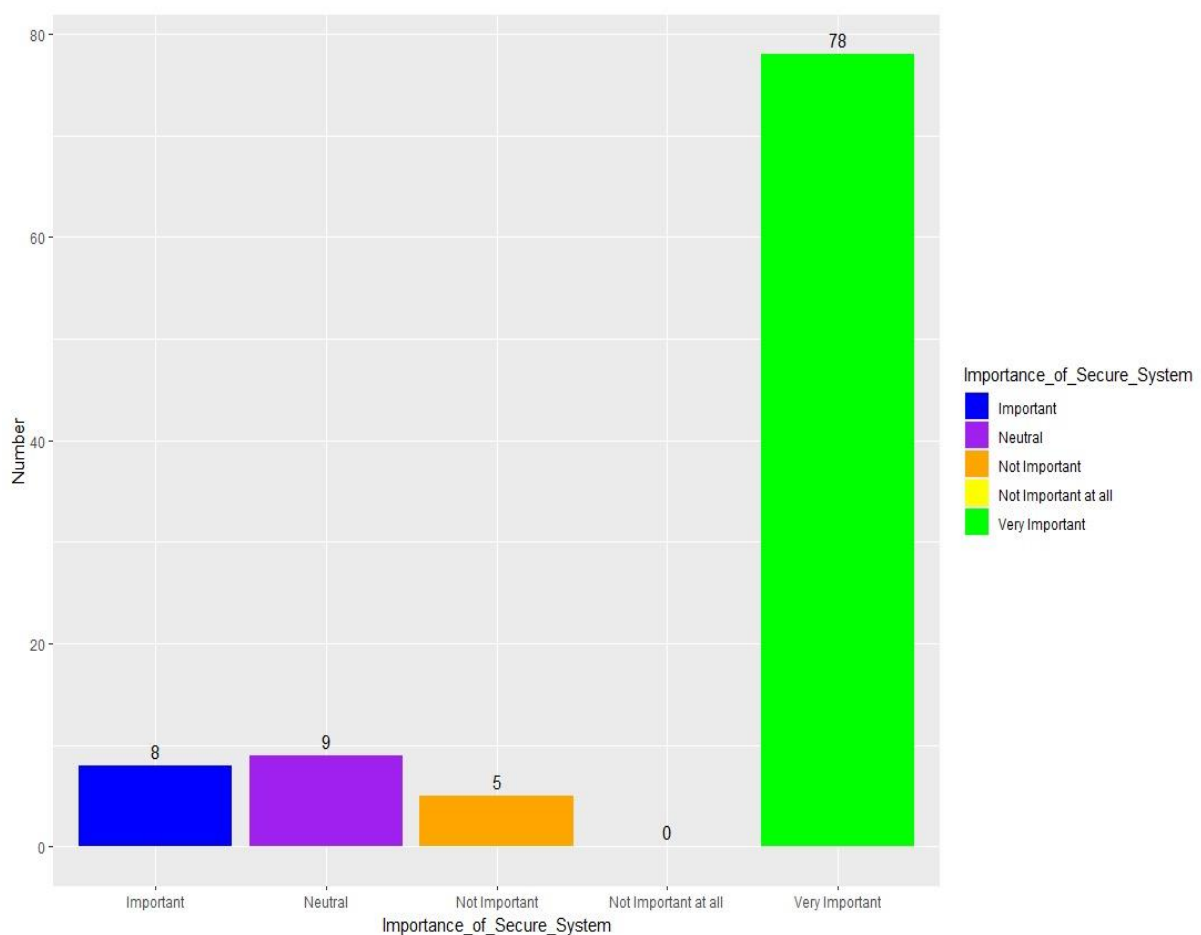


Figure 2

The graph (Figure 2) above shows the levels of importance of our system, which rationalizes the fact that our proposed system will be of significant value to Mengo Hospital.

Nevertheless, we were also able to find out some suggestions for our proposed system, which we would have to incorporate for better visitor experience, as enlisted below;

24/7 Surveillance Monitoring: By having the digital camera system of the whole facility (Mengo Hospital) integrated with our system

Access levels: Through printing of access level cards for each visitor on check-in

Pre-registration: By creating or making appointments online

Express and digital check-in: In our research study for this system, we have meticulously gathered all the necessary and required information to ensure that we have a full functional secure contactless visitor management system for Mengo Hospital, and a satisfactory one for all its intended users. Thus, our findings as explained above are of high value and significance in the design and implementation of our proposed system.

4.4 System user requirements

These requirements vary depending on the software or application to be used. Below are the ones to be considered:

Operating System: The system should be compatible with the operating system used in the organization such as windows, Linux, or MacOS.

Processor: The system should have a capable processor to ensure efficient performance of the software.

Memory: The system should have sufficient RAM to ensure smooth running of the software, usually 4GB or more.

Storage: Adequate storage capacity, such as 500GB or more, is required to store the data of the visitors and employees.

Network: The system should have stable internet connectivity and LAN for the client-server architecture.

Peripherals: A printer, scanner, camera, and other hardware should be compatible with the software to capture visitor details, photos, and IDs.

Security: The system should comply with the organization's security protocols to protect visitor data and prevent unauthorized access.

Mobile compatibility: Having a mobile app will enhance the visitor's registration experience.

4.5 Functional and Non-functional Requirements

4.5.1 Functional Requirements

Access Control

Access control is an essential element of security that determines who is allowed to access certain data and resources and in what circumstances. It typically consists of identifiers (such as usernames), authentication methods (such as passwords), and authorization processes to determine whether an authenticated user should be allowed or denied access to something based on their identity and the result from the authentication process.

The system should require visitors to verify their identity by presenting an ID card or passport or through any other suitable means, while checking in at the facility.

Usability

The online appointment management system should be so user-friendly that both the staff and visitors are able to navigate it with little-to-no training or assistance.

That means the system needs a clear interface that is not cluttered with text or icons. And the workflow as visitors go through the check-in process should be extremely clear, so anyone who visits any office can sign in quickly and easily in order to make the first impression which is actually very important

The system should also allow a visitor to register coherently; their details, including name, contact details. And the purpose of the visit.

Instant badge printing

Visitor badges should be printed when check-in is complete to allow staff to efficiently identify visitors and increase site security. The system should therefore enable visitors to check-in and check-out of the hospital. The system should also notify the host about the visitor's arrival.

Visitor photo capture

Taking photos of visitors during their check-in process makes them instantly recognizable at the reception by the personnel there and others within the office. This also increases security for the office, so photo capture is a great feature for our online appointment management system to have.

Instant Notification for Hosts

When visitors check in at the reception, their hosts (or doctors or persons with whom they made the appointment) should be immediately notified, no matter where they are. Our system will have the capability to send a variety of different kinds of notifications: SMS, email, push notification, Slack DM, or even a phone call. Hosts need to be able to choose the type of notification that's best for them and customize the system to reach them that way.

Accessibility

Our system should have cloud-based software given the fact that you are not required to perform any extra maintenance because software updates can happen automatically. And, with a cloud-based system, you can access your data from anywhere, not just inside the office. We would just make sure our cloud-based system is General Data Protection Regulation compliant so all the data stays secure.

Generate a report

This is a must-have in our system because it would enable generation of the reports we would need to learn about the visitors. Those reports would be filterable by date and time, including real-time data, and be exportable in CSV or PDF formats so they can be distributed and analyzed by the respective stakeholders.

4.5.2 Non-functional Requirements

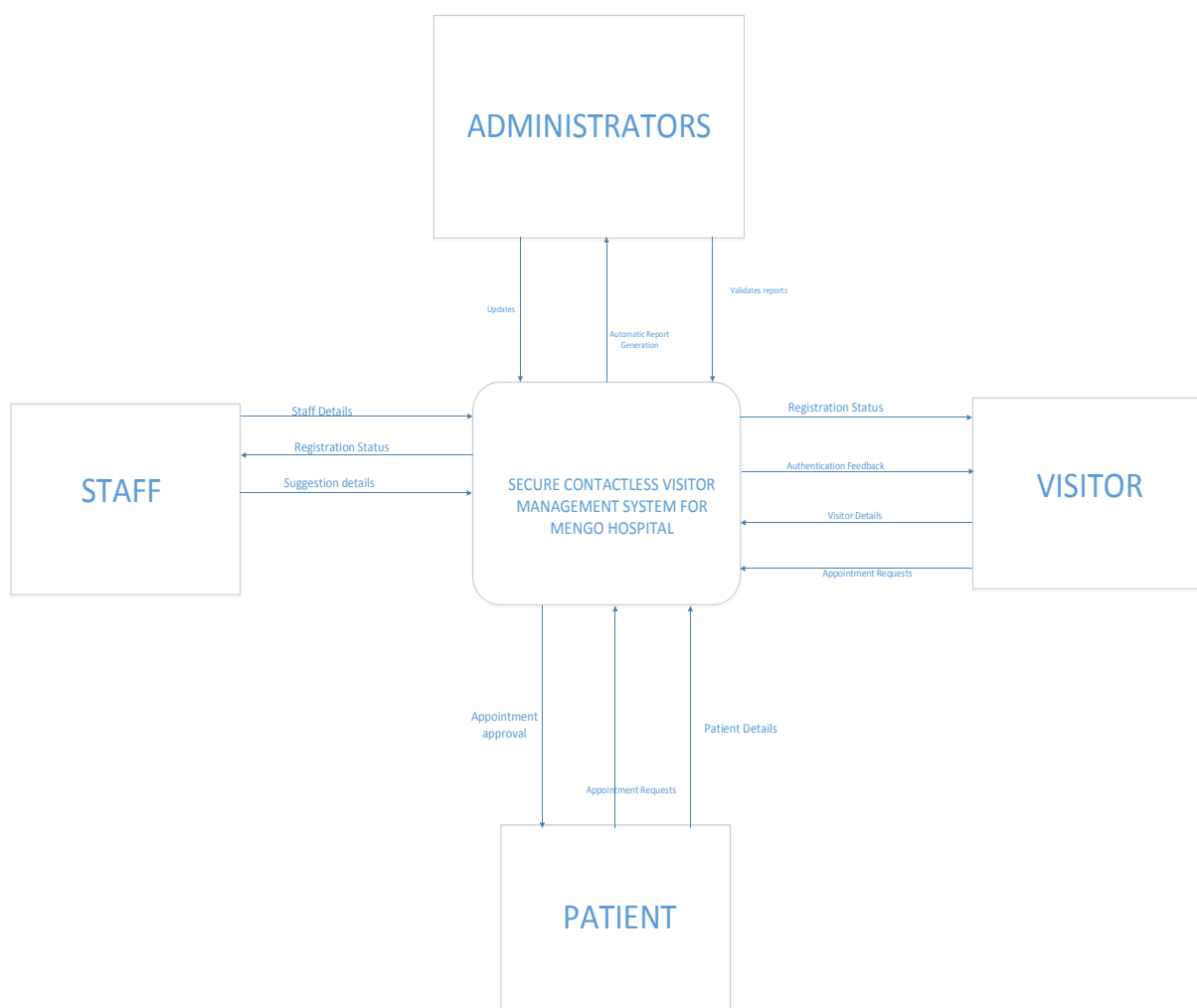
Performance

Most businesses, companies, health institutions or firms make it a goal to grow over time, and our system will not be a good fit if it cannot grow with the evolving technology trends or integrate with other software. That is why it is important to make it scalable and able to handle large-scale data. The system however, should be able to handle a large number of visitors without any significant delay or downtime, at any one time irrespective of the number of users—even if they are many.

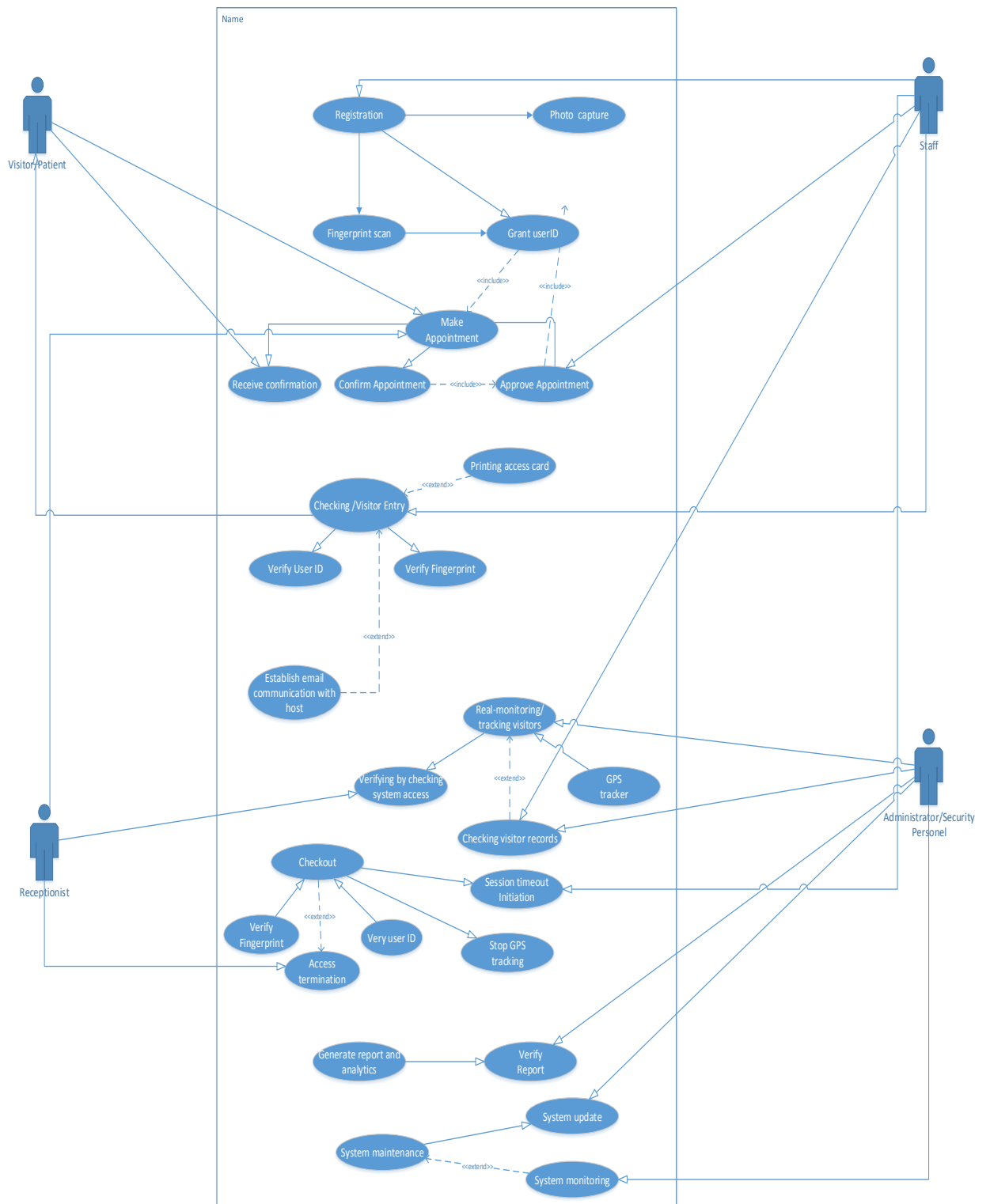
Security

The security of any system has three major components i.e. confidentiality, integrity and availability which is the CIA triad. Hence our system should ensure the privacy and security of visitor data. The system should also be secure against unauthorized access or data breaches. The system should also be available 24/7 for visitor registration and check-in.

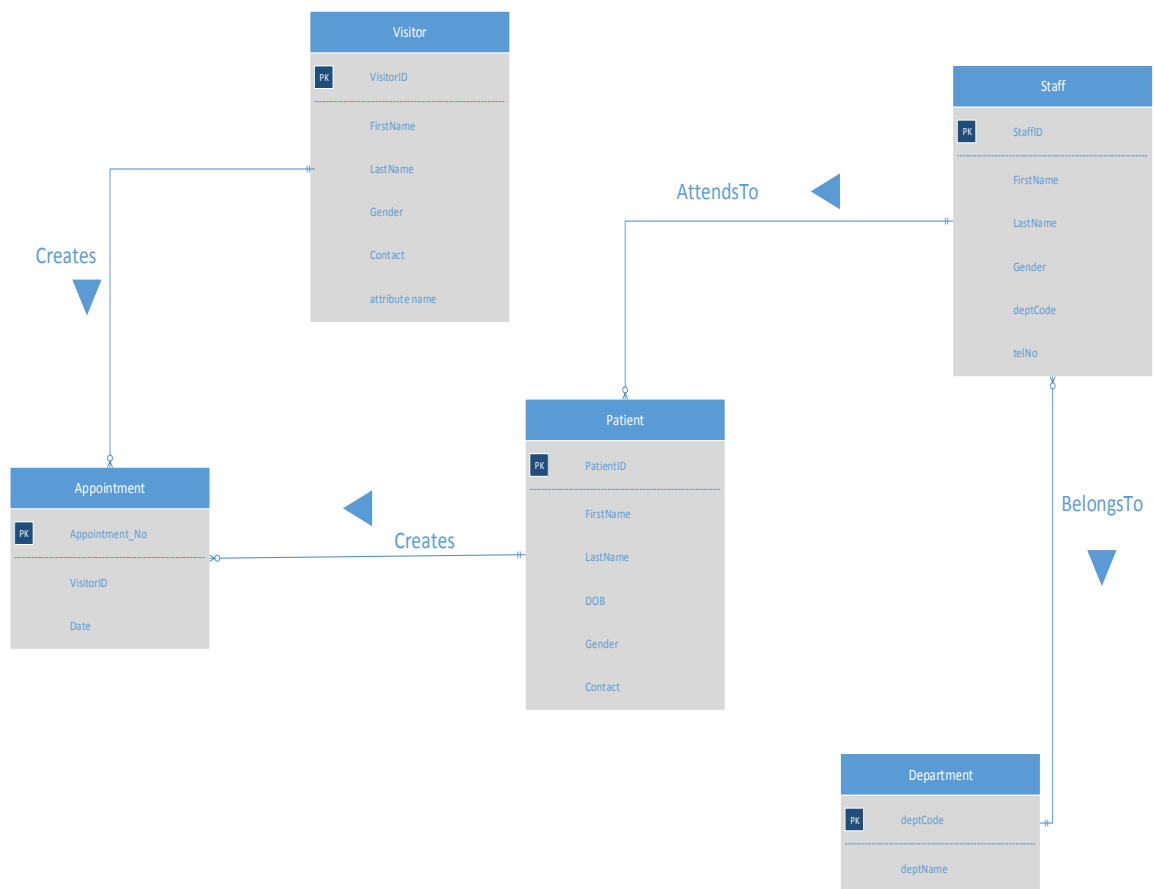
The Context Diagram



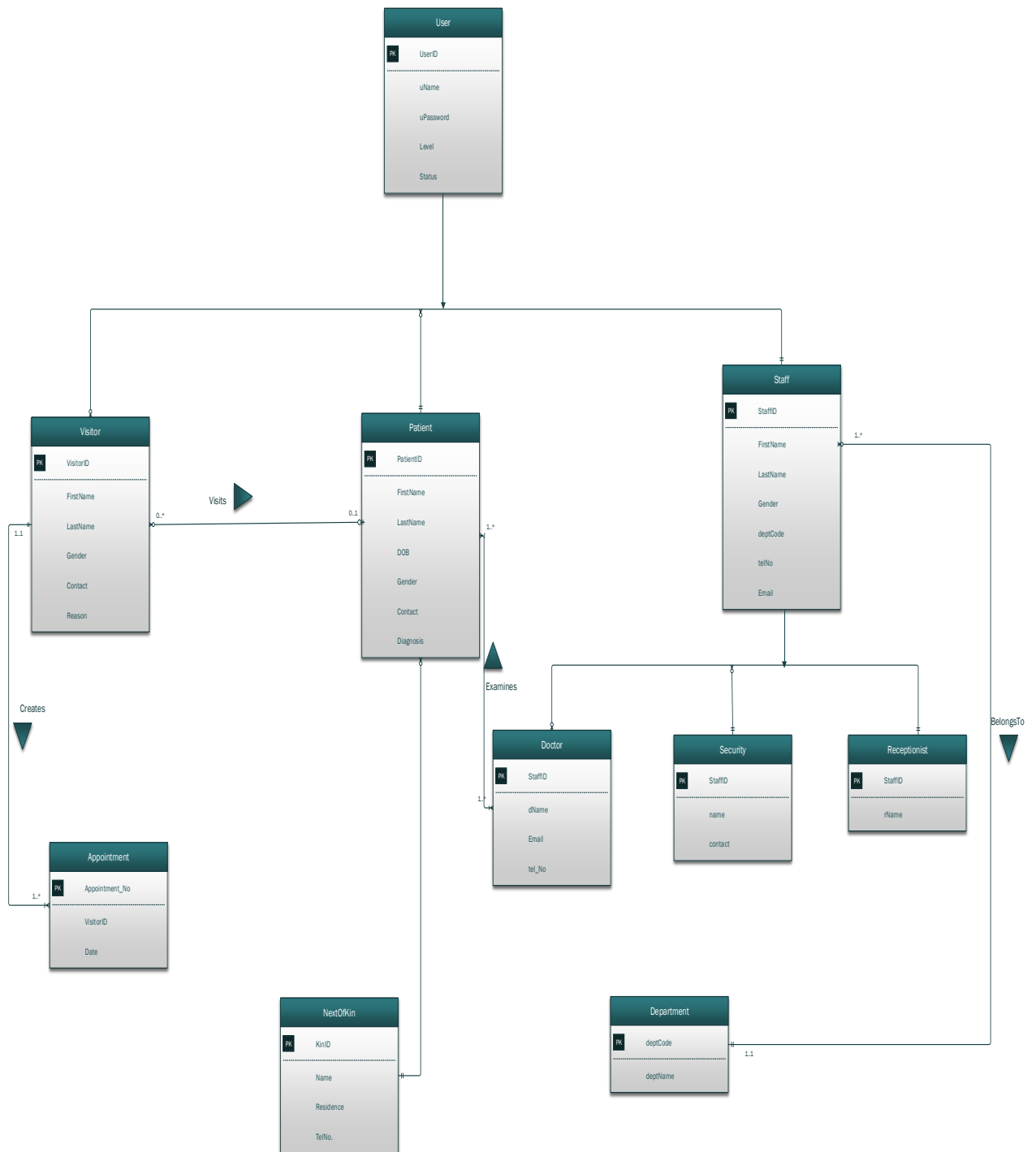
The Use Case Diagram



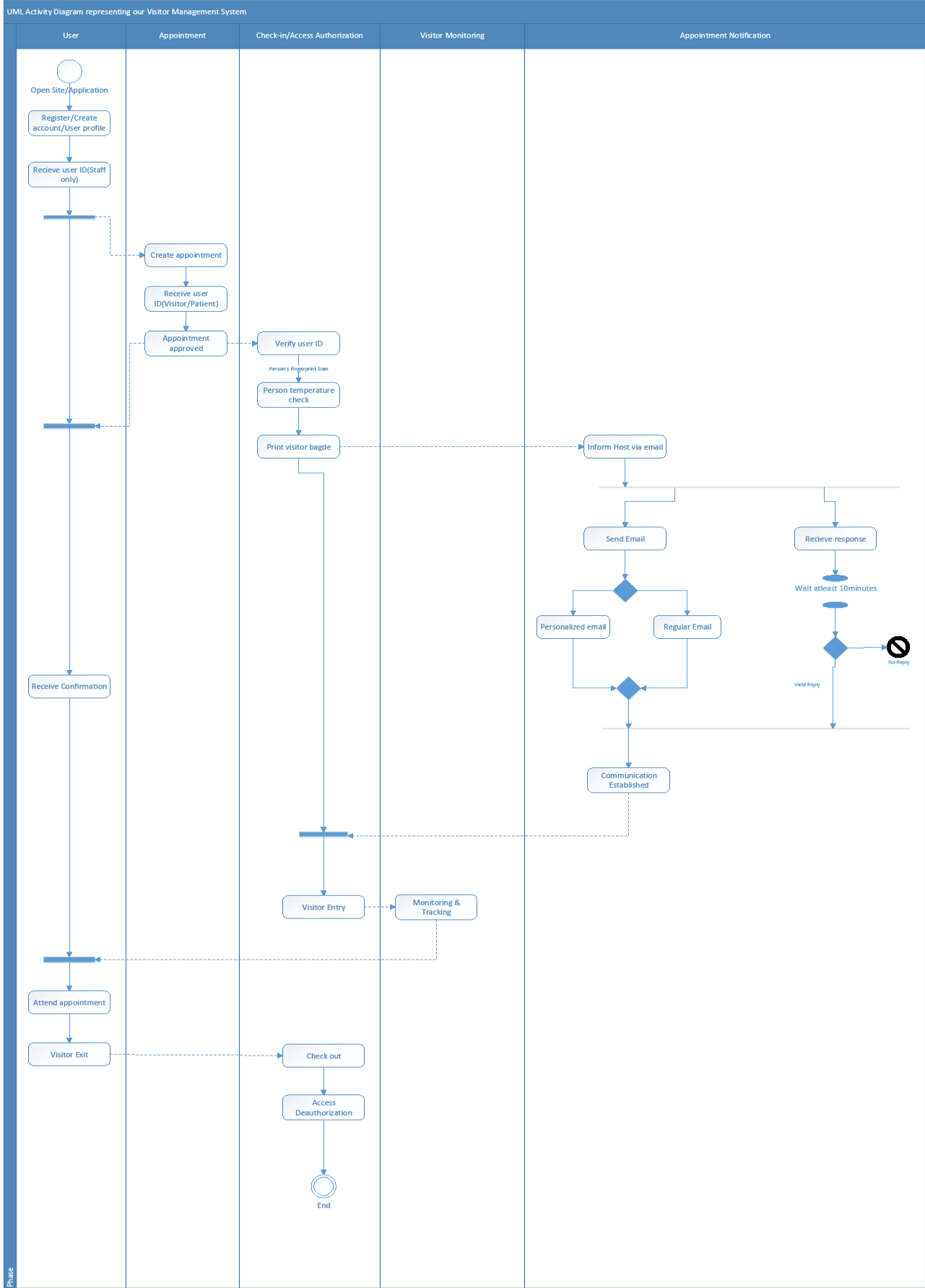
Entity Relationship Diagrams



Entity-Enhanced Relationship Diagram



Sequence Diagram



5.1 Data Outputs

5.1.1 System forms and outputs

Table 1 Showing outputs from the implementation phase and their purpose

Output	Purpose
Android Application Notifications and Reminders Appointments	To be used by all application users, that is, doctors, visitors, receptionists among others
User Manual	Explains how to install and use application
Installation apk	Installed on android operating system
Documentation	Explains design, testing and implementation of system.

5.1.2 System Screenshots

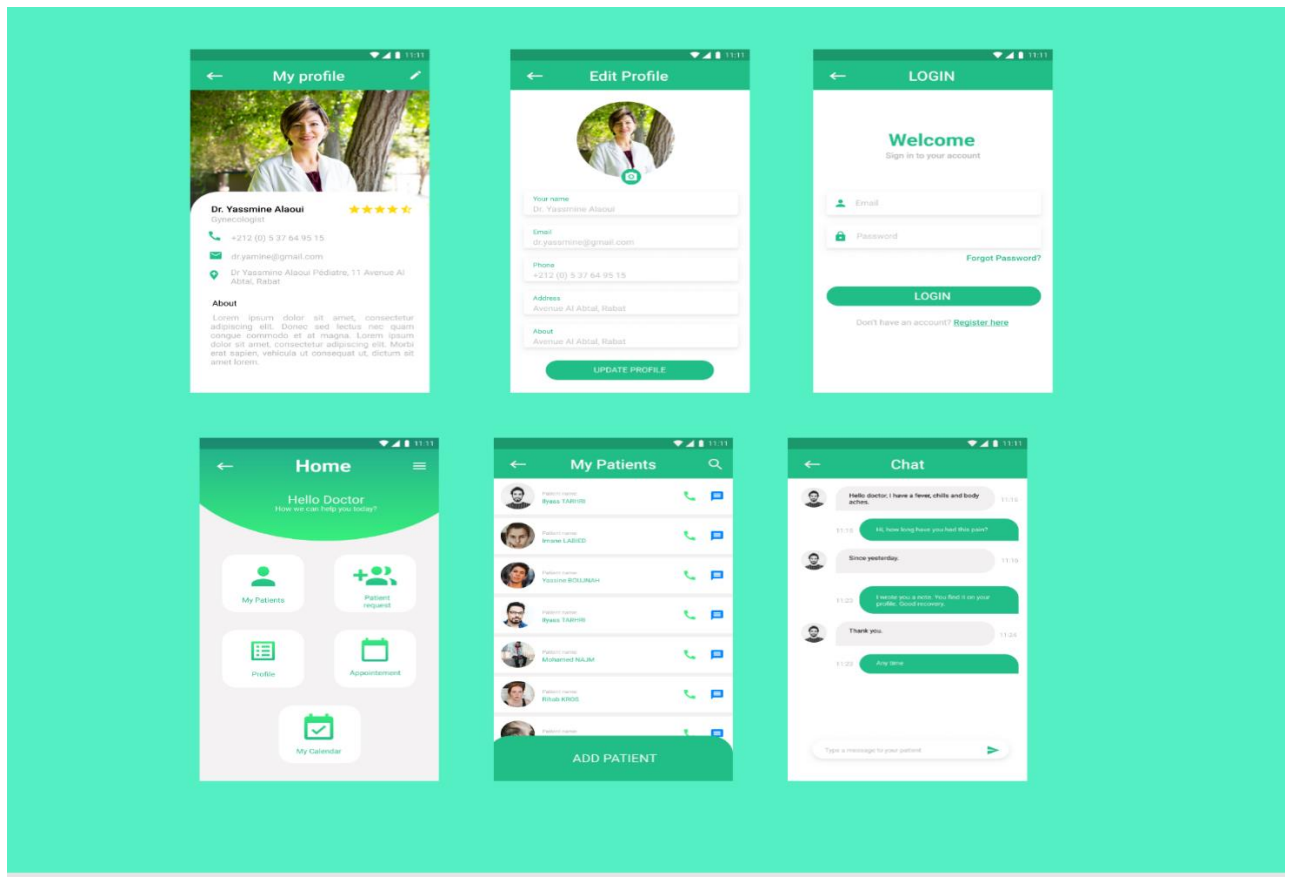


Figure 1 Showing overview of screen images of the application

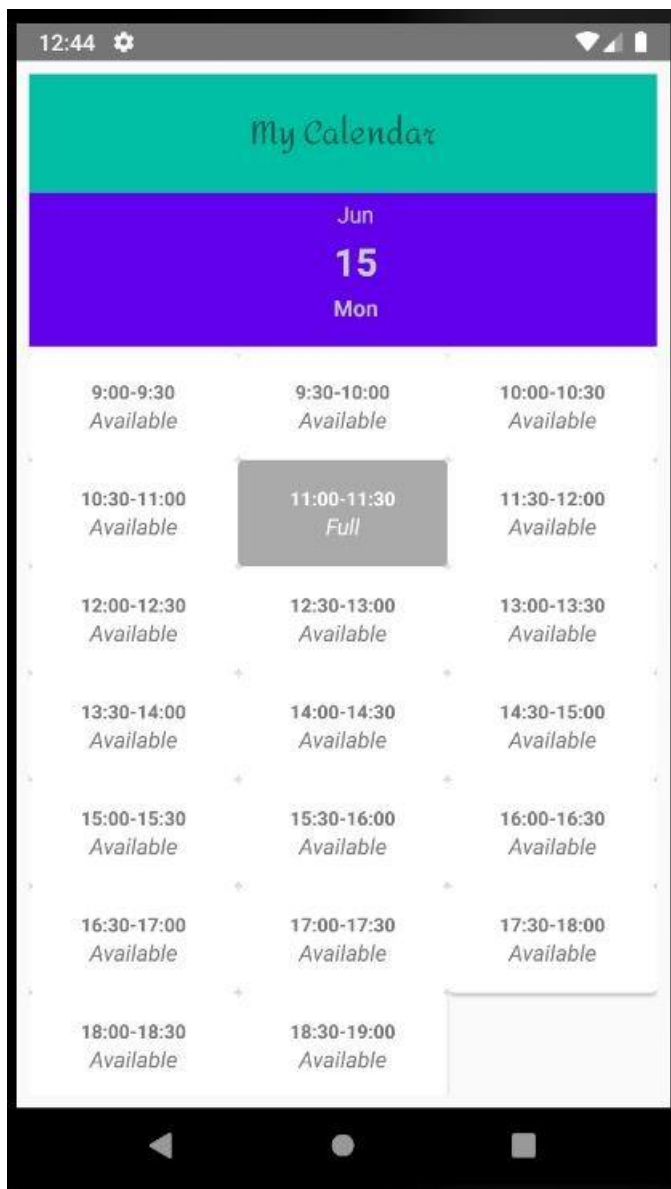


Figure 2 Showing calendar used for booking

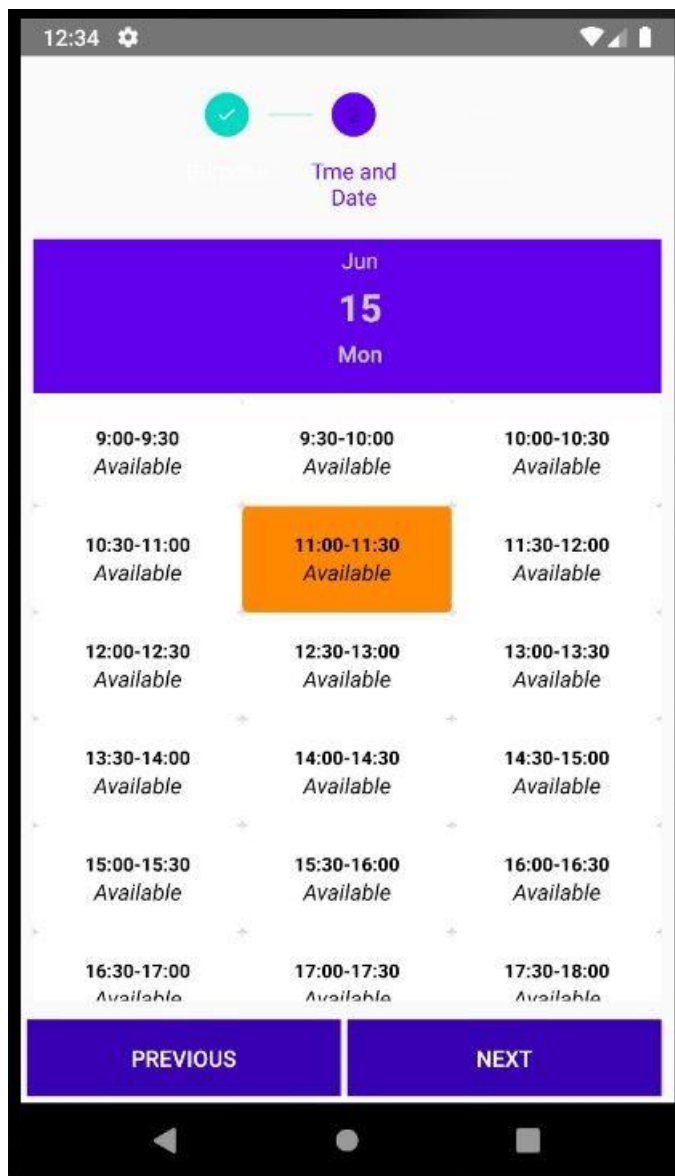


Figure 3 Confirming time of booking

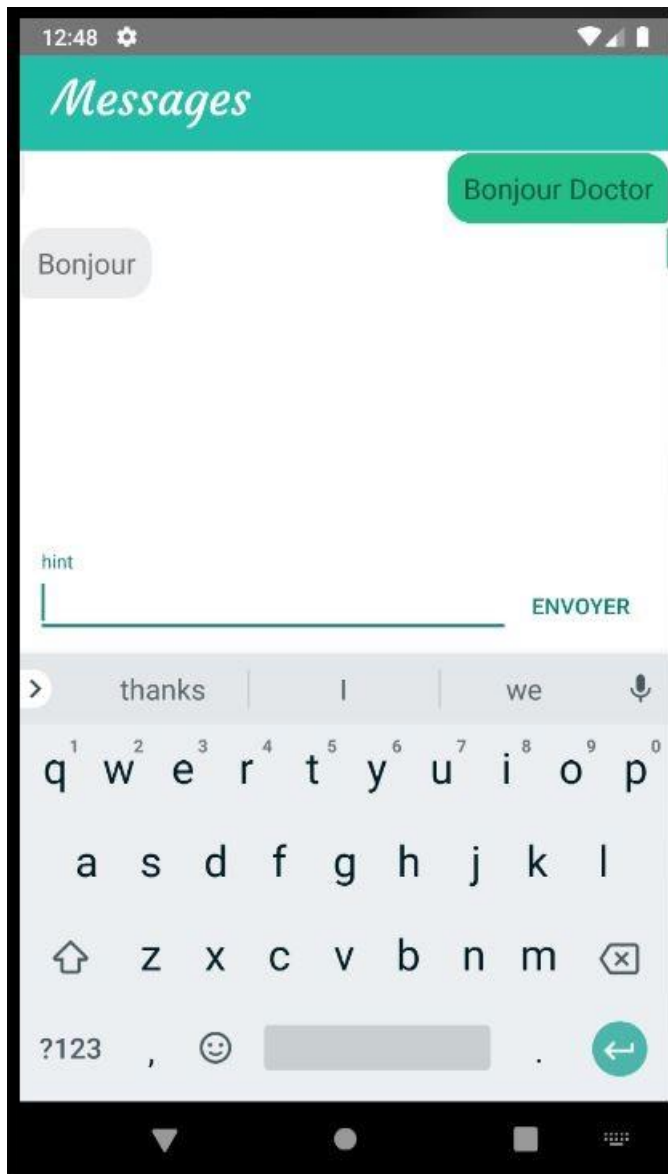


Figure 4 Showing interaction page for users

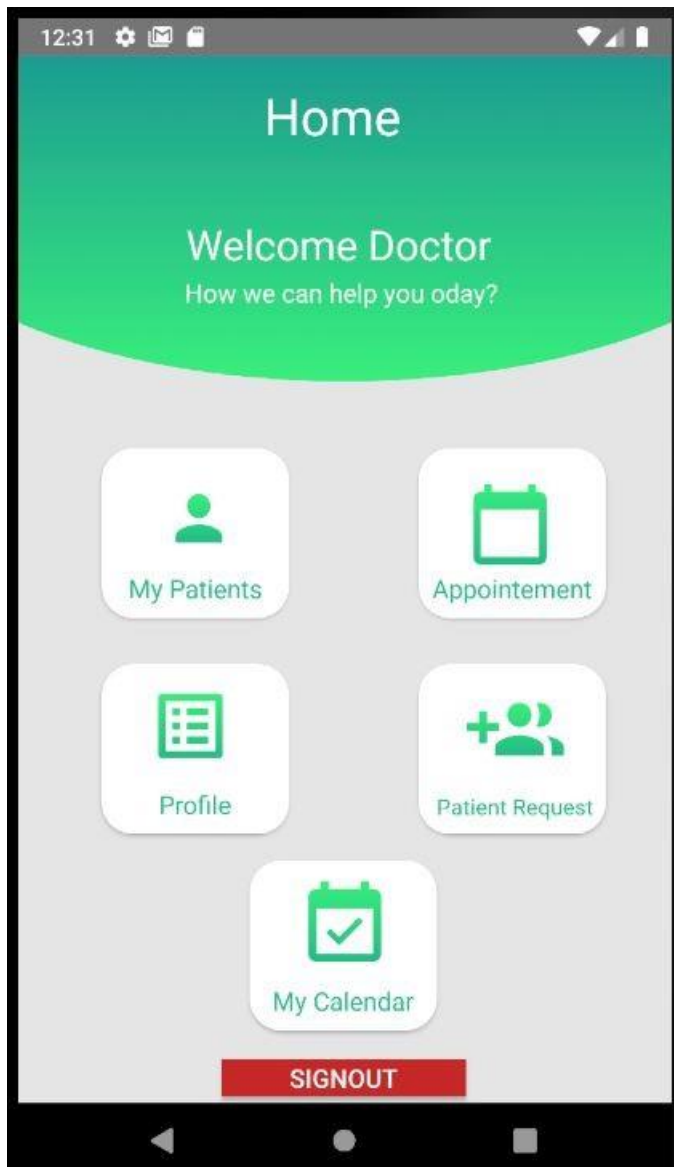


Figure 5 Showing doctor's interface

12:45

Maladie

Description

Traitement

Type de fiche

Consultation

AJOUTER

Figure 6 showing sample appointment booking language using a customized user language

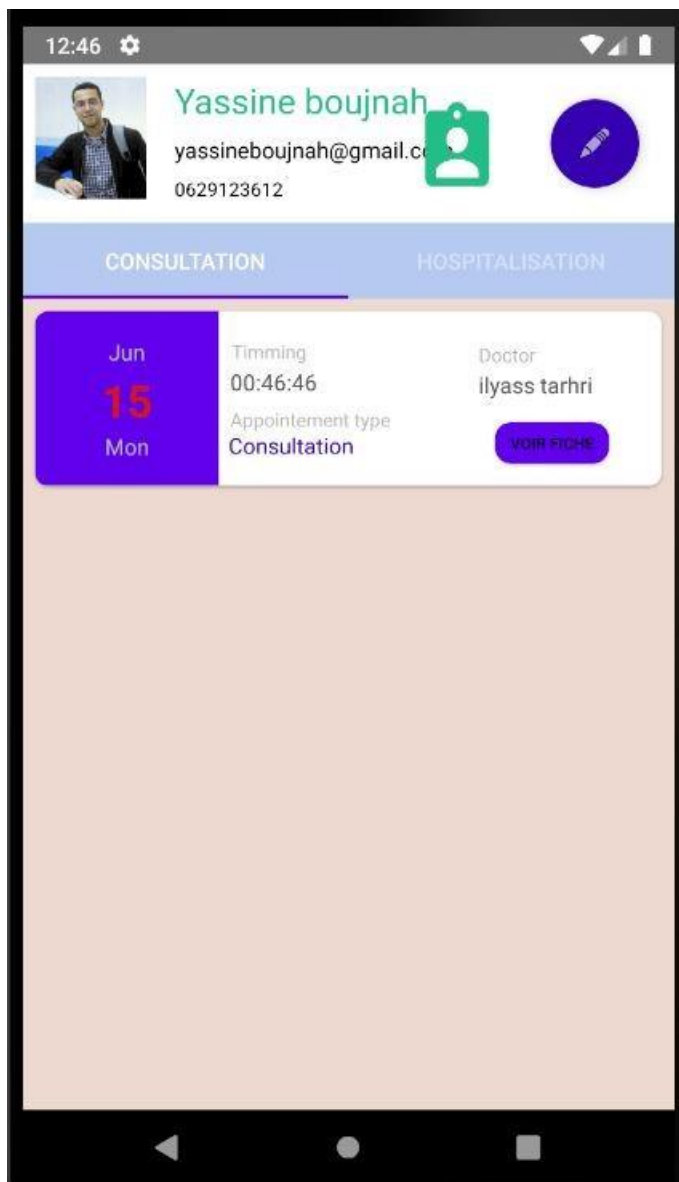


Figure 7 Showing patient appointment details

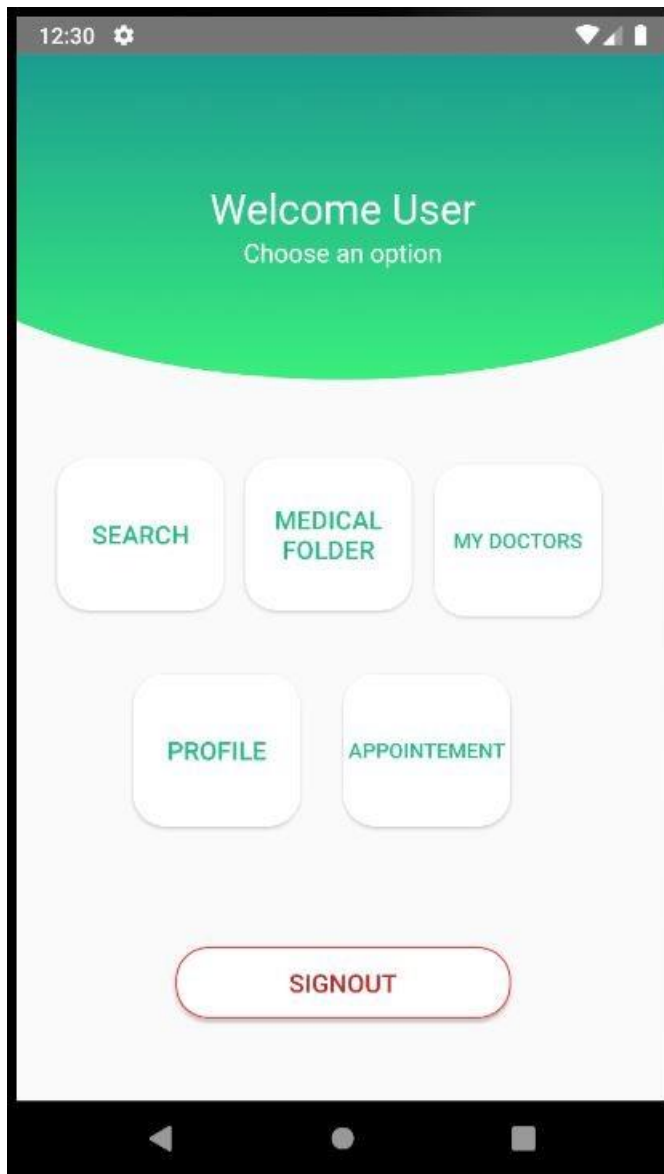


Figure 8 Showing User Dashboard, that is, Patient

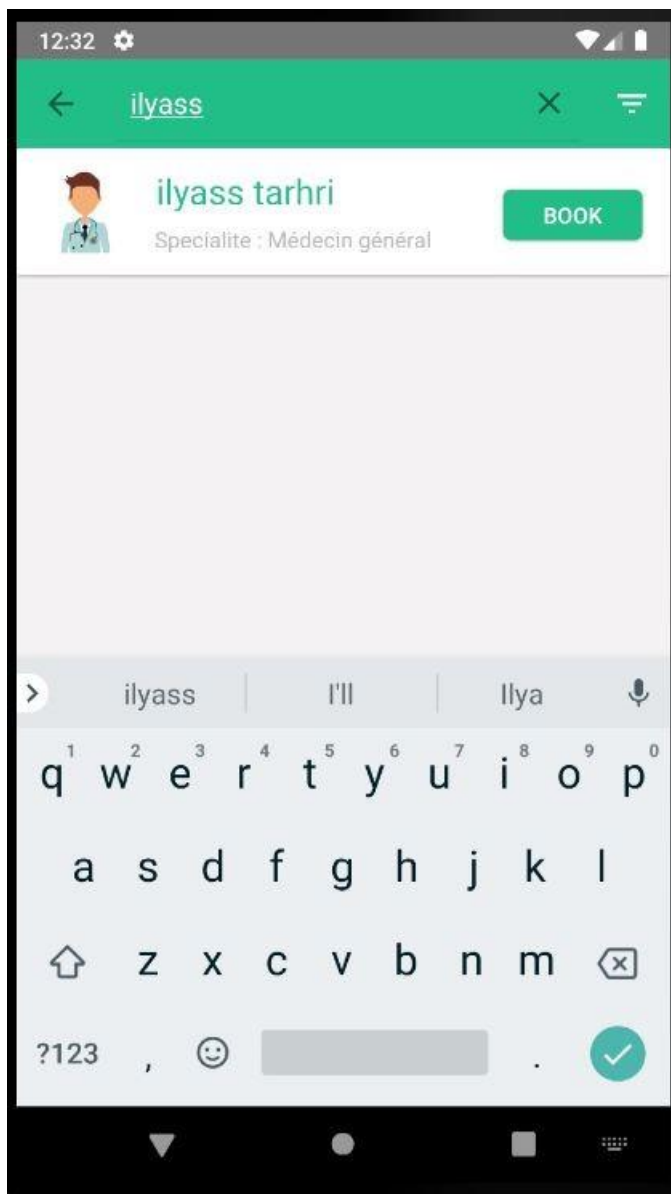


Figure 9 Showing available doctors

5.2 The programming languages used

Table 1 Showing languages used in implementation and their purpose

Language Used	Purpose
XML	For the User Interface displayed to users for navigation and interaction
Java	For application and business logic used
Firebase	For database management

5.3 The Tools

Table 2 Showing tools used during design and implementation of the application

Tool used	Purpose
Draw.io	For user interface mock ups design
Android Studio	IDE for implementation and testing
Google	For research purposes
Third party APIs	For fingerprint recognition and user tracking

5.4. System Testing

5.4.1 Scope and Relevance of tests

The scope and relevancy of tests for the application were done considering coverage, volumes, and system complexity relative to objectives and required operational use, and are as follows:

Coverage: The tests covered the key functionalities and components of the application, including user authentication, session tracking, usability and interface navigation, data input and processing, and notifications. The aim was to ensure that these critical features perform accurately and reliably.

Volumes: The tests considered different scenarios and volumes of data inputs. These included testing the system's ability to detect and recognize various fingerprints, different fingerprint scanners, and increased user and appointments booked without logical errors or scalability downtime. The volume of tests were sufficient to validate the system's performance across a range of usage scenarios, traffic speeds and network.

System Complexity: The tests addressed the complexity of the application, which involved the integration of multiple hardware components and APIs (including firebase, fingerprint recognition). The testing process ensured that the system functions seamlessly and reliably in spite of its complexity.

Relevance to Objectives and Operational Use: The tests directly aligned with the objectives of the application, helping ease monitoring of visitors and a hospital facility. The tests focused on verifying the accuracy, reliability, speed,

and user-friendliness of the system's functionalities, ensuring they meet the requirements of the intended operational use by doctors and hospital clients.

5.4.2 Levels of tests

Unit Testing: Each component was individually tested, these included, signing up, logging in, authentication, booking an appointment, starting a session, ending a session, checking out of the hospital, this was done to validate the functionality of each module and compatibility with the system.

Integration Testing: The integration of hardware and software components were tested to ensure proper communication and functionality. This included testing the interaction between the different user accounts, the interaction between finger print scanners and application among others.

System acceptance Testing: The complete system, including all functionalities specified above, were tested to evaluate the overall performance and user experience. This resulted into an integrated working system.

5.4.3 Types of tests

The types of tests conducted for the application included the following:

Input Tests: These tests focused on validating the system's ability to handle different types of inputs effectively. This includes testing various Date inputs, fingerprints, and GPS coordinates to ensure accurate and reliable response from the system.

Functionality Tests: Functionality tests assessed the performance and correctness of individual system functionalities. This involved testing the visitors', doctors' and check in functionalities to ensure they functioned as intended and met the specified requirements.

Boundary Tests: Boundary tests evaluated the system's behavior at the limits of its operational range. These included testing the system's response to extreme conditions, such low treads fingers, low internet speed, incorrect booking dates, and lower android versions among others.

Performance Tests: Performance tested measure the system's ability to meet performance requirements. This includes evaluating the system's response time for authentications, validations, and GPS navigation accuracy to ensure they meet the specified performance benchmarks.

Usability Tests: Usability tests assessed the system's user-friendliness and ease of use for visually most kinds of users, both the literate and the illiterate. This involved evaluating the effectiveness of icons and buttons given on the UI, the placeholders, time of navigation, error tolerance, learnability of features and the overall user experience during different navigation tasks.

By conducting these various types of tests, the application was thoroughly evaluated in terms of input handling, functionality, boundary conditions, performance, and usability. This comprehensive testing approach ensured that the system meets the needs and expectations of intended users, providing them with a reliable and user-friendly visitation management app.

Table 3 showing summary of steps taken to verify implementation and testing of the application

Topics	Output
Good programming practice	☒ Modularized
	☐ Revision notes (not applicable)
	☒ Encapsulated
	☒ Comments
	☒ Functionally divided
	☒ Meaningful names
	☒ Strictly compiled
	☒ Readable source code
	☒ Well structured

	☒ Fail-safe (handling errors)
Dynamic testing	☒ All statements have been executed at least once
	☒ All functions have been executed at least once
	☒ All case segments have been executed at least once
	☒ All loops have been executed to their boundaries
	☒ Some code parts were not subject to dynamic tests (i.e., comments)

Table 4 Inspection steps for testing the application

Topics	Inspection and performance
Design output	☒ Program coding structure and source code ☒ Evidence of good programming practice ☒ Design verification and documented reviews ☐ Change -control reviews and reports
Documentation	☒ System documentation, flowcharts, etc. ☒ Test results ☒ User manuals, On-line help, Notes, etc. ☐ Contents of user manuals approved
Software development environment	☒ Data integrity ☒ File Storage ☐ Access Rights

	☒ Code protection
--	---

6.0 Chapter Six: Discussion, Recommendations, Future work and Conclusions

6.1 Discussion

In the bid to collect viable information in our research for the design and implementation of our proposed Online Appointment Management System for Mengo Hospital, we had to follow different criteria, in which we identified three states i.e. visitors, patients and staff. We made sure to have the numbers balanced for each stratum as shown in Figure 1; hence coherently acquiring all the suitable information in our requirements gathering and research generally.

Cordially, we used different data collection tools suitably i.e. survey, interviews and questionnaires; through which we were able to eliminate any kind of bias in the information gathered, and ensure its correctness and viability. Nevertheless we found out that the current system at Mengo Hospital to manage visitors is the conventional one or the manual one, which is unreliable and not efficient hence the need for our proposed Online Appointment Management System (OAMS). Through our research, we discovered the major challenges faced at the hospital by each group i.e. visitors and patients, among which are: long waiting hours, security concerns, navigation to rooms. Due to such challenges, our respondents recommended the level of importance of our proposed OAMS as shown in Figure 2; which would ensure an efficient check-in process and eliminate all those challenges.

Consequently, with regards to the challenges faced at the hospital, we asked for suggestions from our respondents on how visitor management at Mengo could be improved and some of their suggestions were; 24/7 surveillance monitoring of the premises, access level granting to ensure security, and pre-registration which would enable creating appointments online, and eliminate the challenge of long waiting hours.

Hence, we ably collected all the suitable information in our research to ensure that our proposed Online Appointment Management System would be implemented in a very feasible and satisfying way to all our stakeholders i.e. rightly serving them

6.2 Limitations

The proposed research encountered several limitations that affected the feasibility and effectiveness of the proposed Online Appointment Management System (OAMS) for Mengo Hospital in Kampala, Uganda. One major limitation was the availability and accuracy of data. The proposed research relies on the availability of inaccurate and irrelevant data on the current manual visitor management system in place, the needs of the hospital and stakeholders, and the ineffectiveness of the OAMS. Another limitation was the inadequate cost and resources required to develop, implement and maintain the system. This research required significant financial and personnel resources to develop, implement and maintain the system, which has been a constraint for some organizations. Additionally, the staff were not very familiar with the system development life cycle (SDLC) model, which affected their ability to effectively use and maintain the VMS. It was important to acknowledge these limitations and take them into consideration while planning and conducting the research.

6.3 Recommendations Future work

As a result of the fact that any Visitor Management System is majorly anchored towards security, it's on this basis that we intend to make our proposed secure contactless Visitor Management System more reliable

security-wise, by implementing a GPS tracking tool which would enable the visibility of the exact location of a visitor within the hospital premises and it would be disabled automatically only when the visitor is at a 10m radius off the hospital premises, thus enabling real-time monitoring.

6.4 Conclusion

With the high importance and necessity of an efficient and effective visitor management system and process, in health institutions most especially; in order to eliminate challenges such as security concerns, health risks arising from pandemics such as Covid-19 and Ebola, and improving generally the visitors' experience. Our proposed Online Appointment Management System will serve a great benefit to Mengo hospital and any other health institution that may adopt it suitably, given the unique features and functions it offers such as real-time monitoring, pre-registration, advanced security features such as encryption, two-factor authentication, finger print scanning and access control to ensure the safety and security of the facility. And nevertheless, this document meticulously provides and justifies the information about the design and implementation of this as a whole project in a very feasible and easy way.

Glossary

A. Key Terms

1. **Visitor Management System:** A software application that helps organizations manage and track visitors who enter their premises. It typically includes features such as visitor registration, check-in, badge printing, and reporting.
2. **Visitor:** A person who enters a building or facility for a specific purpose, such as a meeting, event, or appointment.
3. **Secure:** Refers to the level of protection and safety provided by a system or process. In the context of a Visitor Management System, it means that the system is designed to prevent unauthorized access and protect sensitive information.

4. **Reliable:** Refers to the consistency and accuracy of a system or process. A reliable Visitor Management System should be able to handle a high volume of visitors without errors or downtime.
5. **Contact-less:** Refers to a system or process that does not require physical contact between people or objects. Therefore, it means that visitors can check-in and receive their badges without touching any equipment.
6. **Express:** Refers to a fast and efficient process that saves time and reduces waiting times. This process in our Visitor Management System allows visitors to quickly register and check-in without having to fill out lengthy forms.
6. **Check-in:** The process of registering and recording the arrival of a visitor in a building or facility. In our Visitor Management System, check-in typically involves verifying the visitor's identity, printing a badge, and recording their purpose of visit.
7. **Security:** Refers to the measures taken to protect people, assets, and information from harm or unauthorized access. Security measures may include background checks, ID verification, and access control.
8. **Limitations:** Refers to the restrictions or constraints of a system or process. In our system, limitations may include the number of visitors that can be processed at once, the types of information that can be collected, and the level of customization available.
9. **Visitor Experience:** Refers to the overall impression and satisfaction of a visitor or facility. A good Visitor Management System should enhance the visitor experience by providing a smooth and efficient check-in process.
10. **Monitor:** Refers to the process of observing and tracking activity in a building or facility. It may involve tracking the number of visitors, their movements, and their purpose of visit.
11. **Integrate:** It refers to the ability of a system to connect and communicate with other systems or software. Our visitor management system will be integrated with Mengo Hospital's access control system which would enable it to automatically grant or deny access to visitors based on their check-in status.

12. **Screening:** Screening refers to the process of checking visitors for potential security risks or threats before allowing them access to a facility. This can include background checks, ID verification, and other security measures.
13. **Traditional:** This would imply Traditional visitor management which typically refers to paper-based systems, where visitors sign in on a physical logbook or register. These systems are often manual and can be time-consuming to manage.
14. **Paper-based:** Paper-based visitor management systems rely on physical documents, such as logbooks or visitor badges, to track and manage visitors. Such a system can be less efficient and more prone to errors than digital systems.
15. **Scalable:** Scalability refers to the ability of a visitor management system to grow and adapt to changing needs over time. A scalable system can handle increasing numbers of visitors and locations without sacrificing performance or functionality.

B. Key Concepts

1. **Online Appointment Management System :** This is a software application that is designed to help organizations manage their visitors. It typically includes features such as visitor registration, badge printing, and visitor tracking.
2. **Real-time Monitoring and tracking:** This refers to the ability to monitor and track visitors in real-time. This includes tracking their location within a facility, monitoring their activities, and ensuring that they are following the appropriate protocols.
3. **Visitor Management process:** This refers to the overall process that an organization uses to manage its visitors. This can include everything from pre-registration to check-in to post-visit follow-up.
4. **Scalability:** This refers to the ability of a visitor management system to scale up or down as needed. This is important for organizations that may experience fluctuations in visitor traffic.

5. **Maintainability:** This refers to the ease with which a visitor management system can be maintained and updated. This is important for ensuring that the system remains effective over time.
6. **Integration:** This refers to the ability of a visitor management system to integrate with other systems and applications. This can include integration with access control systems, security cameras, and other tools.
7. **Pre-registration:** This refers to the process of registering visitors before they arrive at a facility. This can help to streamline the check-in process and ensure that visitors are properly screened before they arrive.
8. **Health screening measures:** This refers to the measures the organizations take to screen visitors for potential health risks. This can include temperature checks, health questionnaires, and other screening tools.

REFERENCES

- i. Greetly Digital Receptionist. (2021, October 11). Visitor Management and the Modern Office. Retrieved from <https://www.greetly.com/blog/visitor-management-and-the-modern-office/>
- ii. Centers for Disease Control and Prevention (CDC). (2021). Managing visitors during COVID-19. Retrieved from <https://www.cdc.gov/coronavirus/2019-ncov/community/visitors/index.html>
- iii. Jain, P., Singh, A., & Sharma, P. (2018). Visitor management systems: A critical review. *International Journal of Computer Applications in Technology*, 53(3), 187-193.
- iv. Singh, A., Sharma, P., & Jain, P. (2016). Visitor management systems: An overview. *International Journal of Advanced Research in Computer Science and Software Engineering*, 6(9), 832-836.
- v. Mengo Hospital. (2023). Patient Privacy. Retrieved from <https://mengohospital.org/patientprivacy/>
- vi. Almomani and A. Alsarheed, "Enhancing outpatient clinics management software by reducing patients' waiting time," *Journal of infection and public health*, vol. 9, no. 6, pp. 734–743, 2016.
- vii. Onyefulu, C. , Gyles, M. and Meade, L. (2018) Users' Views on the Online Appointment System and Services Rendered at the Health Centre of the University of Technology, Jamaica.
- viii. Hospital Appointment Scheduling Software Application; Docplus.com (<https://docpulse.com/products/hospital-appointment-scheduling-software/>)

- ix. Magellan Solutions; Article: The Wonders Of Appointment Setting And What It Can Do For Your Business
- x. Commusoft February 15, 2023
<https://www.commusoft.co.uk/blog/online-appointment-system-benefits/>
- xi. Qmatic Appointment Management Solutions
(<https://www.qmatic.com/blog/appointment-systems-in-hospitals>)
(<https://www.qmatic.com/solutions/online-appointment-booking/>)

APPENDICES

Appendix A: Interview Guide

Introduction:

Hello, my name is [Name], and I am a third-year student of Bachelors in Information Systems and Technology at Makerere University. I am conducting this interview as part of a research project on visitor management systems, with a focus on implementing an Online Appointment Management System (OAMS) for Mengo Hospital in Kampala, Uganda. The purpose of this interview is to gather information on the requirements of the proposed VMS, the current manual visitor management system in place, and the needs of the hospital and stakeholders. Your participation in this interview is greatly appreciated and will be used to improve the safety, security, and efficiency of the facility, as well as the visitor experience. The interview will take approximately 15 minutes to complete. Your responses will be kept confidential and anonymous.

Interview Questions:

1. What is your current role at Mengo Hospital?
2. How often do you visit Mengo Hospital?
3. Can you describe the current appointment management system in place at Mengo Hospital?
4. What limitations and challenges do you experience with the current manual visitors' appointment management system?
5. In your opinion, what should an Online Appointment management system include?

6. How do you think an Online Appointment Management System would improve the safety, security, and efficiency of the facility, as well as the visitor experience?
7. How do you think the staff and visitors at Mengo Hospital would adapt to a new visitors' appointment management system?
8. How important do you think it is to have an online appointment management system in place at Mengo Hospital?
9. Do you have any suggestions for improving the visitor management system at Mengo Hospital?
10. Are there any concerns or reservations you have about implementing a new appointment management system at Mengo Hospital?

Conclusion:

Thank you very much for taking the time to participate in this interview. Your input is greatly appreciated and will be used to improve the appointment management system at Mengo Hospital. If you have any further comments or suggestions, please do not hesitate to contact me. Thank you again

Appendix B:

QUESTIONNAIRE

Introduction:

The purpose of this survey is to gather information on the requirements of the proposed online appointment management system (OAMS) for Mengo Hospital in Kampala, Uganda, the current appointment management system in place, and the needs of the hospital and stakeholders. Your participation in this survey is greatly appreciated and will be used to improve the safety, security, and efficiency of the facility, as well as the visitor experience. The survey will take approximately 10 minutes to complete. Your responses will be kept confidential and anonymous.

1. What is your current role at Mengo Hospital?
 - a) Staff
 - b) Patient
 - c) Visitor
2. How often do you visit Mengo Hospital?
 - a) Daily
 - b) Weekly
 - c) Monthly
 - d) Rarely
3. How do you currently check in at Mengo Hospital?

- a) Manual sign-in book
 - b) Electronic system
 - c) Other (please specify) _____
4. How satisfied are you with the current appointment management system at Mengo Hospital?
- a) Very satisfied
 - b) Satisfied
 - c) Neutral
 - d) Dissatisfied
 - e) Very dissatisfied
5. What challenges have you experienced with the current appointment management system at Mengo Hospital? (Please check all that apply)
- a) Long wait times
 - b) Inaccurate visitor information
 - c) Lack of security measures
 - d) Difficult to track visitors
 - e) Other (please specify) _____
6. What requirements do you think an online appointment management system should have? (Please check all that apply)
- a) Pre-registration of visitors
 - b) Express check-in
 - c) Interactive mapping
 - d) Customized access levels
 - e) 24/7 building security
 - f) Other (please specify) _____
7. How important do you think an online appointment management system would be for Mengo Hospital?
- a) Very important
 - b) Important
 - c) Neutral
 - d) Not important
 - e) Not at all important
8. How confident are you in using a new online appointment management system?

-
- This image shows a full page of white paper with horizontal blue or grey ruling lines. The lines are evenly spaced and run across the width of the page, providing a template for handwriting practice. There are no margins, text, or other markings on the page.

Introduction Letter

56

functional requirements, it was suitable for us to visit Mengo Hospital and interact with the various respective stakeholders. Thus, we had to obtain an introduction letter from our University which we used for authorization purposes.

MAKERERE

P. O. Box 7062 Kampala Uganda
URL: www.cit.mak.ac.ug
URL: <http://www.cis.mak.ac.ug>



UNIVERSITY

Tel: +256-41-540628/534
Fax: +256-41-540 620
Twitter: @coeismak
Facebook: www.facebook.com/coeismak

SCHOOL OF COMPUTING & INFORMATICS TECHNOLOGY

DEPARTMENT OF INFORMATION SYSTEMS

3rd May, 2023

The Director
Mengo Hospital
Kampala

Dear Dr. Rose Mutumba,

RECOMMENDATION/INTRODUCTION LETTER

This is to introduce to you five undergraduate students taking a Bachelor of Information Systems and Technology (BIST) Course at the College of Computing and Information Sciences who are requesting to carry out research titled "A Secure Contactless Visitor Management System for Mengo Hospital" for their final year project in your Unit.

1. Balinonye Trevor Mark, 20/U/3464/Ps
2. Aryet David, 20/U/3469/Ps
3. Makiika Mulongo Sarah, 20/U/3432/Ps
4. Munyagwe Edgar, 19/U/19117/Ps
5. Natosha Sarah, 20/U/22615

The final year project is a pre-requisite for completing their university undergraduate degree. It is envisaged that the research undertaken will contribute positively towards their studies and the development of your unit. The research will be supervised by Dr. Ruth Mutebi Mbabazi, a Lecturer at the School of Computing and Informatics Technology.

Your positive assistance will be appreciated.

Sincerely,

Agnes Rwashana Semwanga (PhD)
Associate Professor
asemwanga@cit.ac.ug

c.c. Administrator, Mengo Hospital