DECLARATION

I, Kalinganire Ishimwe Alpha Michelange, with Registration **N^{o} 22129**, a student at Adventist University of Central Africa in Faculty of Information Technology, Department of Networks and Communication System hereby declare that this research project is entirely the real reflection of my own original work and experience to the best of my knowledge.

Kalinganire Ishimwe Alpha Michelange

Signature ……

Date: ……...

APPROVAL

I, NIYODUSENGA Jean Pierre, hereby certify that this project report has been done under my supervision and submitted with my approval.

Signature ……

Date: ……...

DEDICATION

To the Almighty God,

To my lovely family especially my parents,

To all my friends and relatives,

To my supervisor for his guidance,

I dedicate this work.

ABTRACT

Adventist University of Central Africa

Research Project for Bachelor Degree of science in Information Technology

Major in Networks and Communication System

Title: Child right system

Name of the researcher: Kalinganire Ishimwe Alpha Michelange

Name of faculty Advisor: Mr. Jean Pierre NIYODUSENGA

Date Completed:

Child right system is a web application that is used to perform all of the actions required to monitoring child rights abuse cases and reports from local government by helps of inshuti z'umuryango. This application addresses all of the issues in decision making that may arise in an efficient of management daily data.

This project is to design, a computerized existing method and implement a Child rights system that will help National child Development Agency (NCDA), inshuti z'umuryango(IZU), Welfare Services, health authorities, Isange One-Stop Center and local authorities and government partners to follow-up by gathering information from IZU, and tracing information from different level of government.

Different tools were used in preliminary data analysis, design and development of the new system: UML was used for analysis, MySQL used for database building and framework used to develop the system, JavaScript and CSS, Material UI; ReactJs were used for the responsiveness and design respectively. Furthermore, methods such as interviews and documentations were used in order to gather data leading to conceptualization of the problem, and to gather information to build the system.

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LIST OF ABBREVIATIONS

MIGEPROF	Ministry of gender and family promotion
CRC	Convention on the Rights of the Child
NCDA	National Child Development Agency
IZU	inshuti z'umuryango
CSS	Cascading Style Sheet
DBMS	Database Management System
HTML	Hyper Text Markup Language
ICT	Information Communication Technology
IT	Information Technology
UML	Unified Modeling Language
UN	United Nations

ACKNOWLEDGEMENT

I offer special thanks to Almighty God who blessed me with His grace and blessings throughout my life, and from whom knowledge comes.

I express my sincere gratitude to **Mr. NIYODUSENGA Jean Pierre** for having accepted to supervise this project despite his enormous responsibilities. His guidance, patience and a great number of counseling provided to the successful completion of this work.

I genuinely offer my recognition's to the academic staff of the department of Information Technology and the whole Administration at large at the Adventist University of Central Africa for the work done during my stay at the University, the knowledge that I acquired helped me to conduct this work, and I take this opportunity to thank the whole AUCA staffs.

I am also very grateful to my parents, relatives, different families and friends deserve praise for the pain and sacrifices endured during my education. I would not forget to appreciate the company and friendship from my classmate especially those who contributed to the completion of this work.

May God bless you all!

CHAPTER 1

GENERAL INTRODUCTION

Introduction

Nothing is more important than children's welfare. Parents and carers have the primary responsibility for their children. However, local authorities, working with partner organizations and agencies, have specific duties to safeguard and protect the welfare of all the children in their area and everyone who comes into contact with children has a role to play. Human rights are the basic rights and freedoms that belong to every person in the world, from its birth up to his/her death. The respect for human rights and fundamental freedoms lie at the heart of all aims and objectives of the United Nations (UN) and is one of the central purposes of the UN. While Children's rights are the human rights of children with particular attention to the rights of special protection and care afforded to minors. Based on 1989 Convention on the Rights of the Child (CRC), a child is person below the age of eighteen years, unless under the law applicable to the child, majority is attained earlier. The CRC is the first legally binding international instrument to incorporate the full range of human rights including civil, cultural, economical, political and social rights as the children are the roots of human being and a foundation of any country's development. This has been the motivation for majority of the organizations to promote child rights in various areas. However, in most societies, the child rights are still violated. For the case of Rwanda, child rights have been abused due to many reasons including family conflicts, poverty, ignorance drugs abuse, etc. This situation left most of Rwandan children without care from their parents, trauma, poverty and hunger, school dropout, lack of medical care, child labor, etc.

Background to the Study

Information and communication technology is central engine to driving Rwanda's transformation into a knowledge-base economy, Rwanda continues to be one of the fastest-growing African countries in ICT and there are several avenues for growth for the ICT sector from e-commerce and e-services, mobile technologies. Rwanda through the ministry of gender and family promotion (MIGEPROF) collaborates with the National Commission of children (NCC), the National Child Development Agency (NCDA), and government partners; they established Inshuti z'umuryango (Friends of the Family). Inshuti z'umuryango are community-based child and family protection volunteers, with two placed in every village

across the country. Family conflicts have negative effects on all family members, especially children who are more likely to face emotional problems like depression. That's why I come up with the idea of developing a system, which will be used by different levels of government and their partners with the help of Inshuti z'umuryango to strengthen the child protection, tracing, and monitoring of the level of child rights in Rwanda community.

Statement of the Problem

IZU during reports using paper and it took too long in the processing stage, and are not able to get feedback from different cases in the village, and also they are not able to trace those reports until they reach their destination for providing comfort messages to those families faced the problem, those weakness leading them to leave some cases. Some families avoid them because they are not able to tell them more information about their reported case, and they are not able to know how they contribute to the community for set different goals. Those problems lead to failing to provide justice and protect those children.

Objectives of the Study

The objective of the Child rights system is to design, a computerized existing method and implement a Child rights system that will help National child Development Agency (NCDA), IZU, Welfare Services, health authorities, Isange One-Stop Center and local authorities and government partners to follow up by gathering information from IZU, and tracing information at each process stage from different level of government.

Specific Objectives

- To analyze problems within the existing system and build up an improved system.
- To design a database where information regarding the system will be stored.
- To create a system that will be secure so that only authorized people will be granted access.
- To create a friendly and easy statically to use system.

Scope of the project

This research will be limited to the design and development of a web application prototype correcting child abuse cases; will help IZU to record cases by using their smart phones and computers. System will interpret information in statistically, and is able to provide hourly

report based on live statistic, information, able to show status, number, agent, location of cases.

Methodology and Techniques used in the Study

Methodology is the process used to collect information and data for the purpose of making decisions. The methodology may include publication research, questionnaires, surveys and other research techniques and could include both present and historical information. The following are techniques and methods used in conducting this research

Data collection

The satisfactory result obtained is motivated by the good choice of methods and techniques used for the collection of data. For making that in this project, we are going to explain methods and techniques used to observe the reality of the current system and to reach fixed Objectives. During this research we used interviews and observation in order to collect needed data and carry out proper documentation.

Interview

It is defined as systematic conversation between an investigator (interviewer) and an informant (interviewee), initiated for obtaining information relevant to a specific study. This technique was used while conducting this research to come up with an effective, real, clear work and well working system. This technique was used by interviewing members of child right agency, IZU about any means they use when it comes to record, interpret, report child right cases and how exactly do they do it.

Observation

This is the act of watching processes being performed. It is a powerful tool to gain insight into the as-is system, and to check the validity of information gathered from other source. This technique is used to observation existing working environment and process, and to build web app will help much better to reach the objective of child right.

Significance of the project

By here we will briefly get into the importance of implementing this system and indicate ways in which it will be achieved. This will also indicate the services that will be offered to both the public and authorities (government) in general:

- User should be able to record, list, and display statistically all cases.
- The system should be able to list, display, export, control over all user to authorized user (Admin).
- System will provide status information of all Cases.
- The system will facilitate to retrieve information from the database.
- The system will have a database that contains all the information about the cases.
- The system will be able to provide live information about cases and activities.
- The system will be allowing users to export report.
- System will proved help on different topics to make easy user to make daily information.

The Structure of the Work

This study contains five chapters:

Chapter One: will provide the general description of the work, it includes introduction, background of the study, problem statement, project objectives, methods and techniques of the study, delimitation, expected results and organization of the report.

Chapter Two: will emphasize on the analysis of the existing system, profoundly find their issues and arrangements proposed on those issues. This chapter will also describe the environment in which the new system will be implemented.

Chapter Three: entitled Analysis and Design of the new System is the logical conception of the new system. It will represent the conceptual framework of the solutions proposed to solve the problems of the existing system.

Chapter Four: will highlight the technical aspect of the application and the interpretation of the results, where I will explain the new system focusing on how the application that have been conceived, as well as all the technologies used to build the application.

Chapter five: will conclude our project as well as recommendations for future development.

CHAPTER 2

ANALYSIS OF EXISTING SYSTEM

Introduction

System analysis is the process of studying procedure or business in order to identify its goals and purposes and create systems and procedures that will be achieve them in an efficient way. Digging deeply about the existing system will help to clearly understand the failures of the existing system because knowing every single detail of the existing system is very important to the development of the new one, that's why we are going to study the existing system and analyze it. Following that, we will determine whether the suggested system is desired or not and whether the current system needs to be improved.

ICT is a force that has changed many aspects of the way we live. Information and Communication Technologies consist of the hardware, software, networking, and media for collection, storage, processing, transmission and presentation of information (voice, data, text, images), as well as related services.

ICT can be divided into two components, Information and Communication Infrastructure (ICI) which refers to physical telecommunications systems and networks (cellular, broadcast, cable, satellite, postal) and the services that utilize those (Internet, voice, mail, radio, and television), and Information Technology (IT) that refers to the hardware and software of information collection, storage, Processing, and presentation.

This paper is concerned with the organization, monitoring of information, in the form of documents, and statistic for efficient storage and retrieval. By documents we mean books, technical reports, articles, memorandum, letters, photographs, data facts, etc. All forms of memory file organization ranging from documents in a library to data in a real-time command-and-control system.

Internet intermediaries – Internet service providers (ISPs), hosting providers, search engines, e-commerce intermediaries, Internet payment systems and Web platforms – provide essential tools that enable the Internet to drive economic, social and political development, for example by facilitating aggregation of demand, new models of collaboration, citizen journalism and civic participation. Yet intermediary platforms can also be misused for

harmful or illegal purposes, such as the dissemination of security threats, fraud, infringement of intellectual property rights, or the distribution of illegal content.

The technology innovation combined with the information needs of the organization is fulfilled by the use of a management information system (MIS). It integrates the information, which supports the functioning of the business, its management, and abilities for decision making. Information integration across the supply chain enables the network to respond quickly to continuously changing customer demand (Alan, 2005).

Description of the existing system

Historical Background

IZU (Friends of the Family) are community-based child volunteers, with two placed in every village across the country. This nationwide cadre of 29,674 volunteers was established in 2016 by the MIGEPROF through the NCDA, in collaboration with government partners including UNICEF to strengthen the child protection system in communities.

In this initiative, UNICEF provides technical and financial support towards the initiative, the establishment and capacity building efforts are led by NCDA. Based on their good reputation in the community, one male and one female IZU are nominated by residents in every village and usually work as a pair in supporting children.

This community workforce pillar of the child protection system responds to the everyday needs of Rwandan children. Through household visits, IZU identify and handle child protection concerns that may come up. For cases requiring statutory intervention, they refer to suitable social services and law enforcement professionals including District Child Protection and Welfare Services, Rwanda Investigation Bureau, Rwanda National Police, health authorities, Isange One Stop Center and local authorities.

To do they work, IZU spend some time moving from home to home in our respective villages. This helps IZU to identify and discuss child rights violations with family members, identify children and families at risk of separation and react accordingly.

IZU help to reduce family conflicts as well as violence, child abuse, neglect, exploitation and all other forms of child maltreatment in communities across the country. (ncda, 2020)

Mission

To foster the development of a child, the promotion and the protection of his or her rights.

Vision

To foster the development of a child, the promotion and the protection of his or her rights.

Creating a conducive environment for the family stability, gender equality and child protection towards sustainable development.

Description of the existing system

IZU during reports using paper and pen which took longer in the processing stage, to upstage leaders and they are not able to get feedback over different cases, also they are not able to know the status of those reports, and they are not able to know how they contribute to the community for set different goals. Those weaknesses leading them to leave some cases. Some families avoid them because they are not able to tell them more information about their reported case, those problems lead to failure to provide justice and protect those children.

Analysis of the existing System

IZUs spend some time moving from home to home in our respective villages. This helps them to identify and discuss child rights violations with family members, identify children with different problems, and also people call them when they face problems in the family or anywhere else, then they record all problems they find in the family or in the village on paper with pin they do report every week of those problems and send it to the sector. From sector to district until to the NCDA or another private sector like Lawyers of hope, UNICEF all those reports are the ones used to take measures and solutions.

Problems of the Existing System

After taking time to analyze the existing system, they are some frailties I found with it. Those frailties are listed below:

Time waste and resources

IZUs waste time and resources by writing report on paper and submit it on sector.

Data loss

During Weekly report IZUs can miss some point in those reports or any accidental can happen to those written report.

Information in decision making

During Decision making based on last 3 months ago because other reports are still in process.

Status of Casing

IZU does not direct know status of some cases.

Hard to control IZUs

All member of IZUs it hard to control flow of their contribution.

There is a risk of human error

When typed on excel sheets or word documents, there is always a risk of human error. They may forget or type errors for some important information during the monthly or weekly report.

Too much paper work

Because IZUs must hand written document for every cases and weekly report, thereof it isn't easy to control their reports.

Modeling of the existing System

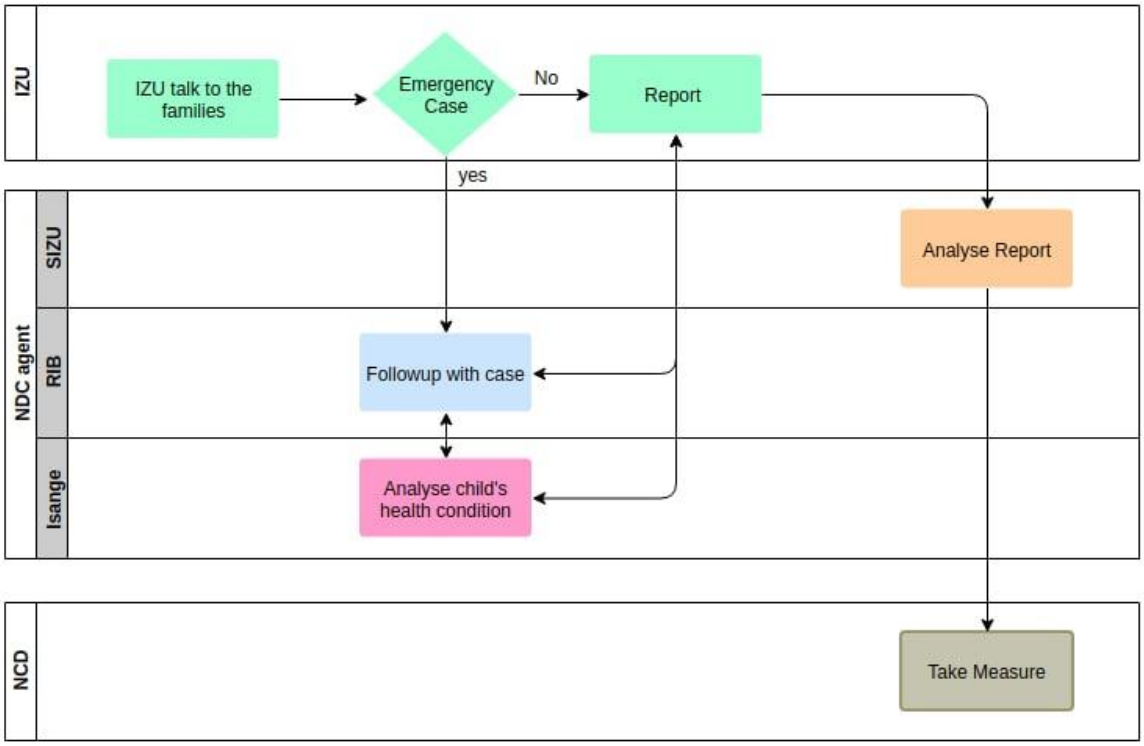


Figure 1 Model of the Existing System

Requirement Specifications

Norms that is both functional and non-functional. A list of characteristics that the system must have in order to function is included in the requirement specification activity. A non-functional requirement is a restriction on how the system can operate that is not directly related to one of the functions the system must serve. A functional requirement specifies a function that the system must support.

Functional Requirements

Functional requirements may be calculations, technical details, data manipulation and processing and other specific functionality that define what a system is supposed to accomplish.

The IZU on cell level has the ability to

Create account and Login

View a list of his/her respective cell's cases

View a list of his/her respective cell's reports

View a list of his/her respective cell's children

View a list of his/her respective cell's suspect

View a list of his/her respective cell's performance statistics

Submit new case

Submit new report

Print report

Logout

The IZU on Sector has the ability to

Create account and Login/ Logout

Validate account's IZU

View a list of his/her respective Sector's cases

View a list of his/her respective Sector's reports

View a list of his/her respective Sector's children

View a list of his/her respective Sector's suspect

View a list of his/her respective Sector's IZUs

View a list of his/her respective Sector's performance statistics

Submit new case

Create new report

Print report

Logout

The Admin has the ability to

Login and Create account

Register New IZU

Create, approve, delete and inactive account's accounts

Print reports and view report

View statistics of finalized information

View a list all of all IZUs (users)

Non-Functional Requirements

A non-functional requirement is a requirement that specifies criteria

That can be used to judge the operation of a system, such as performance, speed, cultural related, politics, etc.

- **Usability**
  - The system interface should provide user with access to all relevant use cases with the fewest number of mouse clicks and key strokes.
- **Reliability**
  - The system should function correctly even if a user inputs invalid entry into registration form and allow him/her to reentry the valid data.
  - The system should not lose registered information through the use of persistent Storage and regular backup.
- **Performance**
  - The system report should always display the correct output to the user.
  - Initially, the system can support at least 1000 users and be able to store maximum data depending on the storage device. Over time should seek to increase these numbers ten times or more.
- **Security**
  - Other users or unauthorized users should not have access to or be able to edit user's account details or registered entries

CHAPTER 3

REQUIREMENTS ANALYSIS AND DESIGN OF THE SYSTEM

Introduction

Research methodology is the way of collecting data for the research project and it is a detailed description of selected methodology, Step-by-step methods of how the researcher intends to achieve the stated objectives of the research. This chapter explains methods we used to collect data during research and software development techniques used to develop this system. It attempts to indicate the source of data, and the methods and techniques used to collect data that was analyzed and interpreted to develop such project.

Design overview

The purpose of the design phase is to plan a solution of the problem specified by the requirement document. This phase is the first step in moving from the problem domain to the solution domain. The design of a system is a critical factor affecting the quality of the software, and has a major impact on the later phases, particularly testing and maintenance. The output of this phase is the design document. This document is similar to a blueprint or plan for the solution, and is used later during implementation, testing and maintenance.

System development can generally be thought of as having two major components:

* System Analysis
* System Design

Systems analysis it entails gathering, organizing, and evaluating information about a system and the environment in which it operates. The goal of system analysis is to examine all aspects of the system in order to create a foundation for designing and implementing a better system.

System design:

The process of establishing the system's architecture, components, modules, interfaces, and data to satisfy particular requirements is known as system design in the context of software development. In order to address the needs of users who are dissatisfied with the current system, the system design is based on an analysis of the current system and the changes that are required. Specifications that outline the function and operation of the suggested system are the end result of this phase. (Uhlhorn, 2010)

Unified Modeling Language

Is a standardized modeling language made up of a collection of integrated diagrams that was created to aid system and software developers in defining, visualizing, creating, and documenting the artifacts of software systems.

The UML is a collection of best engineering practices that have been successful in simulating big, complicated systems. The process of creating object-oriented software and the UML are both crucial components. To express the design of software projects, the UML primarily uses graphical notations. Exploring potential designs and verifying the software's architectural design is made easier by using the UML (Louis Rivest, 2010).

Models of UML

A UML model is a representation of the software's structure, behavior, and interactions before any actual coding takes place. Typically, this model is used to describe an approach to object-oriented programming. A UML model is composed of various types of diagrams depending on the complexity of the software product (Jeffrey L, 2007).

Several UML models are listed below, each with a brief definition:

Use-case diagram: explains how a system functions in terms of actors, goals, and dependencies between use cases.

Class diagram: represents system class, attributes, and relationships among the classes.

Sequence diagram: Represents communication between objects in terms of a sequence of messages.

Definitions and descriptions of some UML concepts used

Some terms will be used frequently when using the object-oriented methodology, so in order to better understand them, here are their definitions:

A class: A class is a set of instructions for creating objects (a specific data structure), setting up state variables or attributes, and implementing behavior (member functions or methods).

A class is divided into 3 parts:

The upper portion holds the name of the class.

The middle portion holds the attributes of the class.

The final portion outlines the procedure or action the class can take or perform.

Relationships: The line connecting the entities, or a diamond-shaped diagram, can be used to represent a relationship. Verbs are used in both instances to describe the relationships. Through relationships, we can demonstrate on a model how two or more objects are related to one another. Relationships in UML models serve the purpose of enabling us to record significant connections between objects. Dependencies, generalizations, and associations are the three types of relationships that matter most in object-oriented modeling (Aurum p,2013)

Dependency: A dependency relationship means that altering one model element may result in the alteration of another model element. It says that one model element may use the data and offerings of another model element, but not always the other way around. A dotted arrow stands in for dependency. The independent element is represented by the head of the arrow, and the dependent element is represented by the other end.

Generalization: A generalization relationship shows that an element of a specialized (child) model is based on an element of a general (parent) model. While either the parent model element or any child model element may have one or more children, it is typical for a single parent to have several children. The use of a child class object for a parent class variable or parameter is permitted but not the other way around. The traits and functions of one's parents are passed down to one's offspring. Class, component, and use-case diagrams all show relationships between generalizations. The generalization is represented by an arrow with a hollow head.

Association: An association relationship is a structural connection between two model elements that demonstrates how actors, use cases, classes, interfaces, nodes, or components of one classifier can connect to and move around components of another classifier. If there is an association between two classes, then an object from one class may be related to an object from the other class. It could be strengthened into an aggregation relationship or another type of aggregation called a composition aggregation, or just a composition relationship.

Aggregation: A HAS-A relationship between two connected objects is referred to as aggregation in terms of objects. It means that the parent class contains a number of child objects. A weak association is an aggregation. If both objects in an association can exist without one another, it is said to be an aggregation. A team object and a player object, for instance. A player can exist without a team even though a team contains multiple players.

Composition: A composition relationship, a type of aggregation, represents a whole-part relationship. The lifetime of the part classifier is a function of the lifetime of the entire classifier, according to a composition relationship. The composition is the kind of association with strength. When one subject owns another and both objects are dependent on the owner subject, the association is said to be composed. Two entities that are highly dependent on one another are combined into a composition. It stands for a relationship component. Both entities are interdependent in their composition. The composed object cannot exist without the other entity when there is a composition between two entities.

A table: A table is a type of data structure used to arrange data into rows and columns. It can be utilized to both store and present structured data. For instance, databases keep information in tables so that it can be quickly accessed from particular rows. Tables are frequently used on websites to display multiple rows of data. Through the storage and display of data in a structured format, spreadsheets combine the two functions of a table. A table's columns are limited in number, but its rows are not. (B.Shelly, 2015)

Design of the new system

System design is the first phase of the system development life cycle in which you and the user develop a concrete understanding of how the system will operate.

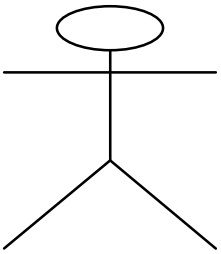
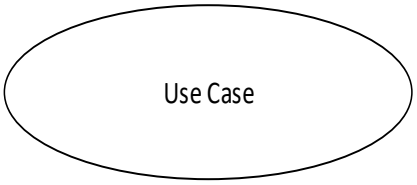
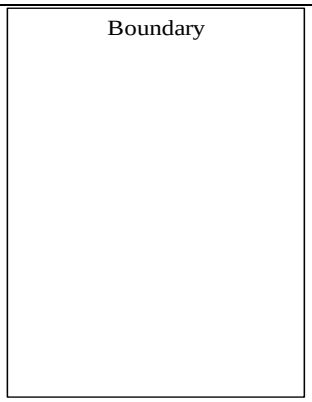
Systems design is the process of defining the architecture, components, modules, interfaces, and data for a system to satisfy specified requirements.

Use Case Diagram

Use case diagram is UML diagram which shows some business or software system, its external users (called actors), and a set of actions (called use cases) that users of the system should or can perform while using the system. Use case diagrams are used to describe functionality of a system from the point of view of external users (Jeffrey L, 2007).

Use case diagrams consist of actors, use cases and their relationships. The diagram is used to model the system/subsystem of an application. A single use case diagram captures a particular functionality of a system.

The symbols below are used in use case diagram

Description	Shape
An actor: • Is a person or system that benefits from the subject but is not a part of it. • Is labeled with its function. • Can be linked to other via a specialization/super class Field, which is represented by an Arrow with a hollow arrowhead.	 **Actor**
A use case: • Represents a major piece of system functionality • Can extend another use case • Can include another use case. • Is placed inside the system boundary • Is labelled with a descriptive verb-noun phrase.	
boundary: • It is a box drawn around the use case to represent the system's edge or boundary. • Includes the name of the subject inside or on top. • Represents the subject's scope, such as a system or a single business process.	

An association relationship: • Links an actor with the use case(s) with which it interacts.	
An include relationship: • Represents the inclusion of the functionality of one-use case within another. • Has an arrow drawn from the base use case to the used Use Case.	
An extend relationship: • Represents the extension of the Use Case to include optional behavior. • Has an arrow drawn from the extension use case to the base Use Case.	

Table 1 The symbols below are used in use case diagram

Use Case Diagram

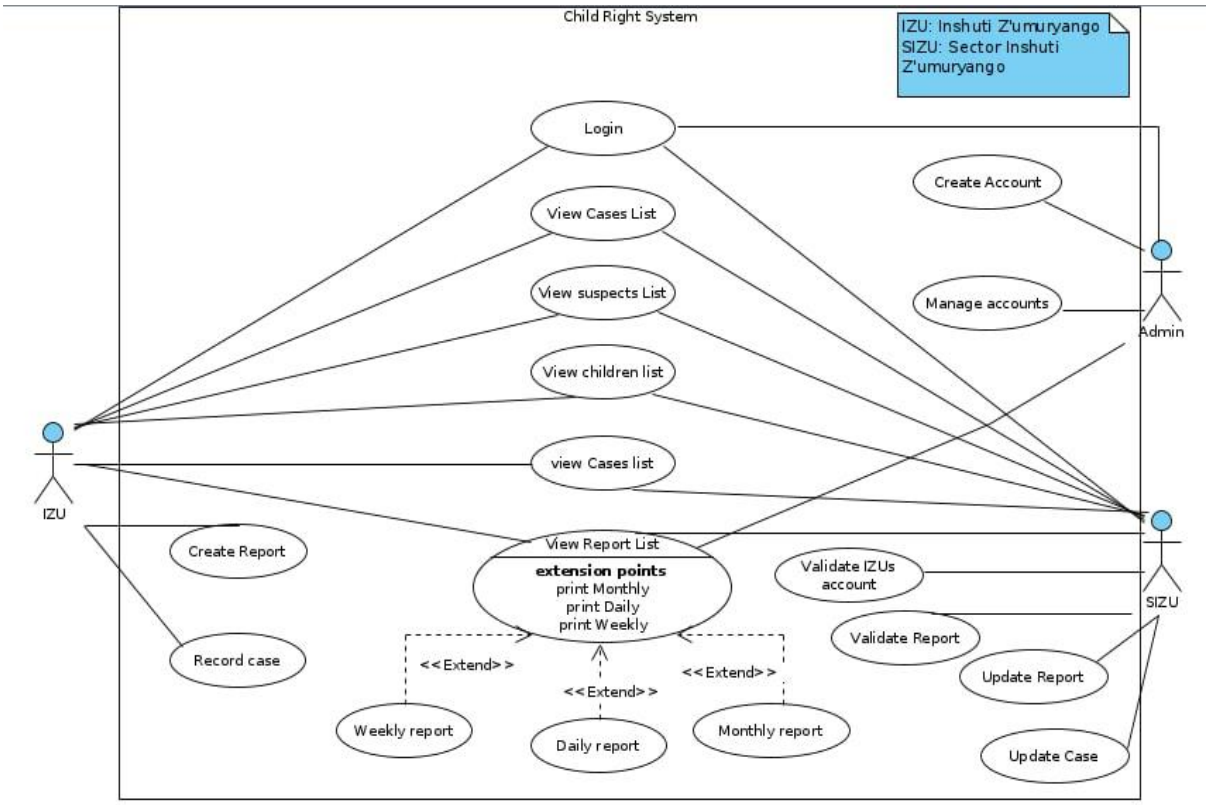


Figure 2 user case diagram

Use case description for IZU

Name: Create case and report
Actor: IZU
Description: This allows IZU to create new Report.
Pre-condition: User to prompt the system must have account.
Post-condition: End of week and month
Normal flow: Creating case 1. User goes to the login page. 2. The system validates the entered username, password. 3. User will go to the Cases page. 4. Then new case. Creating report

1. User goes to the login page. 2. The system validates the entered username, password. 3. User will go to the report page. 4. Then new report.
Alternative flow: If the user enters an invalid username and password the system must display invalid error

Table 2 use case description for IZU reporting.

Use case description for admin

Name: view information
Actor: Admin
Description: This allows Admin to manage all account and data in system
Pre-condition: the user should first have account with the system.
Post-condition: the system shows the message “login failed ”
Normal flow: The creation of a user 1. The Admin create account of IZU. 2. The system displays the formation for IZU. 3. The system print the information/report. 5. The system displays messages on the screen “the user is successfully created”.
Alternative flow: 1. A. If the information is not valid, the system provides the message indicating the error.

Table 3 Use case description for Admin.

Use case description for login

Name: Login.
Actor: all actors
Description: This allows the users to access the system content.

Pre-condition: the user should first have account.
Post-condition: the system shows the user own the information
Normal flow: User login on the system 1. The login page. 2. The system checks the corresponding given information. 3. check the information of user
Alternative flow: If the request was not found is the system provides the message indicating the error.

Table 4 Use case description of Login

Use case description for validate account

Name: **validate the employee**
Actor: SIZU
Description: The System will provide well-organized form for validate the accounts.
Pre-condition: User of the system must have account.
Post-condition: List of all user in her/his location
Normal flow: Printing Reports 1 User goes to the page log in to the system user. 2 The system validates the entered username, password and log into the system. 3 The system shows list of users then decide if he/she approve user's account
Alternative flow: If the user enters an invalid name of employee nothing will be printed.

Table 5 Use case description for validate account

Use Case description for Log out.

Name: Log out.
Actor: user
Description: This allows user to Log out form his/her account.
Pre-condition: 1 The user should be logged in his/her account. 2 The user should click on Log out option.

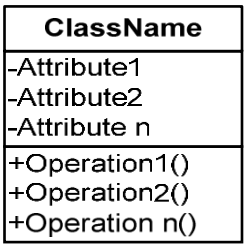
Post-condition: 1 User clicks Log out option.
Normal flow: Logging out. ✓ If the user will click on Log out option, he/she will immediately Log out.
Alternative flow: If the Admin she/he will log out

Table 6 Use case description for Log out.

Class Diagram

A class diagram in the Unified Modeling Language (UML) is a structure diagram that describes the structure of a system by showing the system's classes, their attributes, operations (or methods), and the relationships among the classes.

The elements of class diagram

Term and definition	**Symbol**
A class: 1. Has a name typed in bold and centered in its to compartment 2. Has a list of attributes in its middle compartment. 3. Represents a kind of person, place, or thing about which the system will need to capture and store information. 4. Has a list of operations in its bottom compartment. Attribute name/derived attribute name operation name ()	

An attribute: 1. Represents properties that describe the state of an object. 2. Can be derived from other attributes, shown by placing a slash before the attribute's name.	attribute name /derived attribute name
An operation or method: 1. Represents the actions or functions that a class can perform. 2. Can be classified as a constructor, query, or update operation. 3. Includes parentheses that may contain parameters or information needed to perform the operation.	operation name ()

Table 7 Elements of class diagram

Class Diagram

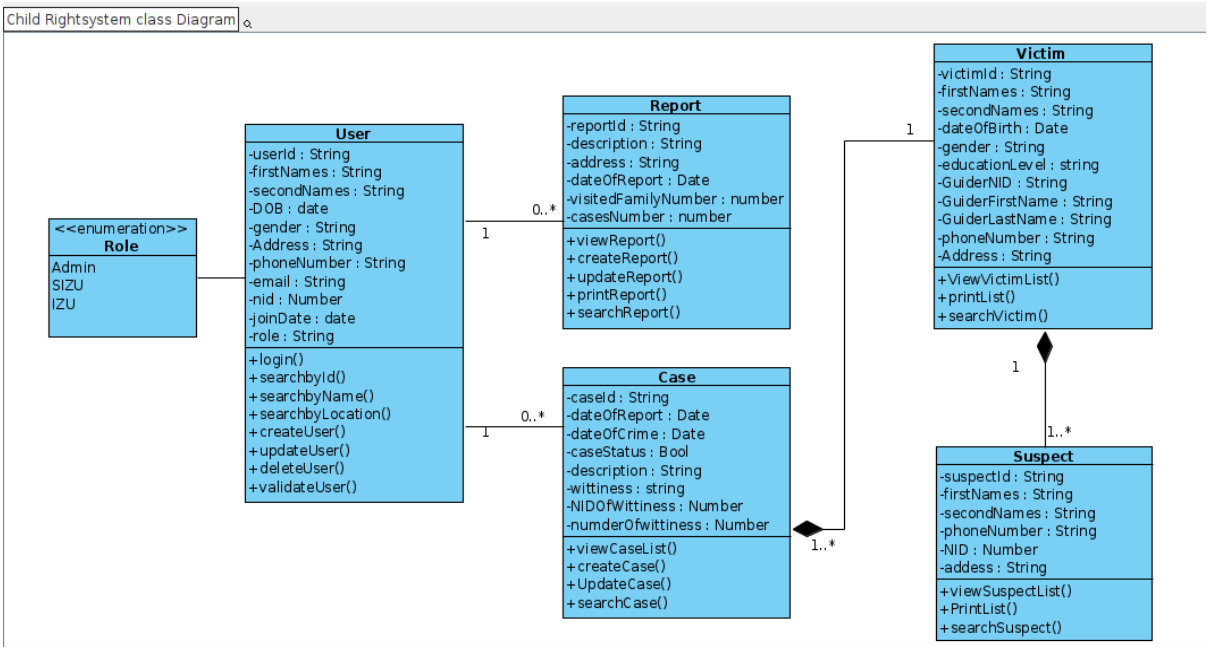


Figure 3 Class Diagram

Sequence Diagram

A sequence diagram is a dynamic model that displays the explicit flow of messages passed between objects during a specified interaction. Sequence diagrams are extremely useful for comprehending real-time specifications and complex use cases because they emphasize the time-based ordering of the activity that occurs among a group of objects.

The elements of sequence diagram

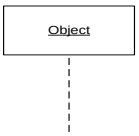
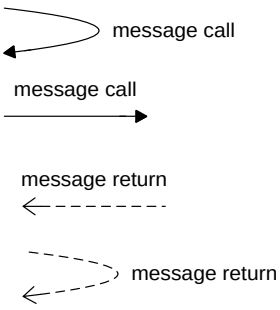
Term and definition	**Symbol**
An actor: • It can be a user/ person or system that derives benefit from and is external to the system. • It participates in a sequence by sending and/or receiving messages.	
An object: • It participates in a sequence by sending and/or receiving messages. • It is placed across the top of the diagram.	
A lifeline: • Denotes the life of an object during a sequence.	
An activation: • Denotes when an object is sending or receiving messages	
A message: • It conveys information from one object to another one. • An operation call is labelled with the message being sent and a solid arrow, whereas a return is labelled with the value being returned.	

Table 8 Elements of sequence diagram

Sequence diagram for creating report

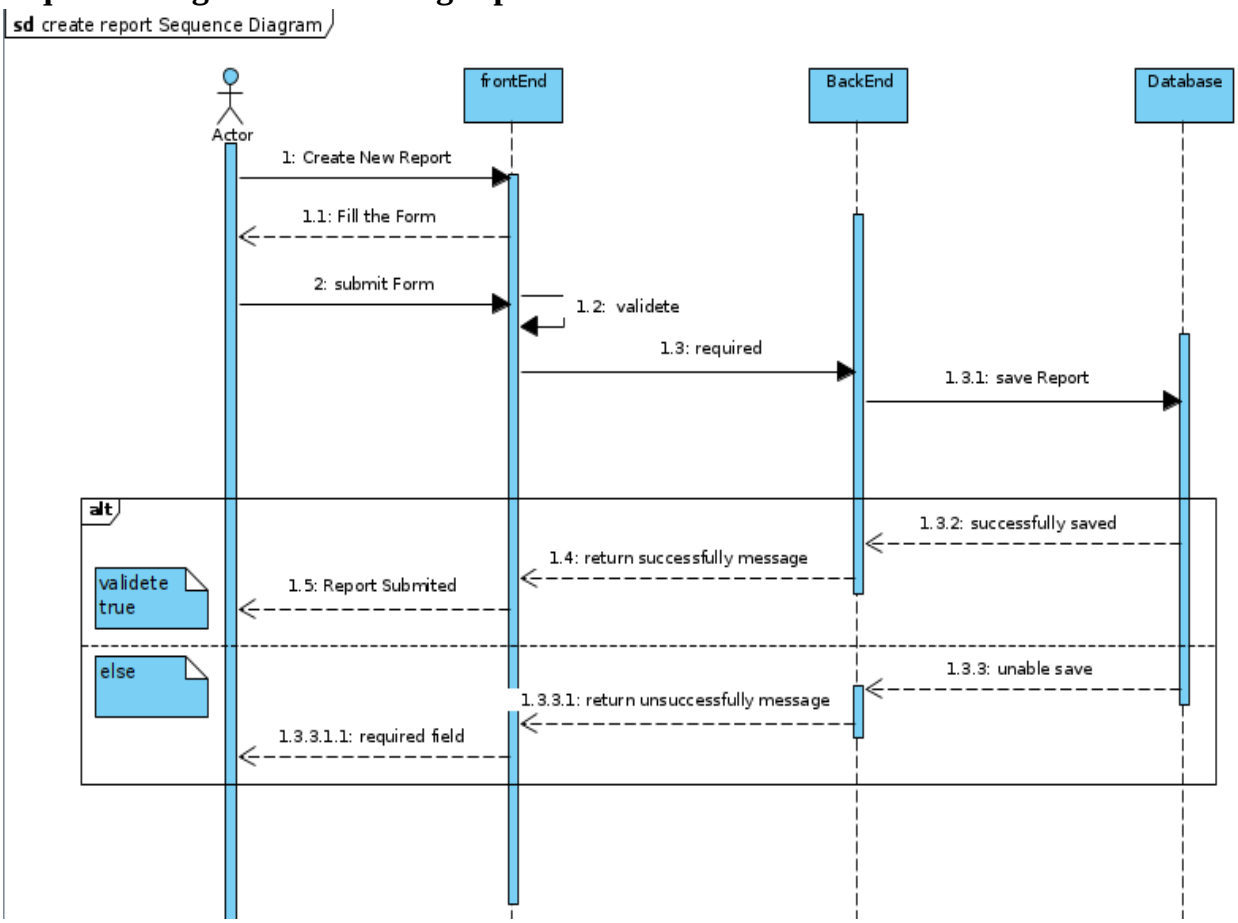


Figure 4 Sequence diagram for creating report

Sequence diagram for create case

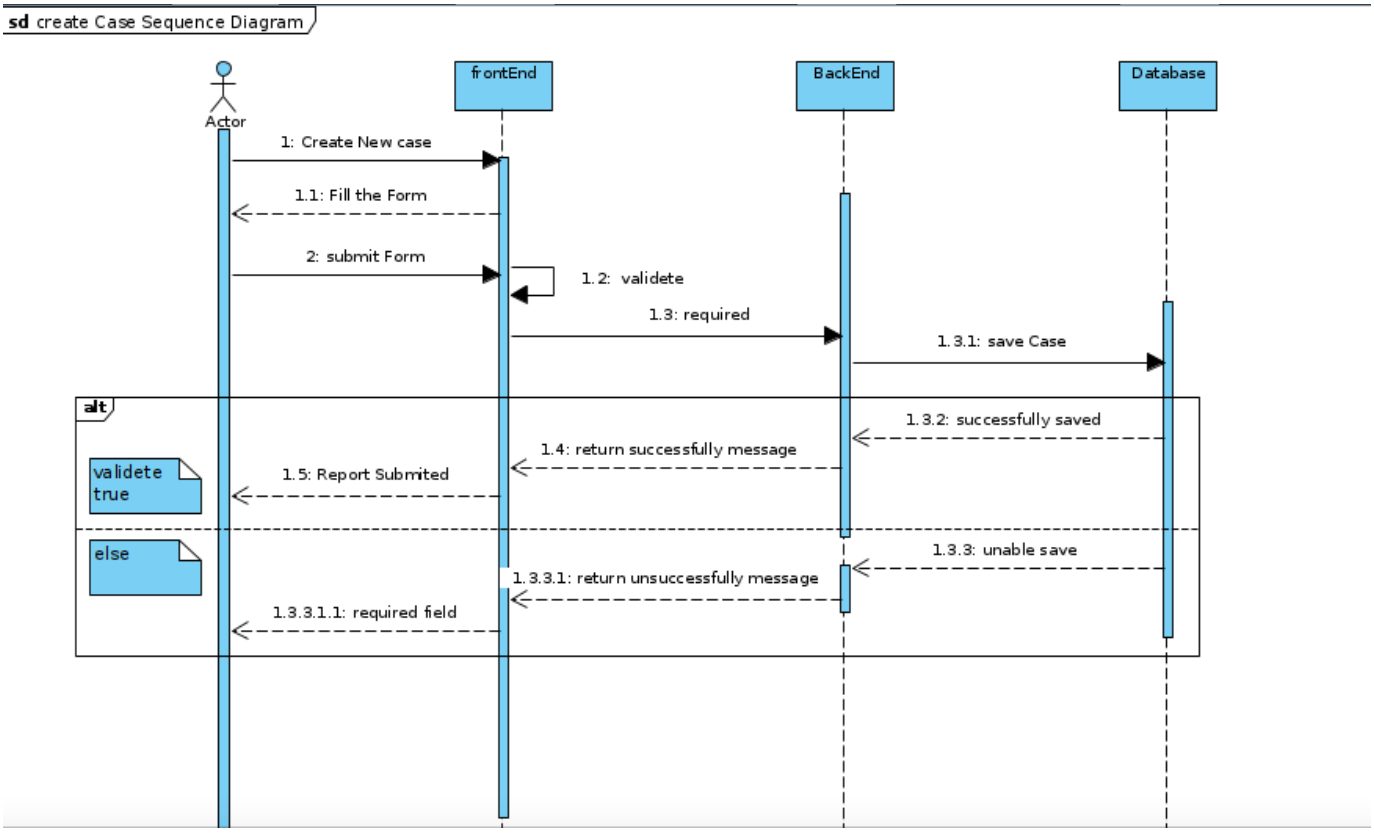


Figure 5 Sequence diagram for Create case

Sequence diagram for Login

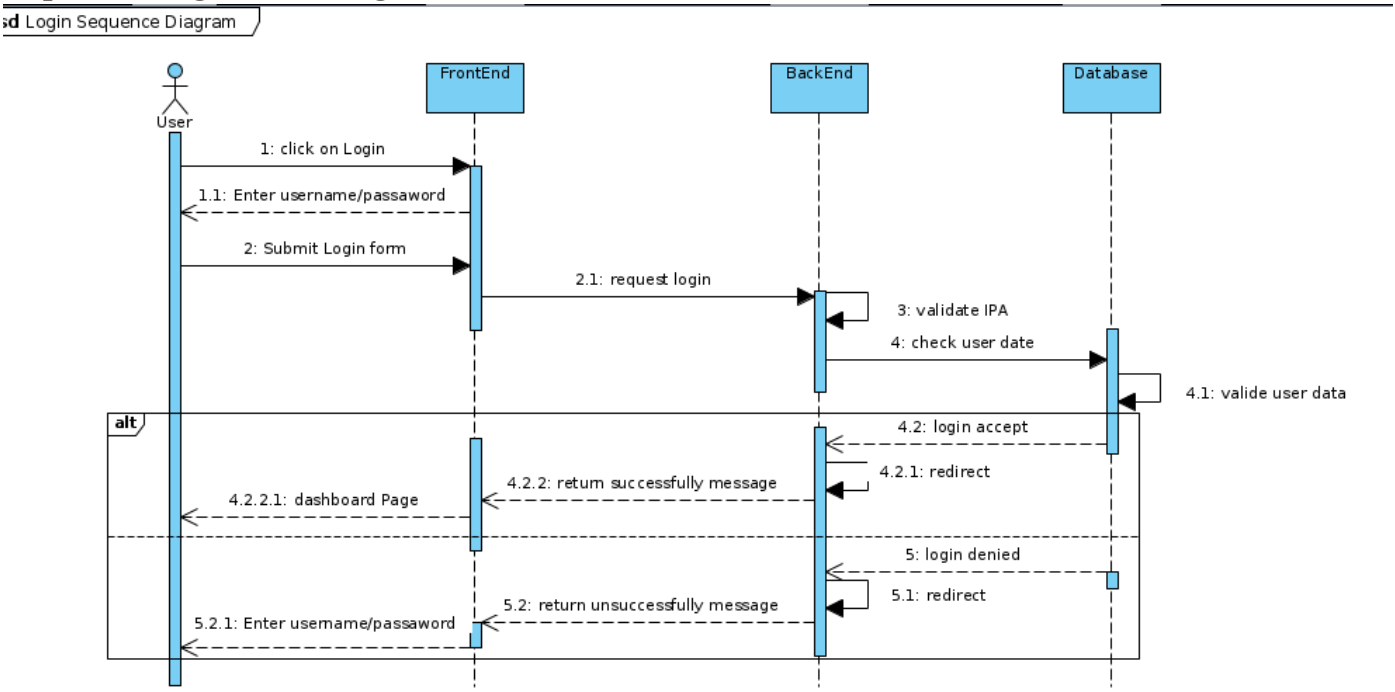


Figure 6 Sequence diagram for Login

Sequence diagram for Print PDF

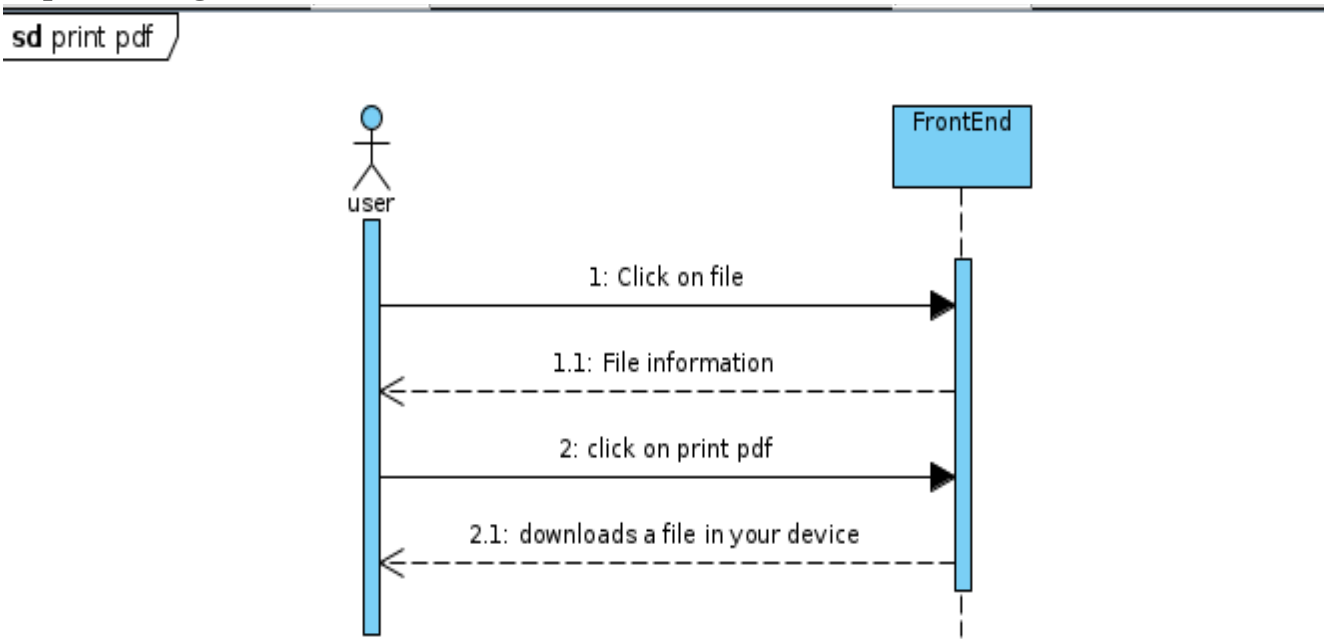


Figure 7 Sequence diagram for updating employee

Activity Diagram

An activity diagram is a behavioral diagram that visually presents a series of actions or flow of control in a system similar to a flowchart or a data flow diagram. An activity diagram portrays the control flow from a start point to a finish point showing the various decision paths that exist while the activity is being executed. They can also describe the steps in a use case diagram.

Activity Diagram

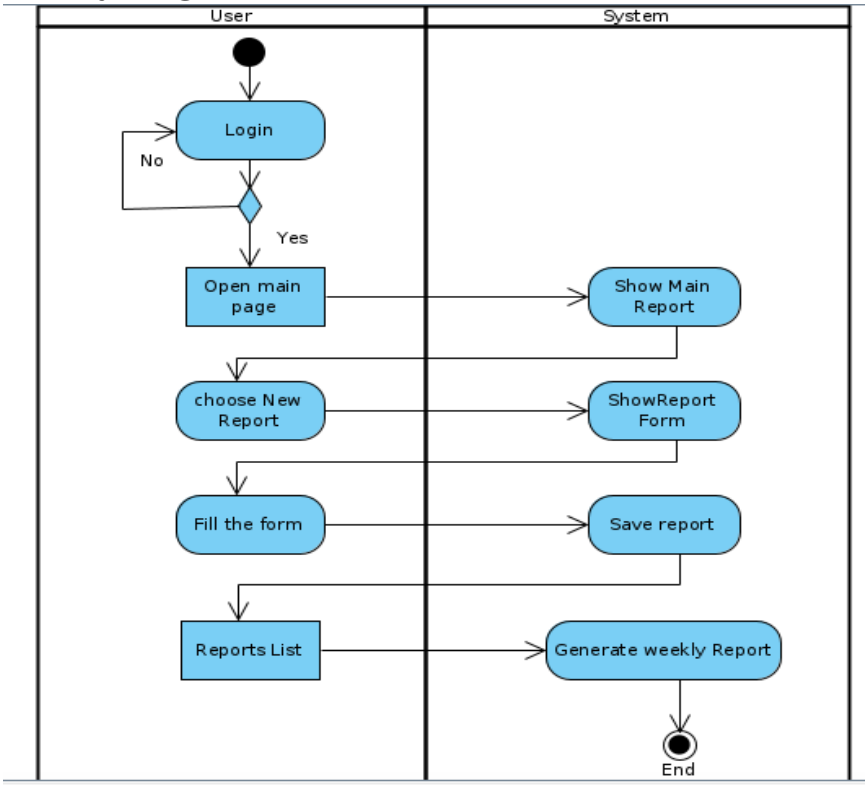


Figure 8 Sequence diagram for updating employee

Database Diagram

A database is a collection of data that has been set up to be easily managed, updated, and accessed. Databases can be categorized based on the types of content they contain, such as full-text, numeric, images, and bibliographic content. In order to see and comprehend how tables are organized and related to one another, we will model a database.

The elements of database diagram

Table 9 Elements of database diagram

Term and definition	**Symbol**
An entity is an object or concept about which you want to store information.	
Cardinality specifies how many instances of an entity relate to one instance of another entity. While cardinality specifies the occurrences of a relationship.	
Connecting line: One to one solid line that can connect attributes to show the relationships of entities in the diagram.	
An attribute is a piece of information that determines the properties of a field or tag in a database or a string of characters in a display.	
Relationships are associations between or among entities.	

Database Diagram

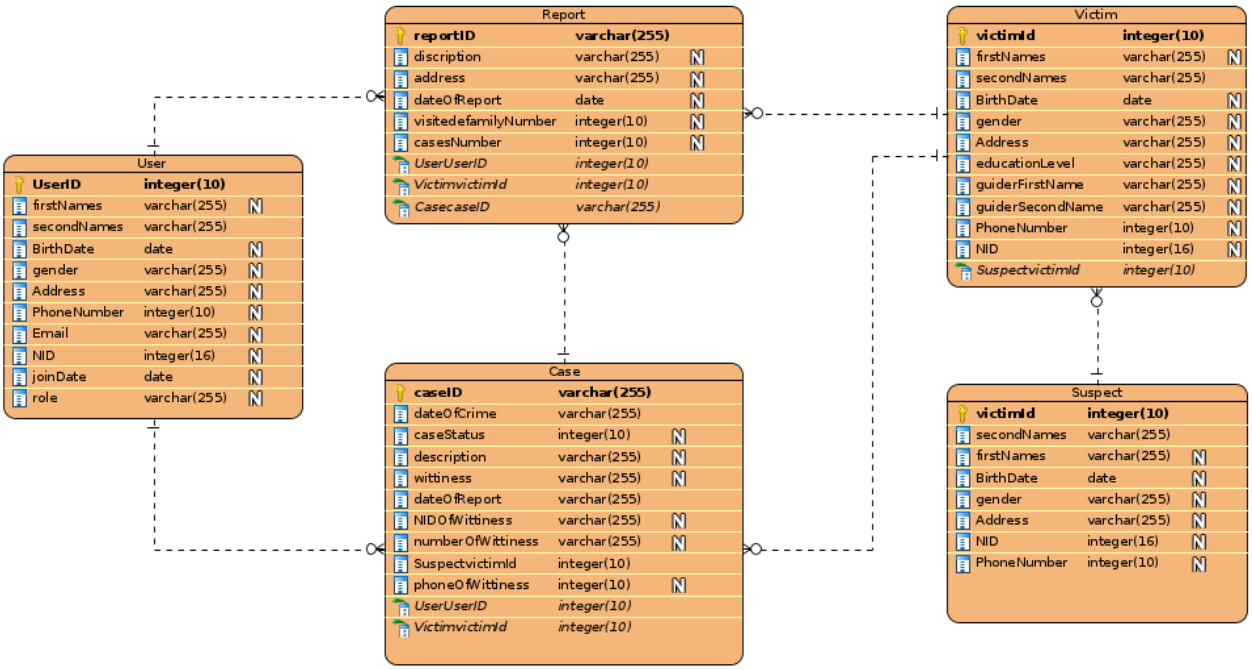


Figure 9 Database Diagram

System Architectural Design

A system architecture diagram is a representation of a system in which the main parts or functions are represented by blocks connected by lines that show the blocks' relationships.

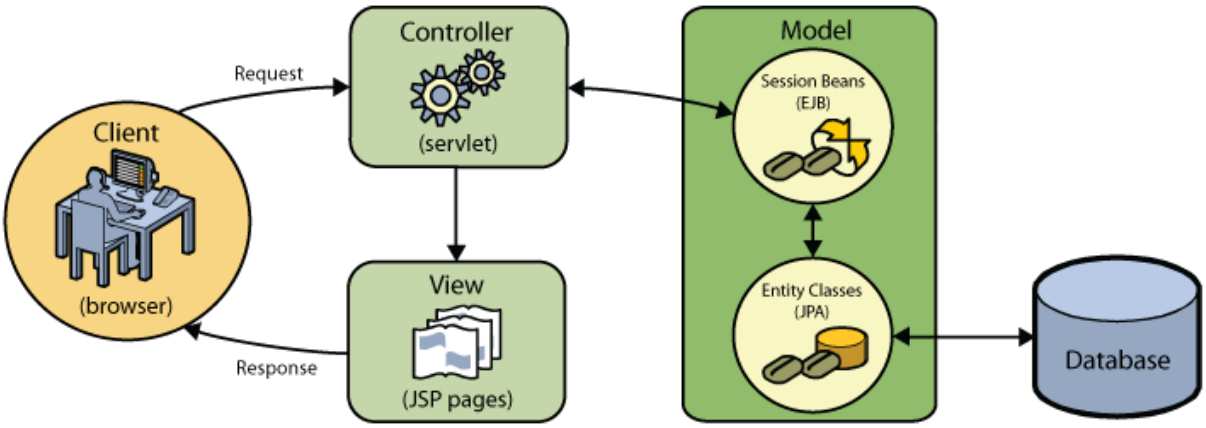


Figure 10 System architectural design

CHAPTER 4

SYSTEM DESIGN AND IMPLEMENTATION

Introduction

This chapter describes the creation and testing of the Child Right System. It also explains technologies that were utilized to create the system and presents the new system by displaying screenshots of the user interface.

Technologies Used

Font End Side

The following technologies and tools were used to build the applications front-end:

- **Library**

React.js: This is the technology that I used to create the user interface of this system. React is a free and open-source front-end JavaScript library for building user interfaces based on UI components. It is maintained by Meta and a community of individual developers and companies.

- **Other technologies**

React Router DOM: I used this module for the navigation system of the front-end application. Referred as declarative routing for React web applications. It helps in creating links and designing was to navigate through an application mainly without refreshing the whole web page.

Axios: I used Axios as the best way to fetch and consume the back-end API that I created for this application. Axiosis a promise-based HTTP Client for node.js and the browser. It is isomorphic (it can run in the browser and node.js with the same codebase).

- **Tools**

Visual Studio Code: This is the development environment I used throughout the whole project. Visual Studio Code, also commonly referred to as VS Code, is a source-code editor made by Microsoft with the Electron Framework, for Windows, Linux and macOS. Features include support for debugging, syntax highlighting, intelligent code completion, snippets, code re-factoring, and embedded Git.

Google Chrome: To preview and tech the front-end designs of my application, I used Google Chrome. Google Chrome is a cross-platform web browser developed by Google

Back End Side

- **Framework**

Node.js: The back-end system of the Medical File Sharing System is developed using Node.js. Node.js is an open-source server environment. Node.js is cross-platform and runs on Windows, Linux, UNIX, and macOS. Node.js is a back-end JavaScript run-time environment. Node.js runs on the V8 JavaScript Engine and executes JavaScript code outside a web browser.

Express.js: I also employed Express.js to make it easier for me to create an API system for the application. Express.js, or simply Express, is a back end web application framework for building Restful APIs with Node.js, released as free and open-source software under the MIT License. It is designed for building web applications and APIs. It has been called the de facto standard server framework for Node.js.

- **Programming language**

JavaScript: The whole system was developed using JavaScript, it's libraries and frameworks. JavaScript, often abbreviated as JS, is a programming language that is one of the core technologies of the World Wide Web, alongside HTML and CSS.

- **Other technologies**

Mongoose: Mongoose helped integrate and use MongoDB Database with Node.js. Mongoose is a JavaScript object-oriented programming library that creates a connection between MongoDB and the Node.js JavaScript run-time environment.

JSON Web Token: The security of this system was achieved by the use of JWT; also known as JSON Web Token. JSON Web Token is a proposed Internet standard for creating data with optional signature and/or optional encryption whose payload holds JSON that asserts some number of claims. The tokens are signed either using a private secret or a public/private key.

Database Management System (DBMS)

MongoDB: The database of choice for this system is MongoDB. I choose it because it provided flexibility and easy of use in comparison to other DBMSs. MongoDB is a source-available cross-platform document-oriented database program. Classified as a NoSQL database program, MongoDB uses JSON-like documents with optional schemas.

❖ **Tools**

Postman: To test the back-end endpoints or also known as APIs, I used Postman. Postman is an API platform for developers to design, build, test and iterate their APIs

MongoBD Compass: MongoDB Compass helped me to manage my databases with its reach and interactive user interface. Compass is an interactive tool for querying, optimizing, and analyzing your MongoDB data.

Presentation of the New System
Software testing

Software tests play an important role in software design. They help in testing the software's effectiveness to check if it actually does what it was supposed to solve.

The following are key aspects to consider in software testing:

- ✓ Does the application meet the requirements that guided its design and development?
- ✓ Is the application functioning as expected?
- ✓ Can the application be implemented with the same characteristics and satisfies the needs of the stakeholders?

The following are some types of software testing:

- ➢ **The Unit Test:** Is software testing method by which individual units of source code, sets of one or more computer program modules together with associated control data, usage procedures, and operating procedures, are tested to determine if they are fit for use. In other words every small component that can be compiled with the goal to know that every unit matches to its specifications, and to know if there are logical mistakes. Indeed,

the unit test is an efficient means that permits to detect the maximum possible mistakes. The application has been checked with the unit test at each piece of the code written.

- **The Integration test**: is a level of software testing where individual units are combined and tested as group .the purpose of this level of testing is to expose faults in the interaction between integrated units.
- **The Validation test:** The last test phase has the role of validating the software in its external environment. The product has been put in final situation in order to verify if it perfectly answers to the needs expressed in the first phase. The validation test is important, since it is necessary to verify if the setting up of the application corresponds to the expressed needs. The application has been tested in its entirety, and it is in this way that we noticed that the progress of operations done corresponds to the functional specifications.

Screenshots of the System

The screenshots below demonstrate how the new system works.

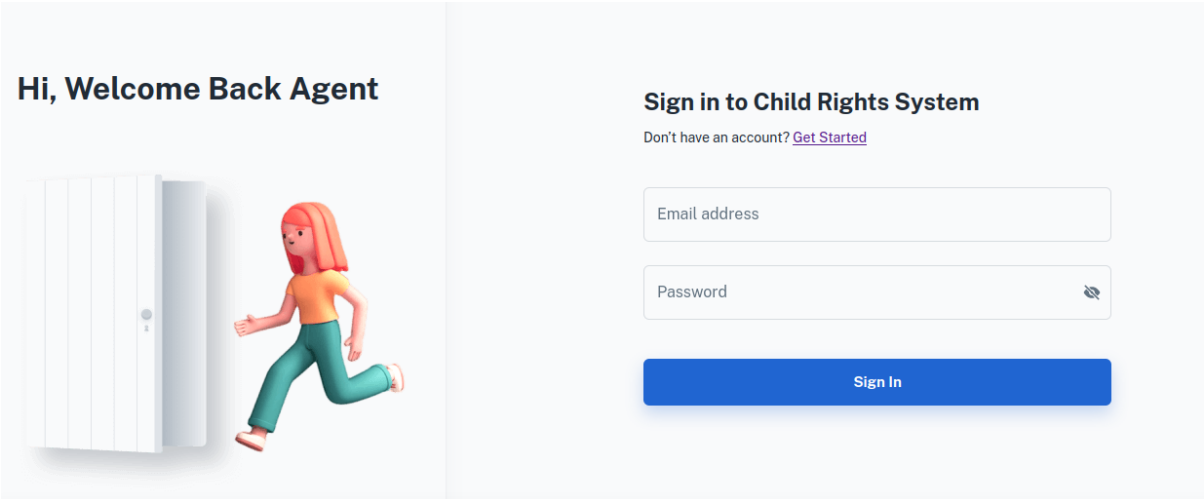


Figure 11 Users Login interface

Hardware and Software Requirements Deployment

Client-side requirements**:**

- A web browser (Google Chrome, Mozilla Firefox, Opera, Torch, etc.)
- Operating System (Windows 7, 8, 8.1 10; Linux, Mac OS).
- A RAM of 512 Megabyte (minimum)
- A hard disk of 8 Gigabyte of free space

Server-side requirements**:**

- Operating System: Windows Server 2008(R2 Standard, R2 Datacenter).
- XAMPP, WAMP etc.
- MYSQL Database;
- Network cark: 1GB/Second;
- RAM: 1GB minimum;
- 2GB or Freer hard disk space.

CHAPTER 5

CONCLUSION AND RECOMMENDATION

Conclusion

As a developing country such as Rwanda, digitizing government services is essential for facilitating citizens to access them easily. As a whole, the study had critically reviewed previous existing social categorization studies. The report had also highlighted and analyzed past research by giving much emphasis on three distinct elements. These include the scope of the study, theories/models used and methodology. This system surely provides secure, reliable and efficient services. Thus, in constructing this system, several steps have been considered so that good software can be produced. In designing the system, the following were considered: database design, interface design and logical design. After the design, the development process took place and here several programming languages such as JavaScript, React, CSS, Jquery, HTML5, and Ajax. After development, testing took place and several test cases were considered in order to minimize defects that can be found when users are using the system. The system will enforce fairness, efficiency and accuracy of better services. With the help of this software, the SDGs goals will also be achieved.

RECOMMENDATION

I highly recommend **NCDA** to use the system as it makes their work easier in terms of finding, requesting, or approving live information in this sector.

This system is maintainable and reliable; it can be improved by adding new features and functionalities.

To conclude this work, I would like to suggest that anyone else who is interested in improving this research by giving the child right system more features and functionalities is welcome to do so.

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APPENDICES

CURRICULUM VITAE

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ABOUT ME

I am currently a volunteer at Gwizatech.site. Gwizatech is a website or blog created by me since 2017, which helps out many people around over 10,000 per year who don't have enough skills about modern technology such as computers or laptops or any other device things, web technology. When they bring their problems, I am able to provide solution day by day through bot chat, website, telegram, and WhatsApp all easy ways of communication I created for them, and I am also able to help many people who want to learn more about technology, and I will continue this until my last day.

EXPERIENCE

Sanlam General Insurance , Rwanda(Kigali), Nyarugenge— IT (Networking)

Sanlam is a big Insurance company here in Rwanda and also in Africa. All daily activities are based on IT(networking) through working with different branches, I did a Profession internship in the IT department, especially in Network administrator, and also IT support in General.

Creators Agency, Rwanda(Kigali), Gasabo— External WP designer & web manager

IT support / and Web/system management

Managing 3 websites for **Kora Coaching**.

I Developed different projects under the creators Agency

Afrika-haguruka 2020 for zaoni temple.

Noblepay website.

REBRA RWANDAREALTORS Ltd, Rwanda(Kigali),Nyarugenge— web manager

I developed their WordPress website.

Online Support for End-User

PERSONAL DETAILS

Date of birthday: 11,1996

Gander: Male

Nationality: Rwandan

Civil status: Unmarried

SKILLS

Computer Networking (DNS, Ipv4, Network Model, Troubleshooting).

System Administration and IT Infrastructure Services.

Command Line in Linux .

Technical Support(Customer Support, BinaryCode ,Customer Support, Linux, Troubleshooting).

System Administration and IT Infrastructure Services.

Network Server Security - Protecting the Server and Client Computers

Database management: MySQL

VPN

Operating Systems

AWARDS/TRAINING

Network Server Security - Protecting the Server and Client Computers by Alison Education.

Google IT Support with 5 Certificates by Google education.

The Bits and Bytes of Computer Networking

Technical Support Fundamentals

Command Line in Linuxs

System Administration and IT Infrastructure Services

IT Security: Defense against the digital dark arts

Analytics robotics by Tsquared Robotics LLC.

EDUCATION

AUCA University, Rwanda(Kigali), Gasabo —bachelor degree

2018 - 2022

I'm doing Information technology(IT) in the department of Networking and communication systems. (Waiting for graduation.)

École Secondaire St Joseph Karuganda, Gakenke — A' Level *Certificate*

2015 - 2017

I studied Mathematics, Economy, and Computer science(MCE).

Cloud Computing

Desk support

LANGUAGES

Kinyarwanda(Mother language).

English(V.Good).

French(listening)

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