**MACHAKOS UNIVERSITY**

**SCHOOL OF COMPUTING ENGINEERING AND TECHNOLOGY**

**DEPARTMENT OF COMPUTING AND INFORMATION TECHNOLOGY**

**DEAF CLIENT-INTERPRETER SYSTEM**

**SHALLON MARIA OMWONO**

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**PROJECT PROPOSAL SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF BACHELOR OF SCIENCE IN COMPUTER SCIENCE OF MACHAKOS UNIVERSITY**

**2024**

**DECLARATION**

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

**STUDENT:**

SHALLON MARIA OMWONO

Signature Date

**SUPERVISOR:**

DR. ERICK O. OMUYA

Signature Date

# DEDICATION

I dedicate this project proposal to my family, friends, lecturers and supervisor whose unwavering support and guidance have been instrumental in this journey. I am deeply grateful for their love and encouragement which has been my source of strength and inspiration in completing this.

# ACKNOWLEDGMENT

I would like to express my sincere gratitude to several individuals who have supported me throughout this whole process.

I am deeply thankful to my supervisor, Dr. Erick O. Omuya for his guidance and insightful feedback. His expertise and mentorship has been instrumental in this project proposal. I am also grateful to my lecturers for the knowledge instilled in me which has guided me in writing the proposal and coming up with the project idea.

Lastly, I extend my appreciation to my family and friends for their unwavering encouragement and understanding during this academic journey.

# ABSTRACT

Add background, introduction and problem statements here. This project aims to tackle communication barriers faced by the deaf community through creation of a web-based system that connects them with interpreters. Globally, over 5% of the population, approximately 466 million people are affected by disabling deafness. In Kenya alone, the 2019 census reported 153,381 deaf individuals above the age of 5, highlighting the prevalence of this issue. Current challenges include language barrier hindering engagement with service providers leading to social isolation. The proposed system seeks to address these challenges by leveraging ICT to virtually or physically connect the deaf community with interpreters across carious sectors. The objective for this project is to develop a user-friendly web-based system through adaptation of agile methodology to enhance communication between the involved parties. The project emphasizes the significance of breaking communication barriers, fostering inclusivity and empowering individuals with hearing disabilities.

# ABBREVIATIONS

WHO : World Health Organization.

KIPPRA: Kenya Institute for Public Policy Research and Analysis.

ICT – Information and Communication Technology

VRI – Video Remote Interpreting

VRS – Video Relay Service

dB – Decibels

HOH – Hard Of Hearing

TDD - Telecommunications Device for the Deaf

CC – Closed Captioning

ALDs – Assistive Listening Devices

TTS – Text-to-speech

STT – Speech-to-text

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# **CHAPTER ONE**

# INTRODUCTION

## 1.1 Background Study

In general, disability is where one has any condition of the body or mind that makes it more difficult to do certain activities and interact with the world around them. According to WHO, disability has three dimensions, they include Impairment in a person’s body structure or function or mental functioning, such as loss of vision or memory loss or loss of limb, Activity limitations like difficulty in seeing, hearing, walking or problem solving and Participation restrictions in normal daily activities, such as working, social and recreation activities and obtaining health care and preventive services (CDC, 2024).

Deafness is measured by determining the loudness of the quietest sound heard, using decibels (dB). People who are not affected by deafness can hear sounds at 20dB or less across all frequencies. Over 5 per cent (430 million) of the entire population worldwide(7.6 billion) or one person out of 20 is affected by disabling deafness, that is, a degree greater than 40dB in the better-hearing ear in adults and degree greater than 30db in children (WHO, 2020).

According to the Kenya National Population Census in 2019, deaf people in Kenya who are aged above 5 years are 153,381. Where 129,518 are in rural areas and 23,843 in the urban areas. Deafness can be defined as an invisible disability where a person cannot understand speech through hearing, which implies very little hearing or no hearing. According to the Deaf People and Human Right Report (2009), Deaf (with uppercase D) refers to a community that share a language like sign language and culture, deaf (with lowercase d) are those with audiological condition of not hearing who are not recognized as part of Deaf community and hard of Hearing is one with mild to moderate hearing loss which does not have cultural affiliation with Deaf Community (Njue, 2020).

There is a communication barrier challenge to the deaf community when interacting with service providers in different setups. Nowadays, there are broadcast programs on television screens with interpreters to help those with hearing disability to understand. In public places like churches and public holidays events , there are usually assigned sign language interpreters thus bridging the gap between the deaf and those with normal hearing. There is online and physical learning of sign language , thus increasing the availability of sign language interpreters.

The proposed system will be able to connect the deaf people and interpreters when they need services where communication is a challenge with the service provider. This system will also help create job opportunities for the interpreters in a case where the organization decides to keep the interpreter in the organization.

## 1.2 Problem Statement

The deaf community faces problems that they are unable to share. This is because there are few people who can understand them, and they end up seeking help from themselves. When a person with hearing disability visits places with people who have normal hearing, they don’t engage because there is language barrier. It is hard for the deaf community to visit places for services because the service provider won’t be able to understand. Explain more challenged here.

Explain two challenges with ICT systems that have attempted to assist in this issue and what their challenges have been. Using ICT, the proposed system will be a web-based user-friendly system that will be able to help the deaf community in the challenge they are facing on communication with the service provider that is by connecting them with interpreters both virtually and physically. The proposed system will allow deaf people or service provider to connect with the interpreter virtually or physically so as to provide interpretation services. The system will be widely used, not only in the health sector but also in all sectors where the interpretation service will be needed.

## 1.3 Objectives

### 1.3.1 Main Objective

To develop a web-based user-friendly system that connects the deaf community with interpreters for effective communication.

### 1.3.2 Specific Objectives

1. To analyze existing systems or methods used to support the deaf community in communication.
2. To design a web-based user-friendly system for the deaf community.
3. To implement the system.

## 1.4 Scope and Limitations of the Study

This project aims to provide a web-based platform that tries to address communication barrier for the deaf community. It tries to help the deaf community and service provider to have a seamless communication by the use of an interpreter either remotely or physically. The project also has resources that can be available to everyone who is interested in sign language or interpretation. It also increases chances for employment for the interpreters as they will be recognized. It can also be used to improve tourism sector where tourists can have interpreters in cases where there is a deaf tourist. Add more content here.

The proposed system could have some limitations such as, there could be dependence on internet connectivity for virtual interpretation services, some challenges for those individuals with limited technological literacy or access to devices, availability of qualified interpreters may vary depending on location and demand and video communication could be blurry if video quality is not good.

## 1.5 Justification

The justification for the proposed system is that it will address the communication challenges faced by the deaf community. By providing access to interpreters both virtually and physically, the proposed system aims to bridge the language barrier and enable effective communication in various sectors. This will enhance inclusivity, empower individuals with hearing disabilities and ensure equal access to services for the deaf community.

Besides this, it can help the country and cultures in tourism. Tourists from other countries with this disability and also our own people with this type of disability, they will be able to learn more about our culture and promote tourism. Add more content here.

# CHAPTER TWO

# LITERATURE REVIEW

## 2.1 Introduction

Various interventions have evolved over time to support the needs of the deaf community. From early manual communication methods to the development of sign language and assistive technologies. One notable example is the establishment of deaf schools, which provided education and a sense of community for deaf individuals.

Additionally, advancements in technology such as hearing aids, cochlear implants and captioning services have greatly improved accessibility and inclusion for deaf individuals. These systems have played a crucial role in facilitating communication and access for deaf individuals.

## 2.2 Existing Systems

This part shows some of the existing systems that are being used to help the deaf community in communication with people who do not know sign languages. They include Assistive Listening Devices(ALD), Text-to-Speech(TTS) and Speech-to-Text(STT) Systems, Deaf-friendly Mobile Apps, Hearing Aids and Video Remote Interpreting(VRI). This systems have their advantages and disadvantages but they do a good work.

### 2.2.1 Assistive Listening Devices (ALDs)

ALDs are used to improve hearing for deaf individuals in various environments such as classrooms, theaters, airports, or places of worship. They permit greater autonomy, alleviate the daily grind, and improve the life quality of the individuals with HOH.

ALDs separate the sounds, particularly speech that a person wants to hear from background noise and improve what is known as the ‘speech to noise ratio (SNR)’ rather than the ‘signal to noise ratio’. ALDs vary in their internal electronic mechanisms ranging from simple hard-re microphone-amplifier to more sophisticated broadcasting systems. They use microphones to capture audio source and broadcast it wirelessly over frequency modulation(FM), infra-red, induction loop or other transmission techniques (Kim,J. & Kim,C. , 2014).

ALDs may require additional equipment such as receivers or transmitters which may be cumbersome to carry around. They rely on proper setup and positioning to ensure optimal performance. Background noise and distance from sound source can still pose challenges for individuals using ALDs (add more challenges and citations here).

### 2.2.2 Text-to-Speech (TTS) and Speech-to-Text (STT) Systems

TTS and STT technologies can be traced to the early 20th century. TTS converts written text into spoken words, allowing deaf individuals to access information through audio output. STT on the other hand converts spoken words into written text enabling deaf individuals to understand spoken language through visual text. These technologies play a crucial role in facilitating communication and accessibility for the deaf community (cite).

The disadvantage of these technologies state that TTS systems may not always accurately convey the intended meaning or emotions behind the written text, as computer-generated voices lack the nuances of human speech, TTS may struggle with pronouncing certain words or names correctly leading to potential misunderstandings and STT systems may encounter challenges in accurately transcribing spoken language, especially in noisy environments or speakers with accents or speech impediments (cite). Explain the challenges with this.

These systems continue to evolve and advance providing more accurate and natural-sounding speech and synthesis. TTS and STT technologies have been advancing rapidly in recent years.

### 2.2.3 Deaf-Friendly Mobile Apps

It is difficult for hearing impairment people to communicate with hearing individuals because most of them do not know sign language. There is an entirely new market of apps created specifically to meet the needs of the people with hearing impairment. Some popular apps include: Ava (iOS and Android), Google Live Transcribe (Android), Otter AI (iOS and Android), Google Sound Amplifier (Android), Rogervoice (iOS and Android), TapSOS (iOS and Android) and Subtitles Viewer (Rogers, 2022).

Some of the disadvantages of deaf-friendly mobile apps are some apps may have limited features or may not fully meet the specific needs or preferences of deaf individuals, some are not a great option for people who have thick accents or speech difficulties, most apps are for transcribing which is not a case for everyone because some do not know how to read, for highest accuracy one has to use premier version which not everyone can afford and they are limited on availability or compatibility across different operating systems (Rogers, 2022).

### 2.2.4 Hearing Aids

The first hearing aid, dating from the 17th century, was an enormous ear trumpet with a tube that channeled sound to the ear. In the late 19th century, acoustic horns were made to fit in the ear. In the 1990s, digital hearing aids were introduced, which allowed a much more customized use to do with the amplification, reduction, filtration, and direction of sound. Today, the newest hearing aid can receive sound wirelessly from telephones, televisions, stereos, and computers (cite).

Hearing aids can encounter challenges such as, they may not completely restore normal hearing and may have difficulty in noisy environments and they can be expensive, require maintenance and may not be covered by insurance.

### 2.2.5 Video Remote Interpreting ( VRI )

VRI is a system that provides sign language interpretation through video calls. The history of VRI dates to the early 2000s when advancements in video conferencing technologies made it possible to provide remote sign language interpretation. It was initially developed to bridge the gap between deaf individuals and hearing individuals in various settings, such as healthcare, education, and business (cite)..

VRI technology is not subject to geographical and time constraints since the interpreter can provide service from anywhere and does not have to spend time commuting to and from the appointment. VRI is often used for sessions, one-on-one visits, and patient walk-ins when an interpreter is needed immediately.

VRI is subjected to disadvantages such as, the quality of the video can sub optimal since the VRI relies on wireless connections, it may not be accessible for individuals with limited technological skills or those without access to reliable internet connections and in certain settings, it may raise privacy concerns as the interpreter and conversation may be visible to others.

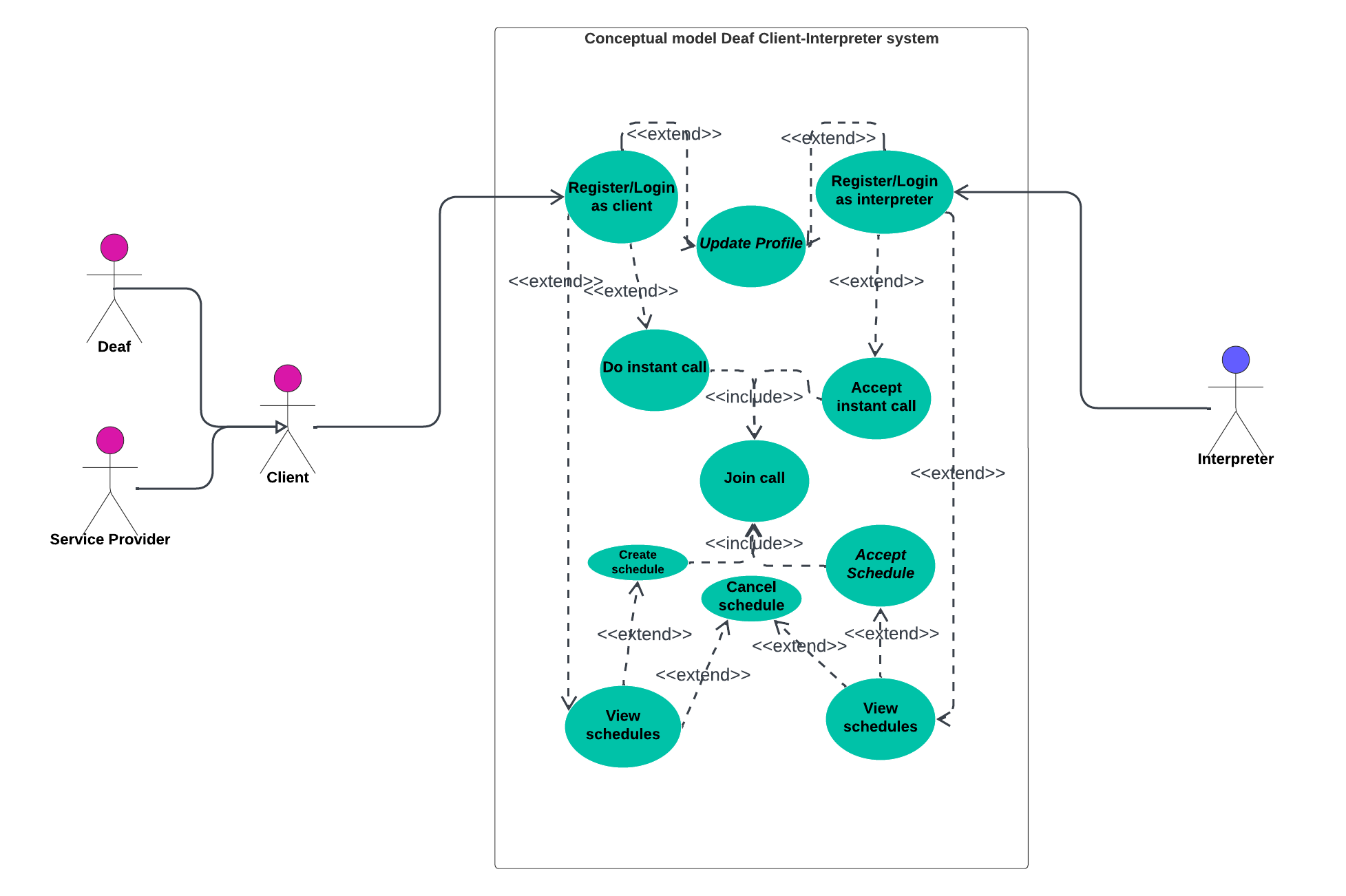
## 2.3 Research Gaps

Discuss this section in two paragraphs in prose.

Some of the identified gaps include:

1. Limited availability of sign language interpretation services.
2. Inadequate access to educational resources in sign language or lack of deaf-friendly communication platforms.
3. Insufficient awareness and understanding of deaf culture and communication needs.
4. Comprehensive mental health services tailored to the deaf community.
5. Limited access to employment opportunities.
6. Some of the means to help the deaf community are expensive and most of them cannot afford.

## 2.4 Conceptual Framework of Proposed System



Briefly describe this conceptual model.

# CHAPTER THREE

# METHODOLOGY

## 3.1 Introduction

In system development, there are some step-by-step procedures one must use that will allow one to measure their progress. This will ensure that the most optimal system is delivered on time.

## 3.2 Research Design

Research design refers to a plan that outlines the methods and procedures to be followed. According to my problem statement, I will use a mixed research design that involves quantitative and qualitative research methods. It helps ensure a structured and systematic approach to gather and interpret data for the project. Add more content here including reasons for selecting the said methods.

## 3.3 Target Population

The target population for this proposed project would be the deaf community, specifically those who face communication challenges due to language barriers when seeking services. This would include individuals who rely on sign language as their primary mode of communication.

You can specify where you are planning to test the system e.g. a school for the deaf and the numbers

## 3.4 Sample Size

Simple Random Sampling will be used, where each member has an equal chance of being chosen. Add more details here.

## 3.5 Data Collection Methods

This shows the techniques one uses to collect data for research. Some sources of collecting data include books, published papers, journals and the internet. The following methods will be used to collect data:

### 3.5.1 Observations

Observation method is both a qualitative and quantitative method where one must systematically watch and record events or behaviors in order to collect data intended for a particular study. In the proposed system case the observation is on our daily lives, qualitative where detailed description and interpretation of observed behaviors is obtained. Explain why this data collection method has been selected. How will you use it?

### 3.5.2 Interviews

In this qualitative method, a respondent is asked open-ended questions about a certain subject. It will help one interact with respondents while asking questions and getting responses which are explained and get possible recommendations. Explain why this data collection method has been selected. How will you use it?

### 3.5.3 Questionnaires

A questionnaire is a piece of printed or written questions with multiple choice of answers for the purpose of a study survey. Explain why this data collection method has been selected. How will you use it?

## 3.6 Data Analysis

Data analysis involves examining and interpreting data to gain insights and make informed decisions. It may include analyzing user interactions, tracking system performance, and identifying pattern trends. By analyzing data, we can better understand the needs and preferences of the deaf community, improve the system’s usability, and enhance the overall user experience. Qualitative analysis which involves interpreting non-numerical data like interviews, observation to gain insights and understand the experiences of deaf community suits.

## 3.7 Software Development – Agile Methodology

For the proposed system, agile software development methodology is considered because it will allows one to continuously gather feedback from the deaf community and adapt to the system based on their evolving needs. The proposed system will follow the following phases:

1. **Start with a clear vision:** Clearly define the purpose and goals of the deaf community system.
2. **Break it down:** Divide the project into manageable tasks or user stories.
3. **Prioritize tasks:** By considering the needs and preference of the deaf community, determine which tasks are the most important and tackle them first.
4. **Sprint planning:** Plan work in short iterations or sprints, focusing on completing specific tasks within a set time-frame.
5. **Daily check-ins:** Set aside time each day to review your progress, make any necessary adjustments and plan your next steps.
6. **Continuous feedback:** Seek feedback from members of the deaf community throughout the development process. This will ensure that the system meets their needs and preferences.
7. **Adapt and iterate:** Based on the feedback received, make any necessary changes or improvements to the system. Continuously iterate and refine your work.
8. **Regular testing:** test your system regularly to identify and fix any issues or bugs. This will help ensure that it functions smoothly and provides a positive user experience.
9. **Documentation:** Keep track of your progress, decisions and any changes made to your system. Documenting work will help you stay organized and provide a reference for future development or updates.

A diagram of a process

Description automatically generated

**Label the diagram. Justify the use of this process model.**

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# APPENDICES

## APPENDIX 1 TIME SCHEDULE

|  |  |
| --- | --- |
| **PROJECT ACTIVITY** | **DURATION** |
| Clear Vision | 2 days |
| Break Down | 8 days |
| Prioritize Tasks | 4 days |
| Sprint Planning | 8 weeks |
| Daily Check-ups | 15 mins daily |
| Continuous Feedback | After each sprint |
| Adapt and Iterate | After sprints |
| Regular Testing | 1 week |
| Documentation | 1 week |

## APPENDIX 2 BUDGET

|  |  |
| --- | --- |
| EXPENDITURE | ESTIMATED COST |
| Laptop HP | 46,000 |
| Data collection | 7,000 |
| Hosting services, domain, and SSL certificates | 4,000 |
| TOTAL | 57,000 |