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Project Title: MuhindiMbingu: Rural Internet Service Delivery Project

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DECLARATION

I declare that this project proposal titled "MuhindiMbingu: Rural Internet Service Delivery Project" is my original work and has not been submitted for examination in any other institution.

Name: Kennedy Maina

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DEDICATION

This proposal is dedicated to my family, friends, and academic mentors who have encouraged me throughout my studies.

ACKNOWLEDGMENT

I wish to express my sincere gratitude to my supervisor, Mr. Kelvin Njagi, for his continuous support, helpful feedback, and guidance. I also appreciate the School of Computing and Informatics, my classmates, and the people of the selected pilot community whose insights enriched this proposal.

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ABSTRACT

The MuhindiMbingu project aims to offer sustainable, affordable, and solar-powered internet services to underserved rural areas in Kenya. It leverages satellite technology, long-range Wi-Fi, and community management models to close the digital divide. This proposal outlines the technical design, budget, timeline, literature review, implementation strategy, and expected outcomes. The project hopes to empower education, communication, and small business growth in target communities and lay the groundwork for future expansion.

CHAPTER ONE: INTRODUCTION

1.0 Introduction

In an increasingly digital world, lack of internet access creates barriers to learning, opportu nity, and social participation. Many rural areas in Kenya face this challenge daily. The Muhin diMbingu project proposes a solution using affordable, satellite-based internet powered by solar energy to connect these communities reliably and sustainably.

1.1 Background Information

In Kenya, urban internet access has grown rapidly, but rural areas remain neglected due to i nfrastructure gaps. This digital divide reduces access to education, healthcare information, and e-commerce. Recent innovations in satellite broadband and solar-powered Wi-Fi offer p romising solutions. This project aims to use these technologies to help close the digital gap.

1.2 Problem Statement

The lack of accessible and affordable internet in rural Kenya has created inequality in educ ation, innovation, and employment. Students struggle with online resources, businesses can't participate in digital markets, and entire communities are isolated from global networks.

1.3 Proposed Solution

Deploy solar-powered Wi-Fi systems connected to satellite internet to provide coverage to r emote communities. The system will be community-focused, easily maintained, and scalable. Installation includes:

Satellite modem and receiver

Solar panel and battery setup

Outdoor Wi-Fi hotspot

Training for local users and technicians

1.4 Objectives

Main Objective:

To implement a sustainable internet system to serve underserved rural communities in Ken ya.

Specific Objectives:

Survey and identify areas with internet access challenges

Install and configure network infrastructure

Provide solar power for uninterrupted service

Train community members for basic operations

Measure impact on education and business access

1.5 Budget Estimate

A minimum budget of will be required for the pilot rollout. Below is the itemized summary:

Item	Quantity	Unit Cost (KSh)	Total (KSh)
Satellite Router & Dish	2	2000	4000
Solar Panel Setup	1	1500	1500
Network Devices & Cabling	2	2000	4000
Community Training Materials	–	–	2000
Transport & Installation	–	–	1500
Monitoring Tools	–	–	2000
	–	–	
Total			15000

1.6 Time Schedule – 7 Weeks

Week	Activity
Week 1	Approval of proposal and planning
Week 2	Survey of selected area and data gathering
Week 3	Purchase of equipment
Week 4	Installation of internet and solar systems
Week 5	System testing and configuration
Week 6	Community training and demos
Week 7	Evaluation, launch, and final reporting

1.7 Gantt Chart (Summary View)

Activity	W1	W2	W3	W4	W5	W6	W7
Proposal Planning	■						
Area Survey & Data		■					
Equipment Procurement			■				
Installation				■			
Testing & Troubleshooting					■		
Community Training						■	
Final Launch							■

1.8 Feasibility Study

1.8.1 Economic Feasibility

The project cost is manageable and can potentially break even over time through low subscri ption fees or partnerships with schools. Maintenance is minimal, and solar power reduces ope rational costs.

1.8.2 Technical Feasibility

The technology (satellite Wi-Fi, solar energy) is tested and suitable for rural conditions. Loc al technicians can be trained to run diagnostics and solve minor issues. All equipment will be sourced from certified local vendors.

1.8.3 Operational Feasibility

The system is simple to operate, requiring minimal training for users. Community ownership is encouraged through stakeholder meetings and collaborative setup. Local champions will be identified to monitor day-to-day usage and report issues.

CHAPTER TWO: LITERATURE REVIEW

2.0 Introduction

This chapter explores similar projects and published studies on rural internet access, especi

ally in Africa. Reviewing their achievements, technologies, and challenges helps justify the need for ***MuhindiMbingu***. It also reveals gaps this project intends to fill—like including solar-powered infrastructure, community training, and long-term scalability.

2.1 Case Study 1: BRCK – Mobile Internet Access in Kenya

Source: BRCK (2024), https://www.brck.com

BRCK is a Kenyan company that developed rugged, portable internet routers that work on 3G/4G connections with backup batteries. Their solution, Moja Wi-Fi, provides free internet supported by sponsored content. It has been used in schools, markets, and informal settlements.

Key Takeaways:

- Effective in areas with mobile network coverage
- Prioritizes resilience in power-deprived zones
- Community-based, with focus on education and inclusiveness

Relevance to MuhindiMbingu:

- Proves value of offline-first content
- Demonstrates that simple interfaces and local support encourage adoption

2.2 Case Study 2: Mawingu Networks – Solar-Driven Connectivity

Source: Mawingu (2024), https://mawingu.co

Mawingu uses solar-powered base stations to deliver fixed wireless internet to rural and peri-urban users. It started with a Microsoft 4Afrika partnership and has expanded to offer pay-as-you-go connections to homes, schools, and businesses.

Key Takeaways:

- Combines solar tech and long-range Wi-Fi
- Affordable pricing models for low-income earners
- Employs local youth for deployment and maintenance

Relevance to MuhindiMbingu:

- A strong proof-of-concept for combining solar and Wi-Fi

- Validates business models with flexible payments and local job creation

2.3 Case Study 3: Internet Society – Community Networks in Kibera

Source: Internet Society (2023)

TunapandaNET in Kibera, Nairobi, is a community-owned mesh network started by Internet Society and Tunapanda Institute. It offers high-speed intranet for schools, training centers, and clinics, with content tailored to local interests.

Key Takeaways:

- Prioritizes education and youth training
- Proves that networks can be community-managed
- Affordable and adaptable to different geographies

Relevance to MuhindiMbingu:

- Inspires the idea of open governance and local maintenance
- Offers templates for technical capacity-building in low-tech communities

2.4 Summary of Best Practices

From these case studies, the following insights emerge:

- **Localized Design**: Solutions should reflect local culture, tech familiarity, and geography
- **Clean Energy**: Solar power reduces cost and improves reliability
- **Community Ownership**: Engagement and empowerment of locals promotes successs
- **Hybrid Revenue Models**: Combining pay-per-use and sponsored access boosts sustainability

2.5 Research Gaps Identified

Despite successful initiatives, several gaps remain:

- Many programs rely on mobile networks, which don't cover all rural areas
- Few focus on energy solutions like solar as a default system
- Capacity-building for local IT support is often underdeveloped
- Ongoing maintenance and long-term sustainability plans are often absent

MuhindiMbingu directly addresses these shortcomings through a solar+satellite hybrid, loca
l training, and community co-ownership.

CHAPTER THREE: METHODOLOGY

3.0 Introduction

This chapter explains the approach used to plan, gather information, build, and test the ***Muh
indiMbingu*** project. The methodology ensures that the project is implemented logically, usin
g proven techniques that allow for smooth progress from start to finish.

3.1 System Development Methodology – Waterfall Model

The **Waterfall Model** will guide the technical development of the system. It follows a step-b
y-step order where one stage must be finished before the next begins. This model suits the
project because the goals and scope are clearly defined.

Phases in the Waterfall Model:

1. **Requirement Gathering** – Understand what the users and community need.

2. **System Design** – Plan the network structure, equipment, and user roles.
3. **Implementation** – Set up the internet system and hardware in the selected area.
4. **Testing** – Check if the system works as expected and troubleshoot errors.
5. **Deployment** – Launch the system for public use.
6. **Maintenance** – Provide ongoing support and updates as needed.

3.2 Data Collection Methods

To understand the needs of the target community and design a system that works for the m, the following techniques were used:

3.2.1 Interviews

Conducted with:

- Community leaders
- Teachers and students
- Small business owners They provided direct feedback on current internet challen ges and expectations.

3.2.2 Questionnaires

Surveys were distributed to 50 residents, asking:

- What devices they use (phones, laptops)
- Whether they currently access the internet
- How much they would pay for a monthly plan
- Preferred times and places for internet access

3.2.3 Observation

Field visits were carried out to inspect:

- Network coverage and power availability
- Community activity patterns
- Possible installation sites like schools or market centers

3.3 Target Population

The target audience includes:

- Secondary and college students
- Teachers and educators
- Local entrepreneurs and shop owners
- Health workers and volunteers

This population represents those who will benefit most from better connectivity and are acti ve users of educational content, communication tools, and e-commerce services.

3.4 System Requirements

3.4.1 Functional Requirements

These are the core things the system must do:

- Connect multiple users to the internet at once
- Enable Wi-Fi coverage for a 300–500 meter radius
- Operate on solar power without relying on electricity
- Monitor basic user activity for analysis

3.4.2 Non-Functional Requirements

These are qualities the system must have:

- Be easy to use and manage
- Work in high heat or dusty conditions
- Be affordable to install and maintain
- Be secure and protect user data

3.5 Tools and Technology

Tool / Component	Purpose
VSAT Satellite Modem	Provides broadband internet connecti on
Solar Power Kit	Ensures 24/7 off-grid power
Wi-Fi Access Points	Create wireless coverage zones
Routers and Cables	Connect devices and transmit data
Monitoring Software	View usage and network health

3.6 Ethical Considerations

Ethics were respected throughout:

- All participants gave consent before taking part in interviews or questionnaires
- No identifying personal data was collected or published
- Data gathered is used strictly for project design and evaluation
- The community will be involved and respected in deployment decisions

CHAPTER FOUR: SYSTEM ANALYSIS & REQUIREMENT MODELLING

4.0 Introduction

This chapter analyzes the structure of the *MuhindiMbingu* internet system and the way user s will interact with it. It also models the system using diagrams such as the context diagra m, data flow diagram, and entity relationship diagram. These tools help visualize the design before actual development begins.

4.1 Data Analysis

Data gathered from questionnaires and interviews indicated several key insights:

- Most users use smartphones to access the internet
- Users are open to low-cost, community-based internet solutions
- There's interest in using the network for education and business
- Reliable power is a challenge, confirming the need for solar setups

4.2 Functional Requirements

The proposed system must:

- Provide internet connectivity via a wireless hotspot
- Allow multiple concurrent users (up to 100 at a time)
- Operate using solar power with minimal downtime
- Monitor network usage for future analysis

4.3 Non-Functional Requirements

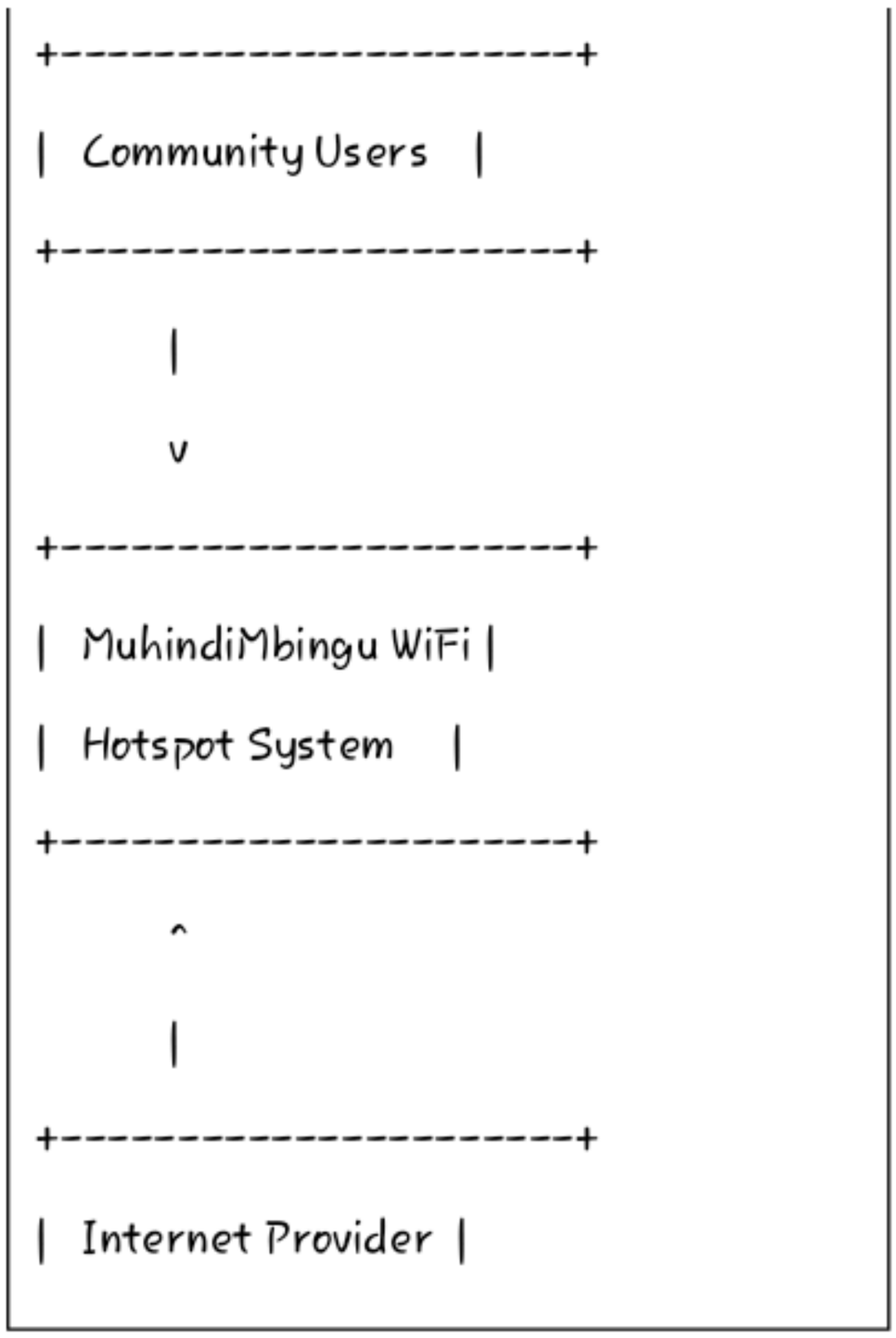
The system must also:

- Be reliable and secure
- Be cost-effective and simple to maintain
- Work well in rural weather conditions (rain, heat, dust)
- Provide strong, consistent signal strength within 300–500 meters

4.4 System Users

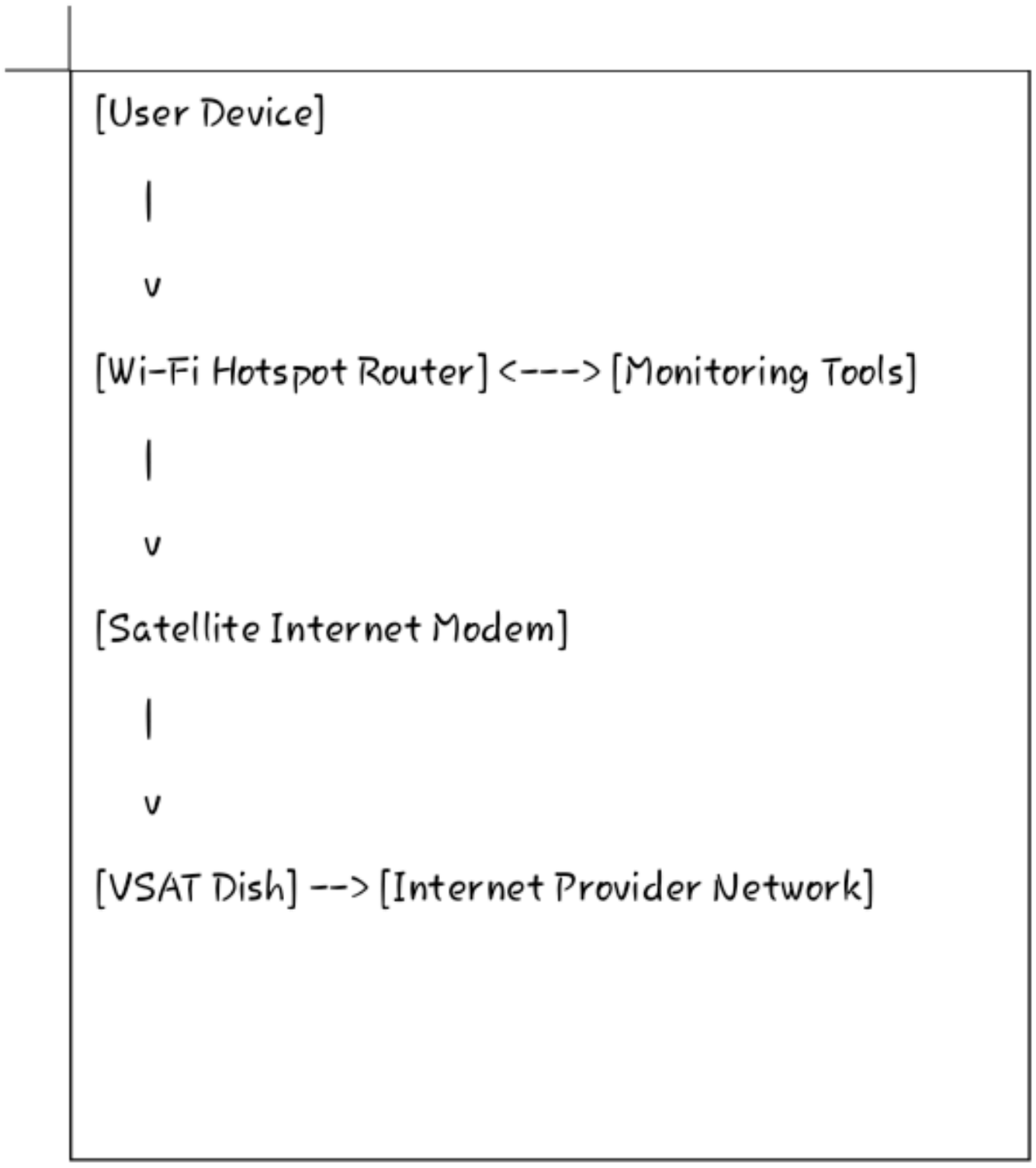
User	Role
Administrator	Oversees network health, system settings, and logs
End Users	Connect to Wi-Fi to access internet services
Support Team	Trained local members to fix minor technical issues

4.5 Context Diagram



This diagram shows that users connect to the system, which in turn connects to the global in ternet via a satellite provider.

4.6 Data Flow Diagram (Level 0)



Each part represents how data moves from the user's device to the external internet netwo
rk and back.

4.7 Flowchart – Setup & Operatio

START

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v

Survey & Analyze Needs

|

v

Procure Equipment

|

v

Install Internet + Solar Kit

|

v

Configure Hotspot System

|

v

Launch & Train Users

|

v

Maintain System & Monitor Usage

|

v

END