

# **LINKod: AN AI-ASSISTED BARANGAY-BASED SOCIAL PLATFORM INTEGRATING NATURAL LANGUAGE PROCESSING AND RULE-BASED RECOMMENDATION ALGORITHMS**

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# OVERVIEW:

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01 Introduction

02 Theoretical Framework

03 Conceptual Framework

04 Statement of the Problem

05 Objectives of the Study

06 Scope & Delimitation

07 Significance of the Study

08 Definition of Terms

09 Review of Related Literature

10 Review of Related Studies

# OVERVIEW:

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11 Research Methodology

12 System Architecture

13 Flowcharts

14 Research Instrument

15 Statistical Treatment

16 Materials

17 Schedule and Timeline (Gantt Chart)

18 Project Teams and Responsibilities

19 Budget Cost / Management Plan

# INTRODUCTION

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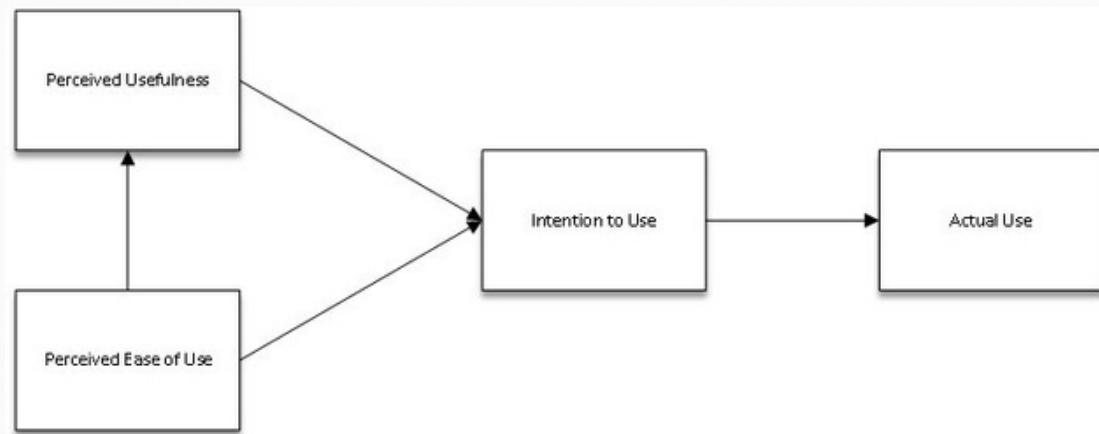
**The Problem:** Traditional barangay communication is inefficient, with delays, limited reach, and low engagement.

**The Current "Fix":** Adoption of fragmented digital tools improves reach but lacks integration and official structure.

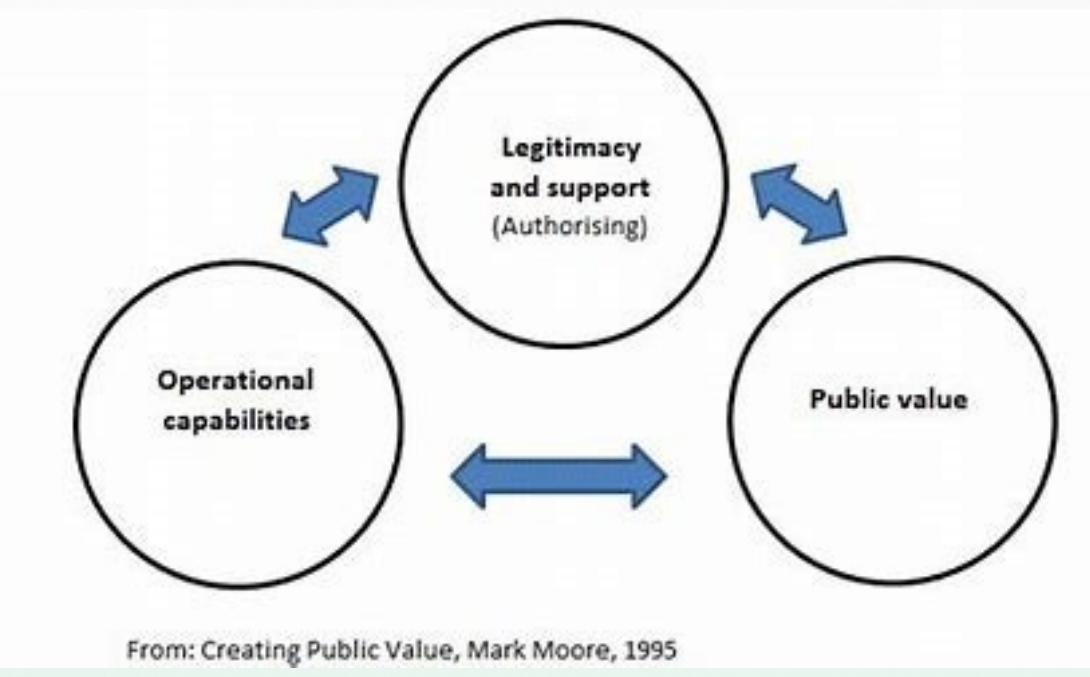
**The Untapped Potential:** Significant economic and social gaps persist. Local vendors have low visibility, and residents lack a formal platform for mutual aid.

**The Justification:** This study bridges these gaps, translating the abstract "smart city" concept into a tangible "smart barangay" initiative.

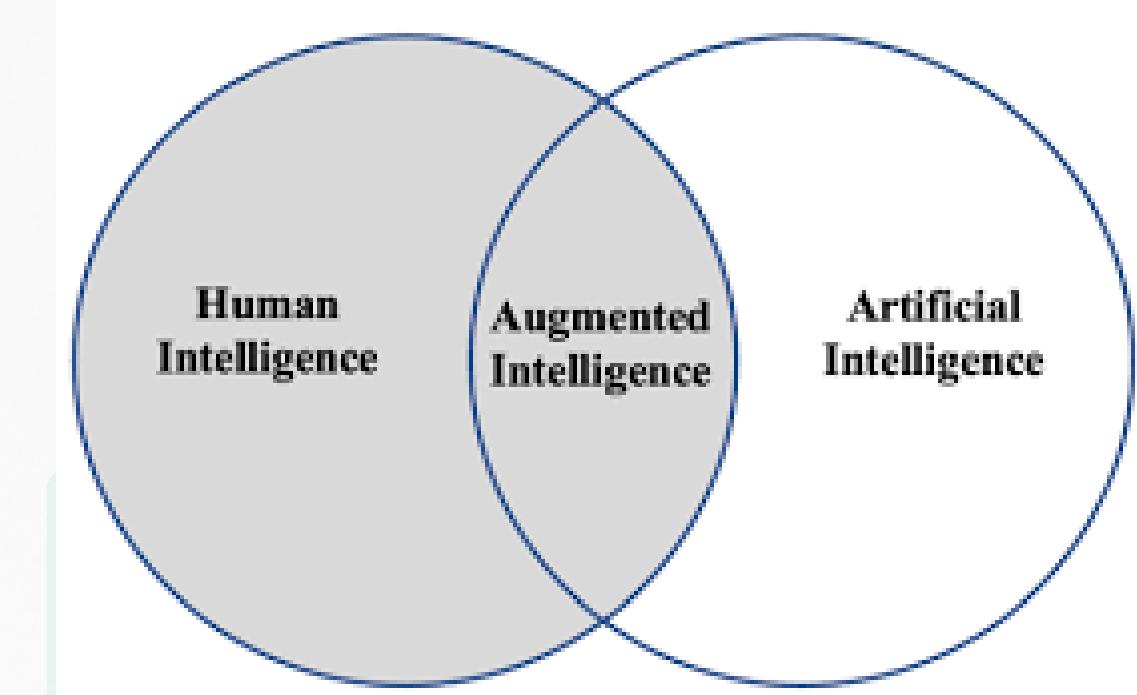
# THEORETICAL FRAMEWORK



**Technology  
Acceptance Model  
(TAM)**  
Davis, 1989

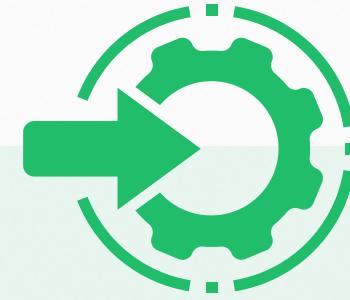


**Public Value Theory**  
Moore, 1995



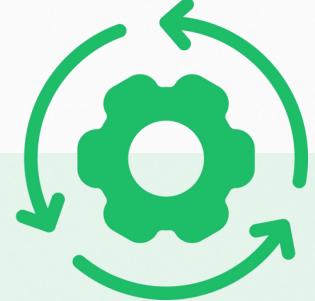
**Augmented  
Intelligence Model  
(AIM)**  
Raisch & Krakowski, 2021

# CONCEPTUAL FRAMEWORK



## INPUT

- User data,
- Announcement content
- Product listings,
- Service requests



## PROCESS

- NLP processing,
- Rule-based recommendations,
- Firebase integration



## OUTPUT

- Clear announcements
- Targeted messaging
- Vendor visibility
- Community assistance

# STATEMENT OF THE PROBLEM

- 1** How to address delayed/unclear barangay announcements?
- 2** How to improve local vendor visibility and promotion?
- 3** How to resolve lack of formal community assistance system?



# OBJECTIVES OF THE STUDY

## General objectives:

To develop and evaluate an AI-assisted barangay-based social platform.

## Specific objectives:

- 1 Design communication module with NLP and rule-based targeting
- 2 Develop digital marketplace for local vendors
- 3 Create community task-sharing module



# SCOPE & DELIMITATION

- ▶ Barangay Cagbaoto, Bayabas, Surigao del Sur (pilot)
- ▶ Three core modules (Communication, Marketplace, Community Assistance)
- ▶ Android mobile platform
- ▶ Create community task-sharing module
- ▶ Limited to micro and small-scale vendors



# SIGNIFICANCE OF THE STUDY



**Barangay Officials:**  
Efficient communication



**Residents:**  
Better engagement and community support



**Local Vendors:**  
Increased market visibility



**Community:**  
Stronger social ties and bayanihan spirit



**Future Researchers:**  
Reference for hyper-local e-governance

# DEFINITION OF TERMS

**AI (Artificial Intelligence):** In this study, refers to rule-based systems and natural language processing algorithms used to auto-generate clear announcements and filter recipients based on pre-defined demographic tags (e.g., senior citizen, student).

**Barangay:** The smallest administrative division in the Philippines, which serves as the primary planning and implementing unit of government policies and the specific context for deploying the LINKod application.

**Bayanihan:** Operationally defined in this study as the act of mutual aid and cooperation measured by the number of successfully completed errand or job assistance requests facilitated through the application's community board.

**Community Engagement:** The degree of interaction and participation of residents with barangay affairs, operationalized as their response rates to digital announcements, frequency of posting on the community board, and usage metrics of the application's features.



# DEFINITION OF TERMS

**Digital Platform:** The integrated web and mobile software system named "LINKod," developed for this study, which hosts the three core features of information dissemination, business promotion, and errand assistance.

**Information Dissemination:** The process of distributing information from barangay officials to residents, which in this study is measured by the speed, reach, and comprehension of push notifications and digital announcements sent via the application, compared to traditional methods.

**Local Livelihood:** The income-generating activities and small-scale enterprises of barangay residents, particularly local vendors and service providers, whose visibility and market reach are supported through the business promotion feature of the LINKod platform.

**Multi-Feature Application:** A software application that integrates several distinct but interconnected functions—specifically, information dissemination, business promotion, and errand assistance—into a single, cohesive system.



# REVIEW OF RELATED LITERATURE

## Foreign:

- Digital governance improves transparency, accessibility, and citizen participation.
- AI helps enhance clarity, decision-making, and service delivery.
- ICT platforms strengthen community cooperation and digital social support.
- Digital marketplaces boost micro-entrepreneur income and visibility.
- Literature stresses aligning technology, users, and organizational readiness.

## Local:

- Philippine barangays are adopting digital tools but face skill and infrastructure gaps.
- Social media enhances announcement speed and coordination.
- ICT programs improve transparency and citizen engagement.
- Current systems are fragmented and lack integrated livelihood features.
- Local works highlight the need for a unified barangay platform.



# REVIEW OF RELATED STUDIES

## Foreign:

- AI-assisted platforms increase engagement through clear, targeted communication.
- Digital governance systems improve efficiency, transparency, and responsiveness.
- Community-based digital marketplaces strengthen local economic activity.
- Studies emphasize trust and ethical design in AI for public services.
- Findings support multifunctional platforms integrating governance and livelihood tools.

## Local:

- Local systems improve barangay communication and record-keeping but lack livelihood modules.
- Adoption improves with digital literacy and training programs.
- Livelihood platforms help small vendors expand reach but are not linked to barangay systems.
- Studies call for unified, user-friendly platforms for governance and community support.



# RESEARCH METHODOLOGY



**Design:** Developmental Research Design



**Locale:** Barangay Cagbaoto, Bayabas, Surigao del Sur



**Model:** Agile Software Development Life Cycle



**Respondents:** Barangay officials, local vendors, residents

# SYSTEM ARCHITECTURE

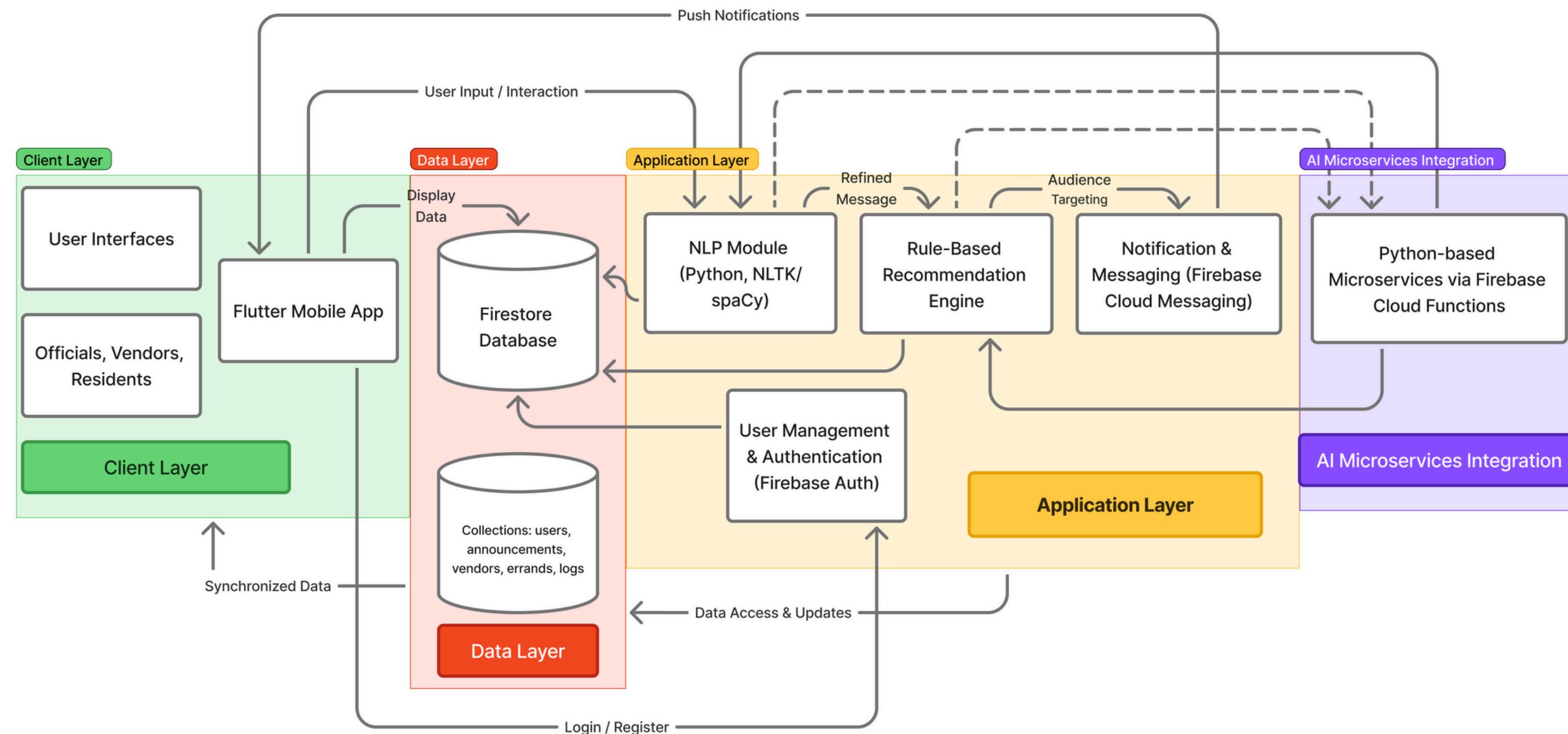


Figure 2. System Architecture of LINKod

# FLOWCHARTS

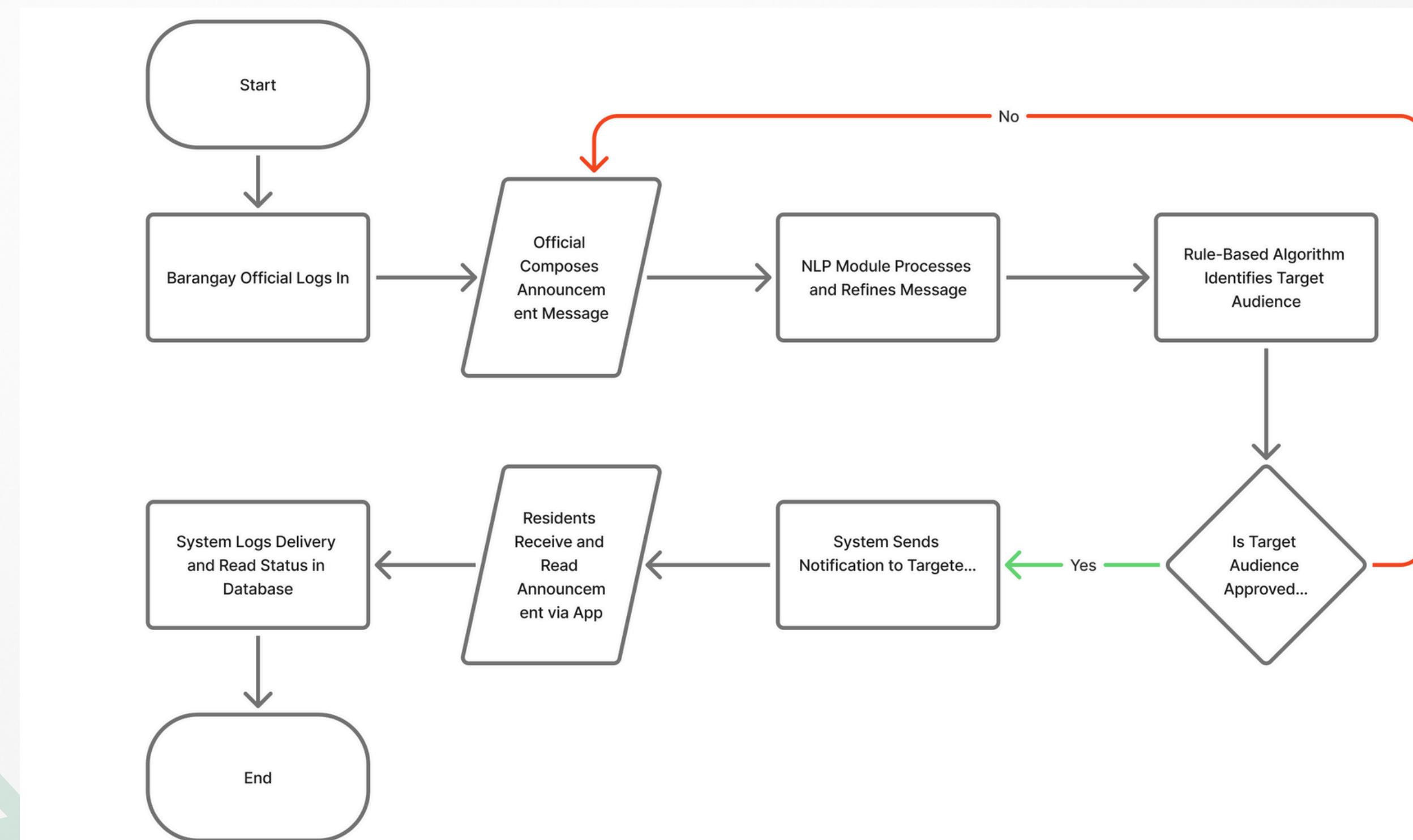


Figure 3. Information Dissemination Flow

# FLOWCHARTS

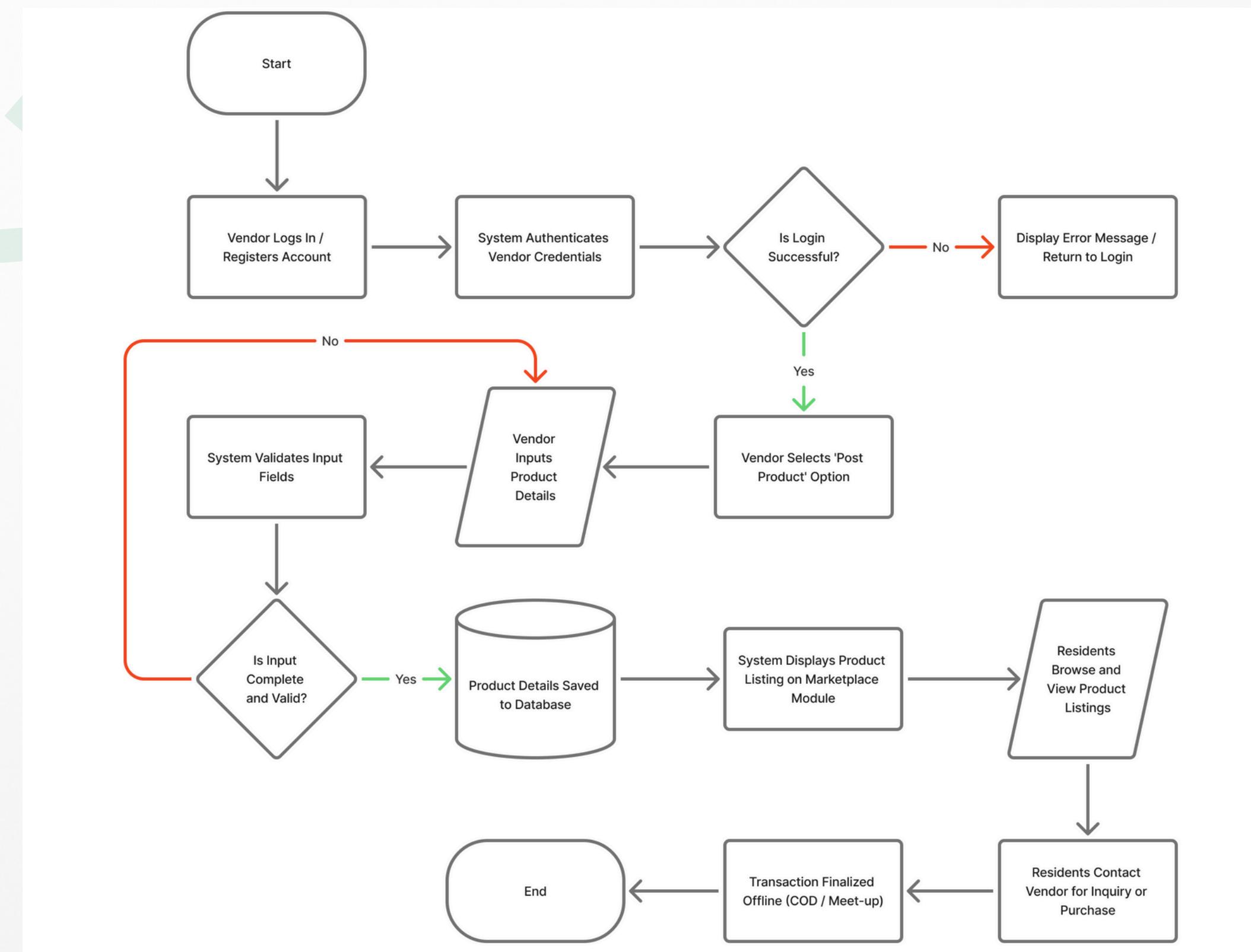


Figure 3. Information Dissemination Flow

# FLOWCHARTS

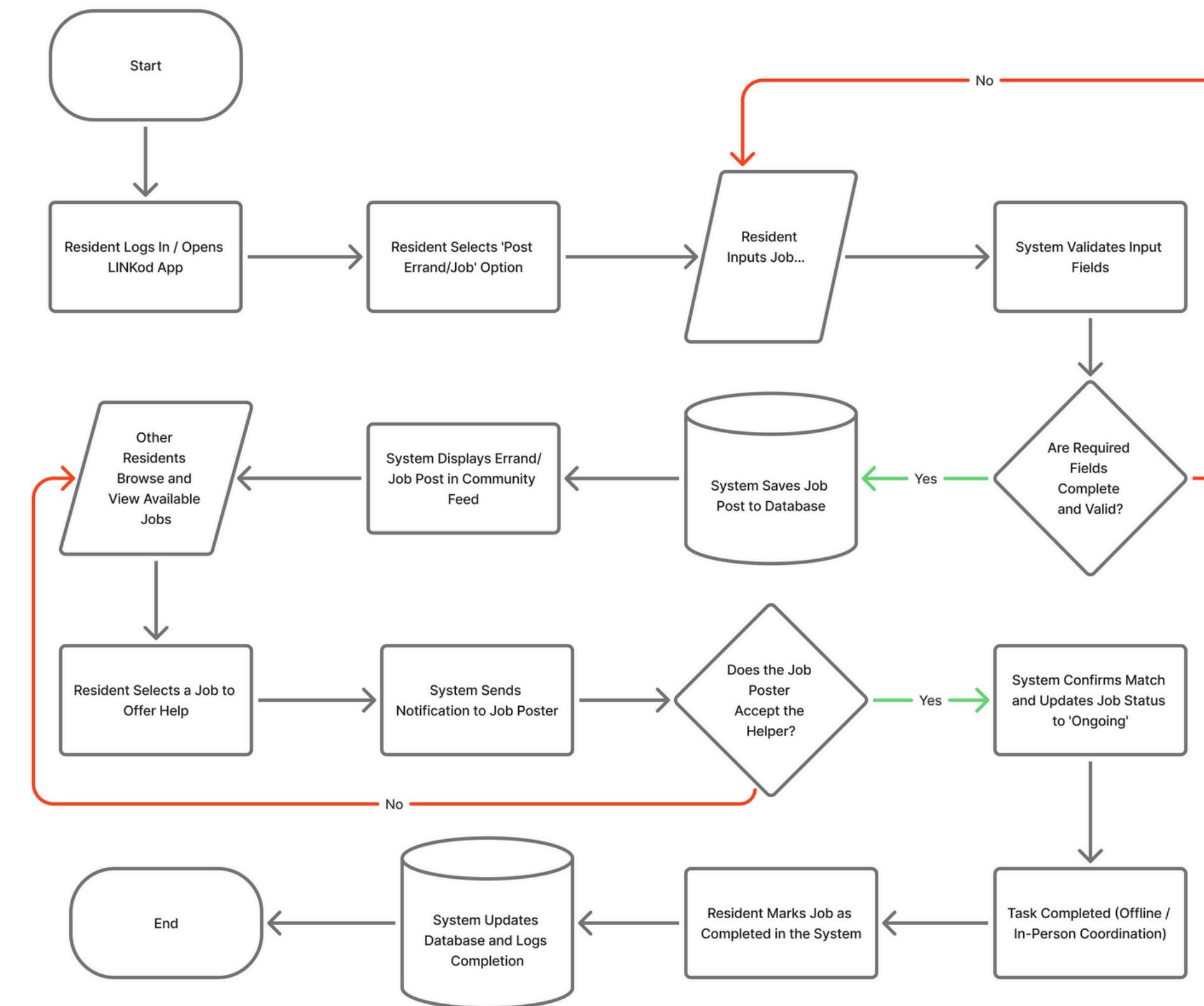


Figure 3. Information Dissemination Flow

# RESEARCH INSTRUMENT

- Structured questionnaire (5-point Likert scale)
- Adapted from System Usability Scale (sus) and TAM
- Expert validation process
- Cronbach's Alpha reliability testing



# STATISTICAL TREATMENT

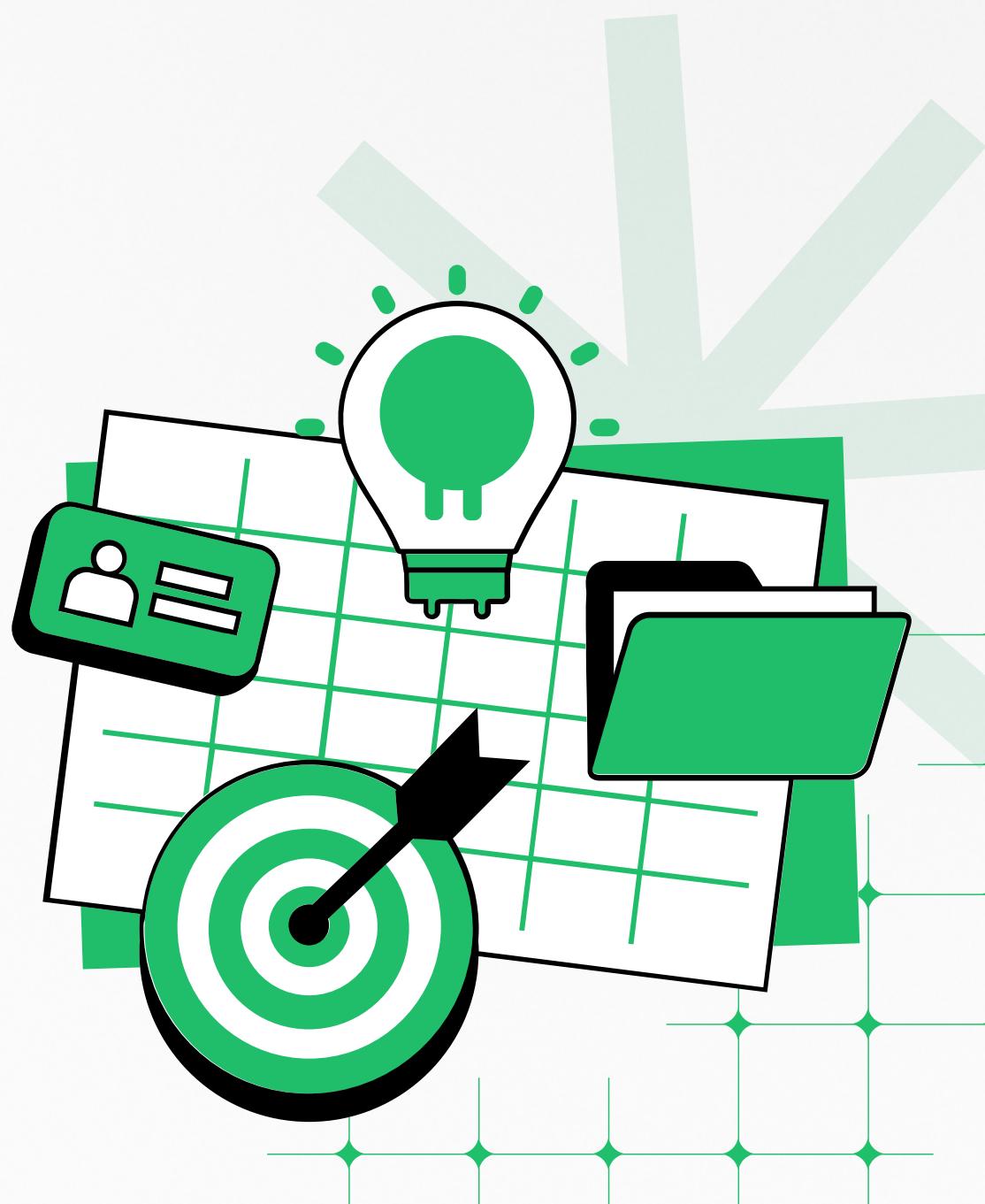


- Descriptive statistics (mean, frequency, percentage)
- Likert scale interpretation
- Usability and effectiveness metrics

# MATERIALS

The following materials were used during the research:

- Survey and interview forms
- Evaluation sheets
- Laptops and mobile devices for testing
- Internet connection for data access
- Documentation tools (Google Docs, Google Sheets, Canva)
- Recording Devices (Smartphone Recorder or Laptop Microphone)



# SOFTWARE

The development utilized the following software and tools:

- **Flutter** – for mobile application development
- **Firebase** – for real-time database and authentication
- **Python (NLTK library)** – for NLP text processing
- **Visual Studio Code** – for coding and debugging
- **Figma** – for user interface design
- **Google Colab / Jupyter Notebook** – for algorithm prototyping

- **Google Workspace (Docs, Sheets, Slides, Drive)** – for documentation, file sharing, and collaborative editing among researchers.
- **Microsoft Excel / SPSS** – for data analysis
- **Zoom / Google Meet** – for online meetings, consultations, and remote coordination with advisers and respondents.

# HARDWARE

- **Laptop (Intel Core i5, 8GB RAM, 512GB SSD)** – for development and testing
- **Secondary Laptop (Intel Core i5, 8GB RAM)** – used for additional testing and parallel development tasks.
- **Android smartphones (version 10 or higher)** – for user testing

- **Wireless internet connection (minimum 10 Mbps)** – for cloud communication
- **External Storage (Flash Drives, External HDD/SSD, or Cloud Storage)** – for regular data backup and secure storage of system files.

# SCHEDULE AND TIMELINE (GANTT CHART)

The following chart outlines the project's phased schedule and key milestones.

**Table 1. Schedule and Timeline (Gantt Chart)**

Project phase	Activities	Months	Week 1	Week 2	Week 3	Week 4
Planning Phase	Topic selection, title formulation, and approval with adviser	September 2025	■ ■ ■	■ ■ ■ ■	■ ■	
Research and Data Gathering Phase	Coordinating with Barangay Cagbaoto, creation of survey and interview questions, data collection from residents, vendors, and Barangay Captain	October 2025	■ ■	■	■ ■ ■ ■	■ ■ ■ ■
System Design Phase	Designing the initial UI layout and flow for the LINKod platform	November 2025	■ ■ ■ ■	■ ■ ■ ■		
System Development Phase	Developing system prototype, database structure, and user interface	December 2025 – January 2026	■ ■ ■ ■ ■	■ ■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■
Testing and Evaluation Phase	System testing, debugging, and revisions based on feedback	February 2026	■ ■ ■ ■	■ ■ ■ ■	■ ■	
Documentation Phase	Completion of Chapters 3–5 and revisions of previous chapters	March 2026	■ ■ ■ ■	■ ■ ■ ■		
Final Defense and Submission Phase	Preparation and finalization of documentation, presentation, and defense	April 2026	■ ■ ■ ■ ■			

# PROJECT TEAM AND RESPONSIBILITIES

This table details the core project team members and their respective responsibilities.

**Table 2. Project Team and Responsibilities**

Name	Role	Responsibility
<b>Jun Mark C. Garcia</b>	<b>Project Leader</b>	<b>System design, integration, coordination</b>
<b>Kane Gabriel P. Estrada</b>	<b>Programmer</b>	<b>Front-end and Back-end development</b>
<b>Charyniel C. Vistal</b>	<b>Designer</b>	<b>UI/UX design</b>
<b>Andrew James L. Buenaflor</b>	<b>Research Analyst</b>	<b>Data gathering and documentation</b>

# BUDGET COST / MANAGEMENT PLAN

The estimated budget for project resources and activities is summarized below.

**Table 3. Budget Cost / Management Plan**

Item	Description	Estimated Cost (₱)
Internet & Hosting	Firebase, domain, and cloud functions	₱2,000
Software Licenses & Tools	Access to premium tools such as Figma (UI design), Canva (poster/presentation materials), and other design or prototyping software	₱1,000
Printing and Materials	Surveys, forms, documentation	₱800
Data Backup and Storage	External hard drive or cloud storage subscription for storing project files, system backups, and datasets	₱800

# BUDGET COST / MANAGEMENT PLAN

The estimated budget for project resources and activities is summarized below.

**Table 3. Budget Cost / Management Plan**

Transportation	Fieldwork, barangay coordination	₱1,500
Allowance for Participants	Snacks/incentives during evaluation	₱1,000
Miscellaneous and Contingency	Unforeseen costs such as extra printing, additional transportation, or technical adjustments	₱900
Equipment and Maintenance	Temporary use and maintenance of mobile devices, laptops, and accessories during system testing and evaluation	₱1,000
<b>Total Estimated Cost</b>		<b>₱9,000</b>



**Thank You!**

Questions & Clarifications