

INSTITUT D'ENSEIGNEMENT SUPÉRIEUR DE RUHengeri

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FACULTY OF SCIENCES AND INFORMATION TECHNOLOGY

DEPARTMENT OF COMPUTER SCIENCE

YEAR III SOFTWARE ENGINEERING

CLASS: A

MODULE: Artificial Intelligence (AI)

GROUP: 3

TOPIC: Artificial Intelligence (AI)

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Small Business Loan Eligibility

1. Problem Definition Access to financing is a significant barrier for small businesses in Rwanda and Africa. Many small business owners struggle to meet traditional loan requirements like collateral or extensive credit history. This project aims to automate the loan eligibility evaluation process using rule-based AI, improving financial inclusion and efficiency in loan approvals.

2. Key Stakeholders

Small Business Owners: Individuals or groups seeking loans to expand or sustain their businesses.

Financial Institutions: Banks, microfinance organizations, or SACCOs evaluating and disbursing loans.

Regulatory Authorities: Ensuring compliance with financial policies.

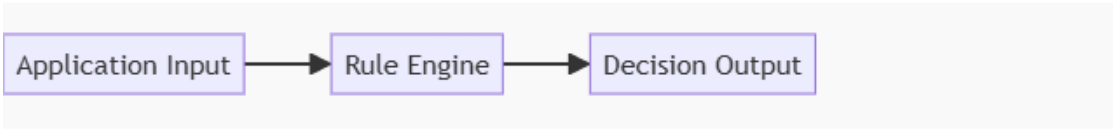
Developers: Implementing the automated decision-making process.

3. IF-THEN Rules

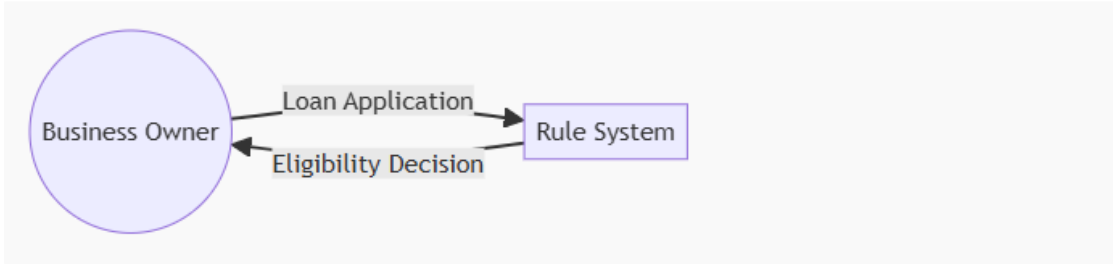
1. IF Business age < 6 months AND No collateral, THEN Loan Rejected.
2. IF Business age 6-12 months AND Revenue < 300,000 Frw, THEN Loan Rejected.
3. IF Business age 6-12 months AND Revenue \geq 300,000 frw AND Loan requested \leq 2x Monthly Revenue, THEN Eligible for Startup Loan (300,000 frw - 2,000,000 frw).
4. IF Business age 1+ year AND Revenue \geq 600,000 frw AND Loan requested \leq 3x Monthly Revenue, THEN Eligible (1,000,000 - 5,000,000 frw).
5. IF Business age 1+ year AND Revenue \geq 3,000,000 frw AND Collateral provided, THEN Eligible for higher loan amounts (5,000,000 - 10,000,000 frw).
6. IF Business has Unpaid Loans AND Default Rate > 30%, THEN Loan Rejected.
6. IF Business has Good Credit Score (\geq 700) AND Registered, THEN Higher Approval Chances.

CHART DIAGRAMS

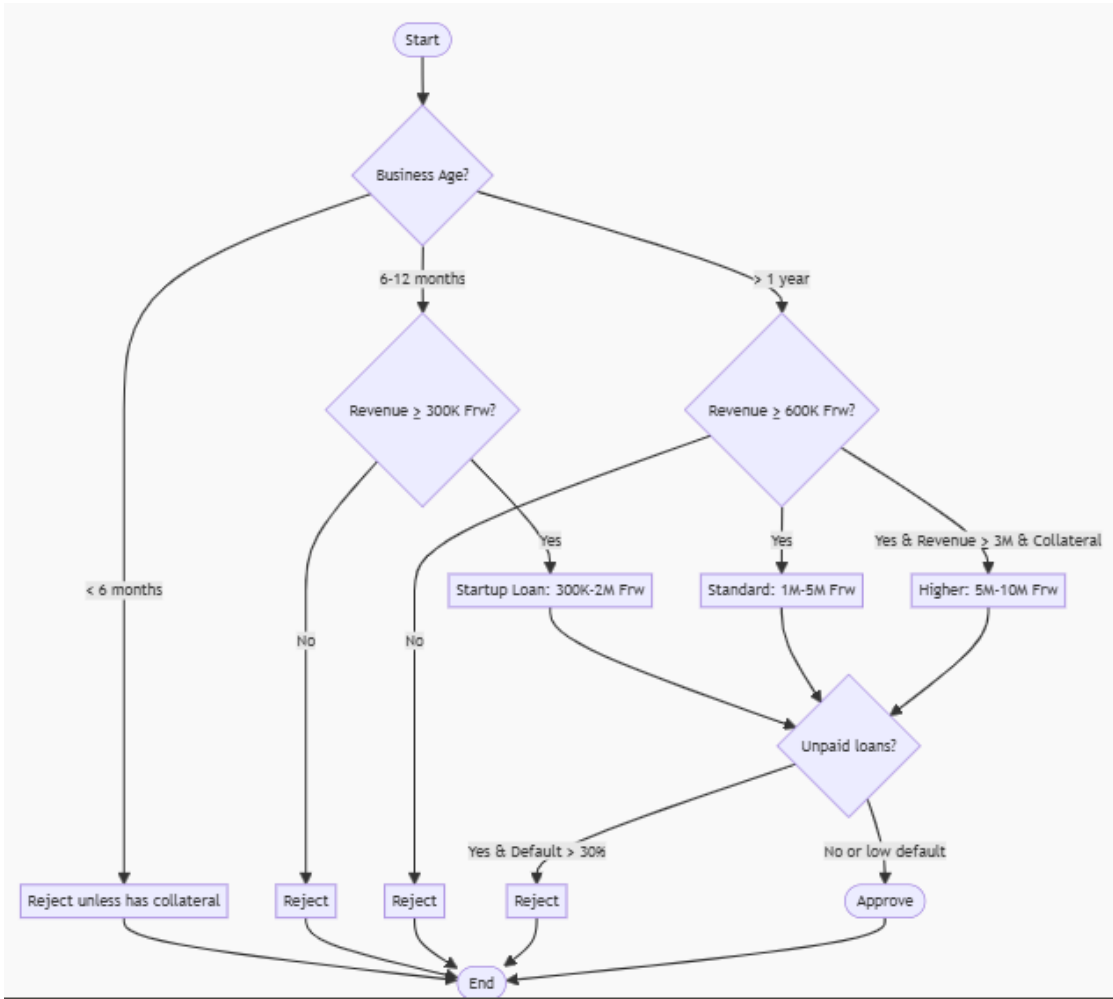
Architecture Diagram



Data Flow Diagram



Flow chart Diagram



USER REQUIREMENTS AND TESTING INITIAL RULES

A. LOAN ELIGIBILITY EVALUATION RULES (IF-THEN LOGIC)

1. Rule 1:

- ✓ **Condition:** Business age < 6 months AND No collateral
- ✓ **Action:** Loan Rejected
- ✓ **Reason:** New businesses with no collateral cannot be approved for loans.

2. Rule 2:

- ✓ **Condition:** Business age between 6-12 months AND Revenue < 300,000 Frw
- ✓ **Action:** Loan Rejected
- ✓ **Reason:** Early-stage businesses with insufficient revenue are not eligible for loans.

3. Rule 3:

- ✓ **Condition:** Business age between 6-12 months AND Revenue \geq 300,000 Frw AND Loan requested \leq 2x Monthly Revenue
- ✓ **Action:** Eligible for Startup Loan (Amount: 300,000 Frw - 2,000,000 Frw)
- ✓ **Reason:** Newer businesses with moderate revenue are eligible for smaller loan amounts.

4. Rule 4:

- ✓ **Condition:** Business age 1+ year AND Revenue \geq 600,000 Frw AND Loan requested \leq 3x Monthly Revenue
- ✓ **Action:** Eligible (Amount: 1,000,000 Frw - 5,000,000 Frw)
- ✓ **Reason:** Established businesses with higher revenue qualify for larger loans.

5. Rule 5:

- ✓ **Condition:** Business age 1+ year AND Revenue \geq 3,000,000 Frw AND Collateral provided
- ✓ **Action:** Eligible for higher loan amounts (Amount: 5,000,000 Frw - 10,000,000 Frw)

- ✓ **Reason:** Established businesses with high revenue and collateral are eligible for substantial loans.

6. **Rule 6:**

- ✓ **Condition:** Business has Unpaid Loans AND Default Rate > 30%
- ✓ **Action:** Loan Rejected
- ✓ **Reason:** Businesses with high default rates and unpaid loans pose too high a risk.

7. **Rule 7:**

- ✓ **Condition:** Business has Good Credit Score (≥ 700) AND Registered
- ✓ **Action:** Higher Approval Chances
- ✓ **Reason:** A good credit score and proper registration increase the likelihood of loan approval.

B. TESTING RULES AND SCENARIOS

1. Test Case: Loan Rejected due to Business Age and Lack of Collateral

- ✓ **Input:**
- ✓ Business Age: 5 months
- ✓ Collateral: No
- ✓ **Expected Output:** Loan Rejected

2. Test Case: Loan Rejected due to Insufficient Revenue for Businesses between 6-12 months

- ✓ **Input:**
- ✓ Business Age: 9 months
- ✓ Revenue: 250,000 Frw
- ✓ **Expected Output:** Loan Rejected

3. Test Case: Eligible for Startup Loan for Businesses between 6-12 months with Sufficient Revenue

- ✓ **Input:**
- ✓ Business Age: 9 months
- ✓ Revenue: 350,000 Frw
- ✓ Loan Requested: 600,000 Frw
- ✓ **Expected Output:** Eligible for Startup Loan (300,000 Frw - 2,000,000 Frw)

4. Test Case: Eligible for Higher Loan with Established Business and Sufficient Revenue

✓ **Input:**

- ✓ Business Age: 1 year
- ✓ Revenue: 700,000 Frw
- ✓ Loan Requested: 2,000,000 Frw
- ✓ **Expected Output:** Eligible for loan (1,000,000 Frw - 5,000,000 Frw)

5. Test Case: Eligible for Higher Loan with Established Business, High Revenue, and Collateral

✓ **Input:**

- ✓ Business Age: 2 years
- ✓ Revenue: 4,000,000 Frw
- ✓ Collateral: Yes
- ✓ **Expected Output:** Eligible for higher loan (5,000,000 Frw - 10,000,000 Frw)

6. Test Case: Loan Rejected due to Unpaid Loans and High Default Rate

✓ **Input:**

- ✓ Unpaid Loans: Yes
- ✓ Default Rate: 35%
- ✓ **Expected Output:** Loan Rejected

7. Test Case: Higher Approval Chances with Good Credit Score and Registration

✓ **Input:**

- ✓ Credit Score: 750
- ✓ Registered: Yes
- ✓ **Expected Output:** Higher Approval Chances

8. Test Case: Loan Rejected due to Business Age and Insufficient Revenue

✓ **Input:**

- ✓ Business Age: 8 months
- ✓ Revenue: 200,000 Frw
- ✓ **Expected Output:** Loan Rejected

9. Test Case: Loan Rejected due to High Default Rate (if unpaid loans condition is met)

✓ **Input:**

- ✓ Business Age: 2 years
- ✓ Revenue: 1,500,000 Frw
- ✓ Default Rate: 40%
- ✓ Unpaid Loans: Yes
- ✓ **Expected Output:** Loan Rejected

C. TEST PLAN

1. Unit Testing:

- ✓ Test individual rules with mock inputs to verify that the system behaves as expected for each rule.
- ✓ Ensure that the correct loan eligibility message is returned based on the rules defined.

2. Integration Testing:

- ✓ Combine different conditions (e.g., age, revenue, collateral) to verify that the rules are evaluated together as expected.
- ✓ Test edge cases, such as a business exactly at 6 months or with exactly 700 credit score.

3. Then perform system testing.

OUTPUT AND RESULTS

1. User inputs




Business Loan Application

Complete the form below to check your loan eligibility

Business Information

 Business Owner Name:

e.g., Cyprien

 Business Age (months):


e.g., 12

Financial Details

 Monthly Revenue (Frw):

 Requested Loan Amount (Frw):

Financial Details

 Monthly Revenue (Frw):

e.g., 500,000

Enter average monthly revenue

 Requested Loan Amount (Frw):

e.g., 2,000,000

Range: 300,000 - 10,000,000 Frw

Credit Assessment

 Has Collateral:

Select an option

 Credit Score:

Score range: 300-850

Higher score increases approval chances

Additional Information

Additional Information

 Has Unpaid Loans:

Select an option

 Default Rate (%):

e.g., 30


Enter 0 if no previous loans

 Business Registration Status:


Select an option

 Check Loan Eligibility


2. Loan Rejected





Loan Application Result


 **Hello Cyprien hr**


Unfortunately, we cannot approve your loan application at this time.


 **Reasons for Rejection:**


 Did not qualify for any loan category


 **Application Summary**


 Business Age:
20 months


 Monthly Revenue:
500,000 Frw


 Collateral:
No

 Credit Score:
300

 Unpaid Loans:
No

 Default Rate:
30%

 Registered:
Yes

 Try Again

3. Loan Accepted

