Microinsurance Platform: Accounting Framework & Algorithm

Context: Republic of Kenya | Currency: KES | Platform: Fineract (Deployed by Atronach)

PART 1: SYSTEM OVERVIEW & KEY PARTIES

1.1 Business Model & Participants

A technology-enabled microinsurance scheme for Bodaboda riders in Kenya, featuring delayed premium remittance to the insurer and a fair refund mechanism.

Entity Role Bank Ledger Responsibility

Atronach K Limited Platform Developer & Operator UBA (Operating Account) Maintains primary ledger in Fineract

KBA Bodaboda Association (Marketing/Mobilization) UBA Receives fees via automated distribution

Robs Insurance Agency Licensed Insurance Intermediary UBA Receives fees & commission via automated distribution

Definite Assurance Ltd Underwriter (Insurance Company) Their Bank Receives premiums & pays commission

UBA Escrow Bank & M-Pesa Paybill Processor - Holds escrow, executes automated splits

Bodaboda Rider Policyholder Mobile Money (M-Pesa) Pays via Paybill number 123456

1.2 Payment Flow Architecture

Rider Payment (M-Pesa) → UBA Paybill → UBA Escrow Account → Automated Distribution

Key Features:

1. Day 1 Premium: Immediately remitted to Definite

2. Days 2-31 Premiums: Accumulated in escrow, remitted in bulk on Day 31

3. Service Fees (KES 3/day): Distributed daily to partners

4. Refunds: Available anytime (90% of accumulated premiums returned)

5. Commission: Paid by Definite on 5th of next month based on actual premiums received

1.3 Chart of Accounts (Key Accounts Only)

Asset Accounts:

1001: Cash at Bank - UBA Escrow Account

1002: Cash at Bank - Atronach Operating Account

1101: Receivable from Definite (Commission)

Liability Accounts:

2001: Premium Payable to Definite (Accrued)

2002: Service Fee Payable to KBA

2003: Service Fee Payable to Robs

2004: Commission Payable to KBA

2005: Commission Payable to Robs

2101: Refund Payable to Riders

Income Accounts:

4001: Atronach - Service Fee Income

4002: Atronach - Commission Income (Platform O&M)

4003: Atronach - Commission Income (Profit Share)

4004: Atronach - Reversal Fee Income

Expense Accounts:

5001: Atronach - Platform Maintenance Costs

5002: Atronach - Transaction Costs

PART 2: TRANSACTION JOURNAL ENTRIES

2.1 Day 1: Rider Onboarding (KES 1,048)

Payment Components:

· Total: KES 1,048

· Premium: KES 1,045 (to Definite)

· Service Fee: KES 3 (KES 1 each to Atronach, KBA, Robs)

Journal Entry 1A: Initial Recognition

Date: [Day 1]

Description: Rider [ID] Day 1 Payment Received

Debit:

1001 Cash at Bank - UBA Escrow Account KES 1,048

Credit:

2001 Premium Payable to Definite (Accrued) KES 1,045

2002 Service Fee Payable to KBA KES 1

2003 Service Fee Payable to Robs KES 1

4001 Atronach - Service Fee Income KES 1

Journal Entry 1B: Immediate Day 1 Premium Remittance

(Executed by UBA Escrow System)

Description: Day 1 Premium Remittance to Definite

Debit:

2001 Premium Payable to Definite (Accrued) KES 1,045

Credit:

1001 Cash at Bank - UBA Escrow Account KES 1,045

UBA simultaneously transfers KES 1,045 to Definite's bank account

Journal Entry 1C: Daily Service Fee Distribution

Description: Service Fee Distribution - Day 1

Debit:

2002 Service Fee Payable to KBA KES 1

2003 Service Fee Payable to Robs KES 1

4001 Atronach - Service Fee Income KES 1

Credit:

1001 Cash at Bank - UBA Escrow Account KES 3

UBA simultaneously transfers KES 1 each to Atronach, KBA, and Robs operating accounts

2.2 Days 2-31: Daily Installments (KES 87/day)

Payment Components:

· Total: KES 87

· Premium: KES 84 (accumulates in escrow)

· Service Fee: KES 3 (distributed daily)

Journal Entry 2A: Daily Installment Receipt

Date: [Day 2-31]

Description: Rider [ID] Daily Installment Day [X]

Debit:

1001 Cash at Bank - UBA Escrow Account KES 87

Credit:

2001 Premium Payable to Definite (Accrued) KES 84

2002 Service Fee Payable to KBA KES 1

2003 Service Fee Payable to Robs KES 1

4001 Atronach - Service Fee Income KES 1

Journal Entry 2B: Daily Service Fee Distribution

(Same as Entry 1C, repeated daily)

Description: Service Fee Distribution - Day [X]

Debit:

2002 Service Fee Payable to KBA KES 1

2003 Service Fee Payable to Robs KES 1

4001 Atronach - Service Fee Income KES 1

Credit:

1001 Cash at Bank - UBA Escrow Account KES 3

2.3 Day 31: Bulk Premium Remittance

Calculation: 30 days × KES 84 = KES 2,520 per completed rider

Journal Entry 3: Month-End Premium Settlement

Date: Day 31

Description: Bulk Premium Remittance to Definite for [Month]

Debit:

2001 Premium Payable to Definite (Accrued) KES [Total from all riders]

Credit:

1001 Cash at Bank - UBA Escrow Account KES [Total from all riders]

Example: For 100 riders completing term: KES 252,000

PART 3: REFUND PROCESSING & COMMISSION

3.1 Refund Processing Algorithm

Refund Rules:

1. Non-refundable: Day 1 Premium (KES 1,045) + All service fees
2. Refundable: 90% of accumulated premiums (Days 2 onward) in escrow
3. Reversal Fee: 10% of accumulated premiums, split:
   · 70% to Atronach
   · 15% each to KBA and Robs

Refund Formula:

Let d = day of refund request (d > 1)

Days paid beyond Day 1 = d - 1

Accumulated Premium = (d - 1) × 84

Refund to Rider = Accumulated Premium × 0.9

Reversal Fee = Accumulated Premium × 0.1

Atronach Share = Reversal Fee × 0.7

KBA Share = Reversal Fee × 0.15

Robs Share = Reversal Fee × 0.15

Journal Entry 4A: Refund Initiation

Date: [Refund Date]

Description: Refund to Rider [ID] on Day [d]

Debit:

2001 Premium Payable to Definite (Accrued) KES [Accumulated Premium]

Credit:

2101 Refund Payable to Riders KES [Refund Amount]

4004 Atronach - Reversal Fee Income KES [Atronach Share]

2004 Commission Payable to KBA KES [KBA Share]

2005 Commission Payable to Robs KES [Robs Share]

Journal Entry 4B: Refund Execution

Description: Payment of Refund & Reversal Fees

Debit:

2101 Refund Payable to Riders KES [Refund Amount]

4004 Atronach - Reversal Fee Income KES [Atronach Share]

2004 Commission Payable to KBA KES [KBA Share]

2005 Commission Payable to Robs KES [Robs Share]

Credit:

1001 Cash at Bank - UBA Escrow Account KES [Total]

UBA simultaneously sends refund to rider's M-Pesa and fees to partners

3.2 Commission from Definite (5th of Next Month)

Commission Calculation:

· Rate: 9% of actual pure premium received by Definite

· Pure Premium = Total Received × (3500/3565)

· Commission = Pure Premium × 9%

Commission Distribution of KES 315 (per full-term rider):

1. KES 100 to Atronach (Platform O&M)
2. KES 100 jointly to KBA & Robs (Mobilization, split 50/50)
3. KES 115 remaining:
   · KES 4 jointly to KBA & Robs (split 50/50)
   · KES 111 divided equally among all three (KES 37 each)

Final Per-Partner Commission (per full-term rider):

· Atronach: 100 + 37 = KES 137

· KBA: 50 + 2 + 37 = KES 139

· Robs: 50 + 2 + 37 = KES 139

Journal Entry 5A: Commission Receipt

Date: 5th of [Month]

Description: Commission from Definite for [Previous Month]

Debit:

1001 Cash at Bank - UBA Escrow Account KES [Total Commission]

Credit:

1101 Receivable from Definite (Commission) KES [Total Commission]

Journal Entry 5B: Commission Distribution

Description: Commission Allocation to Partners

Debit:

1101 Receivable from Definite (Commission) KES [Total Commission]

Credit:

4002 Atronach - Commission Income (Platform O&M) KES [Atronach O&M Total]

4003 Atronach - Commission Income (Profit Share) KES [Atronach Profit Total]

2004 Commission Payable to KBA KES [KBA Total]

2005 Commission Payable to Robs KES [Robs Total]

Journal Entry 5C: Commission Payout

Description: Commission Payment to Partners

Debit:

2004 Commission Payable to KBA KES [KBA Total]

2005 Commission Payable to Robs KES [Robs Total]

4002 Atronach - Commission Income (Platform O&M) KES [Atronach O&M Total]

4003 Atronach - Commission Income (Profit Share) KES [Atronach Profit Total]

Credit:

1001 Cash at Bank - UBA Escrow Account KES [Total Commission]

UBA transfers respective amounts to partner accounts

PART 4: ALGORITHM & CALCULATION BREAKDOWN

4.1 Complete Algorithm Pseudocode

```python
class MicroinsurancePlatform:

    # Constants
    DAY1_TOTAL = 1048
    DAY1_PREMIUM = 1045
    DAILY_TOTAL = 87
    DAILY_PREMIUM = 84
    SERVICE_FEE = 3
    PARTNERS = ["ATRONACH", "KBA", "ROBS"]
    COMMISSION_RATE = 0.09
    PURE_PREMIUM_RATIO = 3500/3565  # 98.18%

    def __init__(self):
        self.escrow_balance = 0
```

```
    self.premium_liability = 0
    self.riders = {}  # rider_id: {start_date, status, payments}

def process_day1_payment(self, rider_id):
    """Process Day 1 payment - immediate premium remittance"""
    # Journal Entry 1A
    self.escrow_balance += self.DAY1_TOTAL
    self.premium_liability += self.DAY1_PREMIUM

    # Immediate remittance to Definite (Entry 1B)
    self.escrow_balance -= self.DAY1_PREMIUM
    self.premium_liability -= self.DAY1_PREMIUM

    # Service fee distribution (Entry 1C)
    service_fee_each = self.SERVICE_FEE / len(self.PARTNERS)
    self.escrow_balance -= self.SERVICE_FEE

    # Record rider
    self.riders[rider_id] = {
        'start_date': 'current_date',
        'status': 'ACTIVE',
        'day1_paid': True,
        'daily_payments': 0,
        'total_premium_paid': self.DAY1_PREMIUM,
        'refunded': False
    }

def process_daily_installment(self, rider_id, day_number):
```

```
    """Process daily payment (Day 2-31)"""
    if rider_id not in self.riders:
        raise ValueError("Rider not found")

    # Journal Entry 2A
    self.escrow_balance += self.DAILY_TOTAL
    self.premium_liability += self.DAILY_PREMIUM

    # Service fee distribution (Entry 2B)
    self.escrow_balance -= self.SERVICE_FEE

    # Update rider record
    self.riders[rider_id]['daily_payments'] += 1
    self.riders[rider_id]['total_premium_paid'] += self.DAILY_PREMIUM

def process_refund(self, rider_id, refund_day):
    """Process rider refund request"""
    rider = self.riders[rider_id]

    if refund_day <= 1:
        raise ValueError("No refund available for Day 1")

    days_beyond_day1 = refund_day - 1
    accumulated_premium = days_beyond_day1 * self.DAILY_PREMIUM

    # Calculate refund amounts
    refund_to_rider = accumulated_premium * 0.9
    reversal_fee = accumulated_premium * 0.1
```

```
    atronach_share = reversal_fee * 0.7
    kba_share = reversal_fee * 0.15
    robs_share = reversal_fee * 0.15

    # Journal Entry 4A & 4B
    self.premium_liability -= accumulated_premium
    self.escrow_balance -= (refund_to_rider + reversal_fee)

    # Update rider status
    rider['status'] = 'REFUNDED'
    rider['refund_day'] = refund_day
    rider['refund_amount'] = refund_to_rider
    rider['refunded'] = True

    return {
        'refund_to_rider': refund_to_rider,
        'reversal_fee': reversal_fee,
        'atronach_share': atronach_share,
        'kba_share': kba_share,
        'robs_share': robs_share
    }

def process_month_end(self):
    """Process Day 31 bulk remittance"""
    active_riders = [r for r in self.riders.values()
                     if r['status'] == 'ACTIVE' and not r['refunded']]
```

```
    total_premium = len(active_riders) * 30 * self.DAILY_PREMIUM

    # Journal Entry 3
    self.premium_liability -= total_premium
    self.escrow_balance -= total_premium

    return total_premium

def calculate_commission(self, month):
    """Calculate commission for the month"""
    # Total premium received by Definite
    total_to_definite = 0

    for rider in self.riders.values():
        if rider['start_date'].month == month:
            # All riders pay Day 1 premium
            total_to_definite += self.DAY1_PREMIUM

            # Only non-refunded riders pay remaining premiums
            if not rider['refunded']:
                total_to_definite += (rider['daily_payments'] * self.DAILY_PREMIUM)

    # Calculate pure premium (removing Definite's internal fees)
    pure_premium = total_to_definite * self.PURE_PREMIUM_RATIO

    # Commission calculation
    total_commission = pure_premium * self.COMMISSION_RATE
```

```
        # Distribution per full-term equivalent rider
        full_term_riders = len([r for r in self.riders.values()
                                if not r['refunded'] and r['daily_payments'] == 30])

        atronach_total = full_term_riders * 137
        kba_total = full_term_riders * 139
        robs_total = full_term_riders * 139

        return {
            'total_to_definite': total_to_definite,
            'pure_premium': pure_premium,
            'total_commission': total_commission,
            'atronach_share': atronach_total,
            'kba_share': kba_total,
            'robs_share': robs_total,
            'full_term_riders': full_term_riders
        }
```

4.2 Detailed Calculation Examples

Example 1: Full-Term Rider (31 Days)

Day 1:

Payment: 1,048

To Definite: 1,045 (immediate)

Service Fees: 3 (1 each to partners)

Days 2-31 (30 days):

Daily Payment: 87 × 30 = 2,610

Premium in Escrow: 84 × 30 = 2,520

Service Fees: 3 × 30 = 90 (30 each to partners)

Day 31:

To Definite: 2,520 (bulk remittance)

Total to Definite: 1,045 + 2,520 = 3,565

Total Rider Paid: 1,048 + 2,610 = 3,658

Total Service Fees: 3 + 90 = 93

Commission (5th next month):

Pure Premium: 3,565 × (3500/3565) = 3,500

Commission: 3,500 × 9% = 315

Atronach Receives: 137

KBA Receives: 139

Robs Receives: 139

Example 2: Refund on Day 11

Day 1-10 paid (11 total days including Day 1):

Day 1 Premium: 1,045 (to Definite, non-refundable)

Days 2-10 Premiums: 9 days × 84 = 756 in escrow

Refund Calculation:

Refundable Amount: 756 × 90% = 680.40 to rider

Reversal Fee: 756 × 10% = 75.60

Atronach: 75.60 × 70% = 52.92

KBA: 75.60 × 15% = 11.34

Robs: 75.60 × 15% = 11.34

Total to Definite: Only Day 1 premium of 1,045

Commission Base: Only on 1,045 (reduced proportionally)

4.3 Reconciliation Checklist

Daily:

1. Match M-Pesa collections to escrow receipts
2. Verify service fee distributions (KES 3 × number of riders)
3. Reconcile escrow bank balance with ledger

Monthly:

1. Verify Day 31 bulk remittance matches premium liability
2. Reconcile total to Definite with their statement
3. Verify commission calculation based on actual premiums
4. Match partner payments with distribution schedule

Key Performance Metrics:

· Active Rider Count

· Refund Rate

· Escrow Balance vs. Liability

· Commission Efficiency Ratio

· Service Fee Collection Rate

4.4 Risk Controls & Audit Trail

1. Dual Authorization: Refunds above KES 5,000 require dual approval
2. Escrow Reconciliation: Daily automated reconciliation with UBA
3. Commission Audit: Monthly audit of commission calculations
4. Rider Verification: KYC verification before Day 1 payment
5. Data Backups: Daily backup of all transaction records

Implementation Notes:

1. This system assumes all bank transfers happen same-day (T+0)
2. M-Pesa transaction costs are borne by the riders (included in amounts)
3. All figures in Kenya Shillings (KES)
4. The system must comply with Insurance Regulatory Authority (IRA) guidelines
5. Tax implications (VAT, withholding tax) are not included in this model
6. The escrow account must be interest-bearing, with interest allocated per partnership agreement

This comprehensive framework provides a complete accounting, algorithmic, and operational guide for implementing the microinsurance platform in Kenya's regulatory environment.