OPERATIONAL DECISION-MAKING & OVERRIDE PROTOCOL LIBRARY

Version 2.0 - Post-Validation Revision

INTRODUCTION & RATIONALE

This library provides a standardized protocol for the most critical and recurring decisions in Uganda's health supply chain. It is built directly from the scenarios and challenges documented in the 2025 Baseline Assessment. The purpose is not to automate these decisions, but to provide a clear, consistent framework that supports human judgment through data-driven recommendations and a structured override process.

The philosophy is: The system informs, the health worker decides. This ensures that local knowledge and clinical judgment are preserved while leveraging predictive analytics where beneficial.

CORE DECISION-MAKING PROTOCOL

Every decision scenario follows a standard structure to ensure clarity and consistency:

- Trigger: What event or condition initiates this decision?
- System recommendation: What does the forecasting system (Tier 1, 2, or 3) suggest?
- Decision authority: Who is empowered to make the final call?
- Override and adjustment process: How does the user accept, modify, or reject the system's suggestion?
- Required data inputs: What information is needed to make an informed decision?
- Expected outcome: What is the goal of this decision?

Foundational Principle: Local Edits Always Win

CRITICAL DESIGN PRINCIPLE: In all decision scenarios, when conflicts arise between system recommendations and user adjustments, the facility worker's local edit is preserved. This 'local edits always win' policy reflects the technical validation finding that health workers on the ground have contextual knowledge algorithms cannot capture.

The system logs conflicts for review by district officers, but cannot retroactively override facility decisions without explicit facility consent. This design builds trust and acknowledges the reality that frontline workers have ground truth about their facility's needs.

Tier 2 Forecasts: Advisory Context, Not Operational Orders

When Tier 2 hierarchical statistical forecasts are mentioned in use cases, these are informational only. Tier 2 forecasts are generated by district-level models and pushed to facilities during sync for comparison purposes. They provide a 'second opinion' but do not replace the operational Tier 1 rule-based forecast that drives actual order generation. Facility staff can view Tier 2 forecasts in a separate 'District Insights' section of the mobile app but the primary ordering workflow uses Tier 1.

USE CASE LIBRARY - STANDARDIZED SCENARIOS

UC-01: Routine Weekly Ordering with Storage Constraints

- Baseline context: Facilities with inadequate storage capacity experienced the most stockouts ($r = -0.695$).
- Trigger: Weekly inventory count is completed in the offline app.
- System recommendation: Tier 1 forecast calculates a recommended order, visibly capped by the facility's storage capacity (e.g., capped at 70% of calculated demand due to inadequate storage).
- Decision authority: Facility Store Manager/In-Charge.

Override Process:

- Adjust up: If temporary storage is available, user can override the cap.
  - Mandatory reason: Temporary storage arranged.
- Adjust down: If budget is constrained or consumption is falling, user can reduce the order.
  - Mandatory reason: Budget constraint or lower consumption trend.
- Data inputs: Current stock, last 3-month consumption, storage capacity rating.
- Expected outcome: An order that balances predicted demand with physical and financial realities.

UC-02: Disease Outbreak Response

- Baseline context: During disease outbreaks or seasonal surges, consumption may far exceed AI forecasts.
- Trigger: DHIS2 surveillance reports a >50% increase in specific disease cases OR a facility user manually activates 'Outbreak Mode'.
- System recommendation: Tier 1 forecast automatically applies a pre-set multiplier (e.g 2x for malaria). System alert displays: 'Outbreak Mode Active: Suggested order doubled to 2,000 Coartem.'
- Decision authority: Facility Clinical Officer/In-Charge.

Override Process:

- User can adjust the multiplier (1.5x, 3x, etc.) based on the scale and severity of the outbreak.
- - Mandatory reason: Selected from dropdown - Malaria Outbreak, Cholera Outbreak, Pneumonia Surge, Measles Outbreak, Other Clinical Judgment.
- Data inputs: DHIS2 surveillance data, facility outbreak reports, current stock levels.
- Expected outcome: Rapid response to outbreak demand surge, preventing stockouts during critical health emergencies.

UC-03: Response to Delivery Delays & Road Inaccessibility

- Baseline context: *"From May to September, we have the rainy season... blocks access to the facility"* - baseline respondent.
- Trigger: A delivery is marked late in WFP LESS OR a user reports road impassable due to weather.
- System recommendation: System receives delivery delay alert from LESS OR user report, then Tier 3 model suggests redistribution options from the nearest accessible facility with surplus stock.
- Decision authority: District Supply Officer.

Override Process:

- District officer reviews the redistribution suggestion.
- Officer can approve, modify the quantities, or reject the plan based on knowledge of ground logistics.
  - Mandatory reason: Roads impassable, redistribution approved, alternative route available.
- Data inputs: LESS delivery status, weather data, stock levels of nearby facilities.
- Expected outcome: Minimized stockout duration for facilities cut off by logistical challenges.

UC-04: Mid-Cycle Budget Reallocation

- Baseline context: *"Budget information was unavailable at most spoke facilities and budget management is a serious issue here"* - baseline respondent.
- Trigger: A mid-year budget top-up is received from the district or a donor.
- System recommendation: The central system recalculates facility budget ceilings and pushes updated, budget-aware Tier 1 forecasts to facilities upon their next sync.
- Decision authority: District Health Officer/Finance Officer.

Override Process:

- District officer can manually adjust the auto-allocated budgets to prioritize high-need or outbreak-affected facilities.
  - Mandatory reason: Donor funding received, reprioritization due to outbreak, unspent funds reallocated.
- Data inputs: Updated budget allocation, facility utilization rates, stockout risk scores.
- Expected outcome: Transparent and equitable budget utilization that responds to changing priorities.

UC-05: Manual Correction of Forecasting Errors

- Baseline context: Data or forecasting errors were cited as a key reason for human override.
- Trigger: A facility user identifies a clearly erroneous system forecast. Examples of clearly erroneous forecasts include: predicting zero quantities for essential items, quantities 50% higher/lower than recent consumption without seasonal justification, or recommendations based on outdated stock data.
- System recommendation: The Tier 1 forecast is displayed as usual.
- Decision authority: Any authorized facility user.

Override Process:

- User directly edits the forecast quantity to a correct value.
  - Mandatory reason: Data entry error, system forecasting error, changed consumption pattern.
- Data inputs: User's local knowledge, current stock ledger, recent consumption data.
- Expected outcome: Data quality improvement and prevention of stockouts due to system errors.

UC-06: Nutrition Program Enrollment Surge

- Baseline context: WFP stakeholder feedback emphasized nutrition supply adequacy for vulnerable populations including refugees and climate-affected communities. Persistent stockouts of nutrition supplies require improvisation and risk program effectiveness.
- Trigger: Nutrition Appointment Platform (WHO/WFP/UNICEF/UNHCR) reports 500+ new beneficiaries enrolled in nutrition program at facility or catchment area.
- System recommendation: Tier 3 district model automatically adjusts demand forecast for nutrition-specific commodities (Ready-to-Use Therapeutic Food, micronutrient supplements, oral rehydration salts) based on enrollment data. System generates allocation recommendations across affected facilities in the district.
- Decision authority: District Supply Officer in coordination with nutrition program officers.

Override Process:

- District officer reviews allocation recommendations across facilities serving the affected population.
- Officer can adjust allocation based on: geographic distribution of beneficiaries, facility storage capacity for nutrition commodities, existing stock levels, delivery logistics to refugee settlements or remote areas.
  - Mandatory reason: Nutrition program expansion, refugee influx, seasonal malnutrition spike, redistribution for equitable access.
- Data inputs: Nutrition Appointment Platform enrollment data, current nutrition commodity stock levels across district, facility capacity assessments, WFP LESS delivery schedules to affected areas.
- Expected outcome: Proactive stock allocation prevents nutrition commodity shortages during program scaling. Supply adequacy indicators are pushed back to Nutrition Appointment Platform to inform program planning.

INTEGRATION, MONITORING & LEARNING

- Integration: These use cases are embedded within the offline app and district dashboard workflows, following the Integration Maturity Model (Level 2: Opportunistic Sync).
- Monitoring: All overrides are logged with user, timestamp, original value, final value, and reason. These logs are:
    - For learning: To identify systematic forecasting errors and improve Tier 1 rules and Tier 3 models.
    - For accountability: To provide a transparent audit trail for procurement decisions.
    - No-blame principle: High override rates are a flag for system improvement, not user penalization. Override frequency above 50% for a specific commodity at a facility triggers investigation of forecasting assumptions, not disciplinary action.

VALUE-FOR-MONEY (V*f*M) ASSESSMENT FRAMEWORK

This framework evaluates the return on investment for the AI Framework using the standard 4E model. It separates hard financial savings from operational efficiency gains to ensure credibility with the Ministry of Health and donors.

Key V*f*M Indicators

- Economy (Spending Less):
    - Reduction in Expiries: The specific monetary value (UGX) of stock that expired because it was overstocked or not redistributed.
    - Emergency Logistics Costs: The reduction in hard costs associated with emergency runs (e.g fuel for district vehicles, per diems for drivers, or NMS surcharges).
    - Deployment Cost: Total project implementation cost per facility (derived from the £50,000 budget / 10 sites).
- Efficiency (Spending Well):
    - Capacity Released: Staff hours saved per ordering cycle (e.g reduction from 2 weeks to 2 days). *Note: This is treated as "time freed for care," not cash savings.*
    - Sync Reliability: Percentage of data uploads that succeed on the first attempt (Target: >90%). This measures if the "offline-first" investment is actually working.
- Effectiveness (Spending Wisely):
    - Stockout Reduction: Decrease in average stockout duration (Baseline: up to 120 days in Nakivale).
    - Forecast Accuracy: Improvement in Mean Absolute Percentage Error (MAPE) compared to the manual 3-month moving average currently in use.
- Equity (Spending Fairly):
    - Service Levelling: Reduction in the variance of stockout days between Regional Referral Hospitals (Mbarara) and refugee-hosting facilities (Nakivale Base Camp).

Data Sources & Calculation

Data Sources:

- Hard Costs: NMS Invoices (expiry values), District Fuel Logs (transport costs), Project Financial Reports (maintenance/hosting costs).
- Soft Metrics: System Activity Logs (sync rates, order processing time), DHIS2 (stockout duration).

VfM Calculation (Sample):

This calculation focuses strictly on cash-releasable savings.

- Total Annual Cost: UGX 50 million (Estimated annual maintenance, server costs and support based on the £200 hosting + personnel retainer).
- Total Annual Savings:
    - *Drug Expiry Reduction:* UGX 80 million (Value of saved stock).
    - *Logistics Savings:* UGX 20 million (Fuel/Per diems saved from fewer emergency runs).
    - *Total Hard Savings:* UGX 100 million.

- Financial ROI:

$$\frac{\text{UGX 100M (Savings)} - \text{UGX 50M (Cost)}}{\text{UGX 50M (Cost)}} = 100\% \text{ Return}$$

Governance

- Quarterly Technical Reviews: As recommended in the Validation Report, technical performance (MAPE, Sync rates) is reviewed quarterly to fix model drift.
- Annual Financial Review: MoH and partners evaluate the Financial ROI to determine if the system pays for itself in saved commodities.

Document Version: Final (post-technical validation)
Date: November 2025
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DOCUMENT REVISION HISTORY

Version	Date	Changes
1.0	October 2025	Initial decision-making use case library with five standard scenarios (UC-01 through UC-05) based on 2025 baseline assessment findings.
2.0	November 2025	Post-validation revision incorporating: - Added Section 2.1: Foundational principle of 'Local Edits Always Win' conflict resolution policy aligned with technical validation findings and stakeholder feedback - Added Section 2.2: Clarification that Tier 2 hierarchical forecasts are advisory/informational only, not operational orders - Added UC-06: Nutrition Program Enrollment Surge use case responding to WFP stakeholder emphasis on nutrition supply adequacy for vulnerable populations (refugees, climate-affected communities) - UC-03 cleanup: Removed document markup, finalized text on delivery delay triggers and Tier 3 redistribution recommendations - Enhanced monitoring section: Added specific threshold (>50% override rate) that triggers forecasting assumption investigation - Integration with Nutrition Appointment Platform data flows specified in UC-06