# Smart ATM Cash Forecasting & Real-Time Refill System

Functional Requirement Document

Business Analyst Project Report
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## 1. Introduction:

### 1.1 Purpose

This Functional Requirement Document (FRD) defines how the Smart ATM Cash Forecasting & Real-Time Refill System will operate. It translates the business requirements into system behavior, functional modules, data flows, and detailed functional rules that developers and QA teams will use.

### 1.2 Scope

The FRD covers:

- Cash forecasting logic
- Real-time ATM monitoring
- Alerting mechanism
- Dashboard functionalities
- Route optimization
- Denomination calculation
- Notifications
- Reporting
- User roles and access levels

## 2. System Overview:

The system predicts ATM cash consumption based on historical transactions, weekdays, events, salary days, festival impact, and location trends. When cash levels drop below thresholds, alerts are triggered and refill routes are optimized.

## 3. Actors:

1. ATM Operations Manager
2. Cash Van Team
3. Branch Manager
4. Forecasting Engine
5. Notification Service

6.  System Administrator

## 4. Functional Requirements:

**4.1 ATM Cash Monitoring Module**

**FR-01: Real-Time Cash Level Fetching**

The system must fetch current cash levels for each ATM from the bank's ATM switch.

**FR-02: Cash Level Classification**

The system must classify ATMs based on cash availability:

- Normal: > 50%
- Warning: 20% – 50%
- Critical: < 20%

**FR-03: Last Refill Timestamp**

System must store last refill time for each ATM.

**4.2 Forecasting Module**

**FR-04: Historical Data Processing**

System must analyze past 90 days of withdrawal data.

**FR-05: Hourly Cash Usage Pattern**

System must calculate predicted hourly withdrawal values.

**FR-06: Daily Cash Requirement Prediction**

System must compute total cash required for next 24 hours.

**FR-07: Festival and Salary Day Adjustment**

System must auto-adjust predictions on:

- Salary credit days
- Public holidays
- Festival days
- Weekends

**FR-08: Accuracy Score**

System must compute a forecast accuracy score based on past performance.

### 4.3 Threshold Alerting Module

**FR-09: Low Cash Alert (Critical)**

When ATM cash < 20%, system must trigger immediate alert.

**FR-10: Warning Alert**

When ATM cash is between 20–50%, system must trigger a warning alert.

**FR-11: Notification Delivery**

The system must send alerts through:

- SMS

- Email

- Mobile App Notification

**FR-12: Alert Details**

Alert must include:

- ATM ID

- Current cash level

- Forecasted depletion time

- Priority score

- Location

### 4.4 Denomination Calculation Module

**FR-13: Denomination Breakdown**

System must calculate required:

- 100 rupee notes

- 200 rupee notes

- 500 rupee notes

- 2000 rupee notes

**FR-14: Optimization Based on Average Usage**

System must adjust denomination ratio based on previous patterns.

### 4.5 Refill Priority Module

**FR-15: Priority Score Calculation**

System must calculate a score using:

- Cash level

- Location

- Forecasted depletion

- ATM usage history

- Customer footfall index

**FR-16: Priority Color Coding**

System must visually mark ATMs as:

- Red: High priority

- Yellow: Medium

- Green: Low

**4.6 Cash Van Route Optimization Module**

**FR-17: Route Generation**

System must generate the most efficient route based on:

- Distance

- ATM priority

- Van capacity

- Traffic time

**FR-18: Real-Time Route Adjustment**

System must re-optimize route if:

- New critical ATM alert occurs

- Delays detected

- ATM goes offline

**4.7 Dashboard Module**

**FR-19: Dashboard View**

System must display:

- ATM ID

- Location

- Current cash level

- Forecasted cash

- Priority score

- Status (Normal/Warning/Critical)

**FR-20: Filter and Sorting**

User must filter by:

- City

- Status

- Priority

- Branch

**FR-21: Drill-Down View**

Clicking an ATM shows:

- Last refill

- Forecast graph

- Historical consumption

- Suggested refill amount

## 4.8 Notification Module

**FR-22: Manager Notification**

When refill is required, notify operations manager instantly.

**FR-23: Cash Van Assignment Notification**

Notify assigned cash van team with:

- Route details

- ATM list

- Priority levels

## 4.9 Reporting Module

**FR-24: Daily Report**

System must generate daily summary including:

- Total ATMs refilled

- Critical incidents

- Average cash usage

**FR-25: Weekly Forecast Report**

System must generate weekly trend-based report for management.

**5. Non-Functional Requirements:**

**NFR-01: Performance**

System must process cash level updates within 2 seconds.

**NFR-02: Availability**

System must be available 99.5% of the time.

**NFR-03: Security**

Only authorized users can view and edit dashboard data.

**NFR-04: Scalability**

System must support up to 10,000 ATMs.

**NFR-05: Usability**

Dashboard must load within 3 seconds.

**6. Assumptions:**

- ATM data feed is accurate and continuous.
- Users have secure login credentials.
- Notification gateways have 95% success rate.

**7. Constraints:**

- Cash van capacity limits.
- ATM hardware does not change.
- Public holidays may affect refill schedules.

**8. Dependencies:**

- ATM Switch data feed
- SMS/Email gateway
- Traffic API for routing
- Historical transaction database

**9. Approval:**

| Role | Name | Signature | Date |
| --- | --- | --- | --- |
| Business Analyst | | | |
| Product Owner | | | |
| Operations Manager | | | |
| Tech Lead | | | |