Reports & Insights Module Documentation

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1. Objective

This document defines the technical specifications for the **Reports & Insights** module.

It includes:

- Home/Dashboard screen
- Inventory Summary Report
- Spending Report
- Usage Rate Report
- Database data requirements

The purpose of this documentation is to ensure team alignment before and during implementation, reduce ambiguity in calculations, and prevent inconsistencies in queries and UI behavior.

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2. 1. Feature Scope (v1)

The following components are included in version 1:

2.1. 1.1 Home / Dashboard

The Dashboard provides a high-level summary of inventory and spending insights.

It must display:

- Total inventory items
- Low-stock items count
- Expiring soon items count
- Total spending (current month)
- Optional: Most used category

Each summary card must navigate to its corresponding full report.

2.2. 1.2 Inventory Summary Report

Provides aggregated insights about stored items.

Includes:

- Total items
- Breakdown by category

- Breakdown by room
- Low-stock count
- Expiring soon count

2.3. 1.3 Spending Report

Tracks spending behavior over time.

Includes:

- Total spending for selected time range
- Spending grouped by category
- Time-based trend (line chart)

Supported filters:

- Last 7 days
- Last 30 days
- Last 90 days

2.4. 1.4 Usage Rate Report

Measures how quickly items are consumed.

Includes:

- Usage per item
- Usage per category
- Time-based consumption trend

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3. 2. Metric Definitions

All calculations must follow the definitions below.

3.1. 2.1 Inventory Metrics

Total Items:

```
COUNT(inventory_items)
```

Low Stock:

```
Items where current_stock <= minimum_stock
```

Expiring Soon:

```
Items where expiration_date <= (current_date + defined_threshold_days)
```

3.2. 2.2 Spending Metrics

Total Spending (period):

```
SUM(purchase_events.cost)
WHERE purchase_date BETWEEN start_date AND end_date
```

Spending by Category:

```
SUM(cost) GROUP BY category_id
```

Monthly Spending:

```
SUM(cost) WHERE month(purchase_date) = current_month
```

All currency values must follow consistent formatting (e.g., 2 decimal places).

3.3. 2.3 Usage Rate Metrics

Usage Rate (per item):

```
Total quantity consumed / number_of_days_in_period
```

Where:

- Quantity consumed = SUM(usage_events.delta)
- Period = selected time range

Usage by Category:

```
SUM(usage_events.delta) GROUP BY category_id
```

If insufficient timestamp data exists, usage rate must return null or "Not enough data".

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4. 3. Database Data Contract

The Reports module depends on the following tables:

4.1. 3.1 inventory_items

Required fields:

- id
- user_id or home_id
- category_id
- room_id
- current_stock
- minimum_stock
- expiration_date

Indexes recommended:

- user_id/home_id
- category_id
- expiration_date

4.2. 3.2 purchase_events

Required fields:

- id
- item_id
- cost
- quantity
- purchase_date

Indexes recommended:

- item_id

- purchase_date
- user_id/home_id

4.3. 3.3 usage_events

Required fields:

- id
- item_id
- delta
- occurred_at

Indexes recommended:

- item_id
- occurred_at

Aggregation Strategy:

- Heavy grouping (SUM, GROUP BY) should be executed server-side.
- Dashboard queries must minimize round trips.
- Frequently accessed summaries may use lightweight caching.

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5. 4. Chart Guidelines

Inventory Breakdown: - Bar chart (by category or room) - Donut chart (distribution view)

Spending Trend: - Line chart (time-based)

Spending by Category: - Bar chart

Usage Trend: - Line chart

All charts must:

- Include axis labels
- Display units (currency, units/day, etc.)
- Handle empty states
- Display meaningful fallback when no data exists

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6. 5. Dashboard Behavior Specification

The Dashboard must:

- Display summary cards with real-time aggregated values
- Navigate to corresponding report on tap
- Show loading indicators while fetching data
- Display empty state if no data exists
- Display error state if query fails

Performance goal: Dashboard should load in under 1 second under normal conditions.

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7. 6. Edge Cases & Assumptions

Missing Price: - Exclude from spending totals or treat as 0 (decision must remain consistent).

Missing Timestamps: - Usage rate cannot be computed. - Return null or display "Insufficient Data".

Timezone: - All date calculations must use consistent timezone logic (UTC or defined app timezone).

Rounding: - Currency: 2 decimal places - Usage rate: up to 2 decimal places

Shared Homes: - Reports aggregate data at home_id level unless otherwise specified.

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8. Success Criteria

- This documentation file exists in the repository.
- All metrics include formulas and required fields.
- Queries can be implemented directly from this document.
- No calculation logic is undefined.
- Approved by Team Lead before full implementation.