

# Promotion Tracking Feature Implementation

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## Overview

The promotion tracking functionality in AKA AI Marketer is implemented through the integration of sales data analysis with promotion management. The system tracks two key metrics to measure promotion effectiveness:

1. **Sold Count** (**soldCount**): The total number of units sold during a promotion
2. **Sales Change** (**salesChange**): The difference in sales compared to a pre-promotion period

These metrics are calculated on-demand and displayed in the promotions management interface to help users measure the effectiveness of their marketing efforts.

## Sales Change Calculation Examples

The **salesChange** metric compares sales during the promotion with the average sales from a 30-day lookback window before the promotion. The system divides this lookback window into multiple periods of the same length as the promotion to get a fair comparison. This calculation helps determine if the promotion actually increased sales beyond normal levels.

### Example 1: Short Promotion Period

- Promotion: "Weekend Special" for "Margherita Pizza"
- Promotion Period: May 10-12, 2025 (3 days)
- During Promotion: 45 units sold
- 30-Day Lookback Window (April 10 - May 9):
  - Period 1 (May 7-9): 30 units
  - Period 2 (May 4-6): 25 units
  - Period 3 (May 1-3): 28 units
  - ... (and so on for 10 total 3-day periods)
- Average of all periods: 27 units
- Calculation:  $45 - 27 = +18$  units
- Result: **salesChange** = +18 (positive change)

### Example 2: Longer Promotion Period

- Promotion: "Breakfast Deal" for "Coffee" and "Croissant"
- Promotion Period: May 1-14, 2025 (14 days)
- During Promotion: 350 units sold
- 30-Day Lookback Window (April 1-30):
  - Period 1 (April 17-30): 280 units
  - Period 2 (April 3-16): 260 units
  - (Only 2 full 14-day periods fit in the 30-day window)
- Average of periods:  $(280 + 260) \div 2 = 270$  units
- Calculation:  $350 - 270 = +80$  units
- Result: **salesChange** = +80 (significant positive change)

# Implementation Details

## Backend Implementation

The promotion tracking functionality is primarily implemented in the `PromotionSerializer` class in the backend. The serializer adds two calculated fields that are not stored in the database but computed at runtime:

### 1. `get_sold_count` Method

- Calculates total units sold during the promotion period
- Filters sales data by product names and promotion date range
- Returns 0 for upcoming promotions that haven't started yet

### 2. `get_sales_change` Method

- Compares sales during the promotion with a previous equivalent period
- Returns the absolute difference in units sold
- Returns `None` for promotions that haven't started yet

## Data Flow

1. User loads the Promotions Management page
2. Backend calculates `soldCount` and `salesChange` for each promotion
3. Frontend displays the metrics with appropriate formatting
4. User can assess promotion effectiveness through these metrics

## Technical Considerations

### Performance Calculation

- **Lookback Window:** A 30-day window before the promotion start date is used for baseline comparison
- **Equivalent Periods:** The lookback window is divided into periods of the same length as the promotion
- **Averaging Method:** Multiple equivalent periods are averaged to establish a fair baseline
- **Product Scope:** Only products specifically associated with the promotion are included in the analysis

### Edge Cases

- **Upcoming Promotions:** For promotions that haven't started yet (status = "upcoming"):
  - `soldCount` is explicitly set to 0
  - `salesChange` is explicitly set to `null` (not displayed in the UI)
- **No Previous Data:** If no sales data exists for the comparison period but the promotion is active/ended:
  - `salesChange` equals the current promotion's sales
- **Zero Previous Sales:** If previous period had zero average sales:
  - `salesChange` equals the current promotion's sales

## User Experience

The promotion tracking indicators allow users to quickly assess the effectiveness of their promotions:

- **Positive Change (green):** The promotion is increasing sales
- **Neutral Change (gray):** The promotion is maintaining sales at previous levels
- **Negative Change (red):** The promotion is not performing as well as expected

This immediate visual feedback helps marketers make informed decisions about their promotion strategies.

## Integration with Other Features

The promotion tracking functionality integrates with:

1. **Sales Data Collection:** Uses the same data source as sales charts
2. **Promotion Management:** Displays directly in the promotion management interface
3. **AI Suggestions:** Performance data helps inform future promotion suggestions