Toy Store Dashboard

Complete Project Documentation - Step by Step Build Process

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1️⃣ Project Overview

🎯 Project Goal

Create a professional Business Intelligence dashboard system in Microsoft Excel that demonstrates advanced data modeling, DAX calculations, and professional visualization techniques for a toy store retail business.

📊 What We Built

- **2 Interactive Dashboards:** Sales Dashboard & Procurement Dashboard
- **Data Model:** Star Schema with 4 tables and relational integrity
- **10 Custom DAX Measures:** Revenue, Cost, Profit, Margin, Inventory metrics
- **Professional Design:** Custom gradient color palette, KPI cards, charts

> 💡 **Key Achievement:** Transformed 245,800 raw transaction records into actionable business intelligence with Power BI-level visualization quality in Excel.

🛠️ Tools & Technologies

Technology	Usage

Microsoft Excel	Primary platform for dashboard creation
Power Pivot	In-memory data model with relational tables
DAX	Custom calculated measures for KPIs
PivotTables	Dynamic data aggregation from Power Pivot
Advanced Charting	Custom formatted visualizations with gradients

2️⃣ Dataset Preparation

📁 Data Sources

We created synthetic realistic data for a toy store retail business spanning 1 full year (2025).

Table 1: sales.csv (Fact Table)

```
Sale_ID, Date, Store_ID, Product_ID, Units
206, 2025-01-02, 1, 130, 1
213, 2025-01-03, 1, 130, 1
...
Total Records: 245,800 transactions
```

- **Sale_ID:** Unique transaction identifier
- **Date:** Transaction date (full year 2025)
- **Store_ID:** Store location identifier (1-120)
- **Product_ID:** Product identifier (1-180)
- **Units:** Quantity sold

Table 2: products.csv (Dimension Table)

```
Product_ID, Product_Name, Product_Category, Product_Cost, Product_Price
1, Classic Teddy Bear, Plush, 8.50, 19.99
2, Mega Board Game, Board Games, 15.00, 34.99
...
Total Records: 180 products
```

- **180 unique products** across 16 categories
- **Categories:** Building Blocks, Action Figures, Arts & Crafts, Board Games, Dolls, Puzzles, etc.
- **Price range:** $5 - $50

Table 3: stores.csv (Dimension Table)

```
Store_ID, Store_Name, Store_City, Store_Location, Store_Open_Date
1, Downtown Store, New York, Urban, 2020-01-15
2, Riverside Mall, Los Angeles, Suburban, 2019-03-22
...
```

```
Total Records: 120 stores
```

- **120 store locations** across major US cities
- **Location types:** Urban, Suburban, Rural
- **Store age:** 2018-2024 opening dates

Table 4: inventory.csv (Fact Table)

```
Store_ID, Product_ID, Stock_On_Hand
1, 34, 26
1, 150, 26
...
Total Records: 14,143 inventory records
```

- **Current stock levels** for each store-product combination
- **Stock range:** 0-50 units per product per store

> **1 Data Loading Process:**
>
> 1. Created 4 CSV files with realistic retail data
> 2. Loaded each CSV into Excel as separate worksheets
> 3. Converted each range to Excel Table (Insert → Table)
> 4. Named tables: sales, products, stores, inventory

3️⃣ Power Pivot Setup

🔄 Enabling Power Pivot

> **1 Enable Power Pivot Add-in:**
>
> 1. File → Options → Add-ins
> 2. Manage: COM Add-ins → Go
> 3. Check ☑ Microsoft Power Pivot for Excel
> 4. OK → Power Pivot tab appears in ribbon

📊 Building the Data Model

> **2 Add Tables to Data Model:**
>
> 1. For each table: Select table → Power Pivot → Add to Data Model
> 2. Power Pivot window opens showing all 4 tables
> 3. Tables loaded into in-memory columnar database

🔗 Creating Relationships (Star Schema)

We created a **Star Schema** design with fact tables (sales, inventory) connected to dimension tables (products, stores).

> **3** **Define Relationships:**
>
> ```
> Relationship 1: sales[Product_ID] → products[Product_ID] (Many-to-One)
> Relationship 2: sales[Store_ID] → stores[Store_ID] (Many-to-One)
> Relationship 3: inventory[Product_ID] → products[Product_ID] (Many-to-One)
> Relationship 4: inventory[Store_ID] → stores[Store_ID] (Many-to-One)
> ```
>
> **How to create:**
>
> 1. Power Pivot → Diagram View
> 2. Drag Product_ID from sales to products
> 3. Drag Store_ID from sales to stores
> 4. Repeat for inventory table
> 5. Verify: All relationships show 1-to-Many cardinality

> ✅ **Result:** Fully normalized Star Schema with bi-directional filtering enabled for analysis.

⚠️ Common Issues & Solutions

> **Issue 1:** Text values in numeric columns (e.g., "1.5" instead of 1.5)
> **Solution:** Power Query → Transform → Data Type → Decimal Number
>
> **Issue 2:** Relationships not auto-detected
> **Solution:** Manually create in Diagram View, ensure matching column names

4️⃣ DAX Measures Creation

We created **10 custom DAX measures** to calculate key business metrics. All measures were created in the Power Pivot window.

📈 Sales Measures

1. Total Revenue

```
Total Revenue:=SUMX(sales, sales[Units] * RELATED(products[Product_Price]))
```

Logic: For each row in sales, multiply Units by Product_Price (from related products table), then sum all results.

Result: $9,862,933 total revenue

2. Total Cost

```
Total Cost:=SUMX(sales, sales[Units] * RELATED(products[Product_Cost]))
```

Logic: Similar to revenue but uses Product_Cost instead of Product_Price.

Result: $5,556,827 total cost

3. Total Profit

```
Total Profit:=[Total Revenue] - [Total Cost]
```

Logic: Simple subtraction of two existing measures.

Result: $4,306,106 total profit

4. Margin %

```
Margin %:=DIVIDE([Total Profit], [Total Revenue], 0)
```

Logic: Profit divided by Revenue, with 0 as default if division by zero.

Result: 43.7% profit margin

5. Units Sold

```
Units Sold:=SUM(sales[Units])
```

Logic: Simple sum of Units column in sales table.

Result: 567,270 units sold

6. Number of Transactions

```
Number of Transactions:=COUNTROWS(sales)
```

Logic: Count all rows in sales table.

Result: 245,800 transactions

📦 Inventory Measures

7. Total Stock Units

```
Total Stock Units:=SUM(inventory[Stock_On_Hand])
```

Logic: Sum of Stock_On_Hand column in inventory table.

Result: 338,993 units in stock

8. Stock Value

```
Stock Value:=SUMX(inventory, inventory[Stock_On_Hand] * RELATED(products[Product_Cost]))
```

Logic: For each inventory row, multiply stock quantity by product cost.

Result: $3,121,214 in inventory value

9. Stock to Sales Ratio

```
Stock_to_Sales_Ratio:=DIVIDE([Total Stock Units], [Units Sold], 0)
```

Logic: Stock divided by sales to show inventory coverage.

Result: 0.598 (59.8% stock-to-sales ratio)

10. Days of Inventory

```
Days_of_Inventory:=DIVIDE([Total Stock Units], [Units Sold], 0) * 365
```

Logic: Stock-to-sales ratio multiplied by 365 days.

Result: 218 days of inventory (7+ months of stock!)

> 💡 **DAX Best Practices Used:**
>
> - **SUMX vs SUM:** Used SUMX for row-by-row calculations with RELATED()
> - **DIVIDE():** Always used instead of / to handle division by zero
> - **Measure References:** Built complex measures from simpler ones
> - **Descriptive Names:** Clear, readable measure names with underscores

5️⃣ Sales Dashboard Design

🎨 Dashboard Architecture

We used a **layered architecture** with separate sheets for calculations and presentation:

- **Data Sheet:** PivotTables pulling from Power Pivot
- **Sales Dashboard Sheet:** Visual layer with shapes, charts, and formulas linking to Data

📊 Components Built

1. Gradient Header (Rows 1-5)

> **① Create Gradient Background:**
>
> 1. Insert → Shapes → Rounded Rectangle (cover A1:P5)
> 2. Format Shape → Fill → Gradient Fill
> 3. Type: Linear, Direction: Vertical (Down)
> 4. Gradient Stops:
>   - Stop 1 (0%): #2B9FED (light blue)
>   - Stop 2 (50%): #9B6FED (purple)
>   - Stop 3 (100%): #F76BB7 (pink)
> 5. Send to Back (so text is visible)

2. Logo & Title

- **Logo:** Toy_Store_logo.png inserted in A2:B5
- **Title:** "SALES DASHBOARD - 2025" in merged cells C2:M2
- **Font:** Segoe UI Bold, 24pt, White color

3. KPI Cards (4 cards, Rows 7-10)

2 **Create KPI Cards with Shapes:**

Why shapes? Excel textboxes don't support formulas, so we used shapes as backgrounds with cells containing formulas on top.

Card 1 - Total Revenue (B7:D10):

1. Insert Rounded Rectangle shape

2. Fill: #2B9FED (blue), No Line

3. Shadow: Outer, Offset Bottom Right

4. Label in B8: " 💰 Total Revenue" (white, bold)

5. Formula in C10:

```
="$"&ROUND(GETPIVOTDATA("[Measures].[Total Revenue]",Data!$B$2)/1000000,2)&"M"
```

6. Result displays: $9.86M

Cards 2-4: Repeated same process with different colors and measures:

- **Card 2 - Cost:** #9B6FED (purple), $5.56M

- **Card 3 - Profit:** #C77DFF (light purple), $4.31M

- **Card 4 - Margin:** #F76BB7 (pink), 43.7%

⚠️ **Important Lesson:** Polish Excel uses semicolons (;) instead of commas (,) in formulas. Custom number formats didn't work, so we used TEXT() and ROUND() functions instead.

4. Monthly Revenue Trend - Line Chart (B12:G25)

3 **Create Line Chart:**

1. **Data Sheet:** Create PivotTable

   - Rows: Date (grouped by Month)

   - Values: Total Revenue

   - Result: 12 months (Jan-Dec) with revenue per month

2. **Insert Chart:** Line with Markers

3. **Format Chart Area:**

   - Fill: #3B82F6 (blue)

   - Rounded corners

4. **Format Line:** White (#FFFFFF), 3pt width

5. **Format Markers:** White circles

6. **Axes:** Removed Y-axis (minimalist design), White X-axis labels

7. **Title:** "Monthly Revenue Trend" (white, bold, 16pt)

5. Top 10 Best-Selling Products - Bar Chart (H12:R25)

4 **Create Horizontal Bar Chart:**

1. **Data Sheet:** Create PivotTable

- Rows: Product_Name
- Values: Total Revenue
- Sort: Largest to Smallest
- Filter: Top 10 items

2. **Insert Chart:** Clustered Bar (horizontal)

3. **Format Bars:** Gradient Fill

- Stop 1 (0%): #9B6FED (purple)
- Stop 2 (100%): #F76BB7 (pink)
- Direction: Linear Right

4. **Reverse Categories:** Largest on top
5. **Data Labels:** White text at end of bars
6. **Background:** #3B82F6 (blue)

> ✅ **Final Result:** Professional sales dashboard with gradient design, 4 KPI cards showing key metrics, trend chart showing consistent monthly revenue, and top 10 products bar chart highlighting best sellers.

6️⃣ Procurement Dashboard Design

🎯 Purpose

Create a second dashboard focused on **inventory management and procurement analytics** to complement the sales view.

📦 Components Built

1. Header & KPI Cards

> **1** **Copy Header from Sales Dashboard:**
>
> 1. Copied gradient header and logo
> 2. Changed title to: "PROCUREMENT DASHBOARD - 2025"
> 3. Copied 4 KPI card shapes
> 4. Updated metrics to procurement-specific:
>   - **Card 1:** 📦 Total Stock Units - 339K
>   - **Card 2:** 💰 Stock Value - $3.12M
>   - **Card 3:** 📊 Stock/Sales Ratio - 59.8%
>   - **Card 4:** ⏱️ Days of Inventory - 218

> 💡 **Design Insight:** Days of Inventory = 218 is HIGH! Standard retail target is 60-90 days. This indicates potential overstock issue worth investigating.

2. Stock Distribution by Category - Donut Chart

2 **Create Donut Chart (Top 5 + Others):**

1. **Data Sheet PivotTable:**

   - Rows: Product_Category

   - Values: Total Stock Units

   - Filter: Top 5 categories

   - Manual addition: Created "Others" row with remaining stock (189,674 units)

2. **Why Top 5 + Others?** 16 categories in donut = unreadable. Simplified to 6 segments.

3. **Insert Chart:** Donut Chart

4. **Custom Colors:**

   - Arts & Crafts: #3B82F6 (blue)

   - Action Figures: #F97316 (orange)

   - Baby & Toddler: #8B5CF6 (purple)

   - Toy Vehicles: #06B6D4 (cyan)

   - Puzzles: #C77DFF (light purple)

   - Others: #10B981 (green) - 56% of stock!

5. **Data Labels:** Values in thousands (33.0, 31.5, etc.)

6. **Title:** "Stock Distribution by Category (in thousands)"

⚠ **Challenge:** Excel kept showing "Total Stock Units;" prefix in data labels. Solution: Removed "Series Name" from data labels, kept only "Value".

3. Top 10 Products by Stock Value - Bar Chart

3 **Create Horizontal Bar Chart:**

Why Stock Value instead of Low Stock Alert?

Initial plan was "Low Stock Alert" (products with lowest stock), but we realized this isn't actionable without knowing **sales velocity**. A product with 10 units might be:

- **Critical** if it sells 100/month → Reorder NOW!

- **Fine** if it sells 5/month → 2 months of stock

Instead, we showed **"Where is our capital tied up?"** - more useful for procurement decisions.

1. **Data Sheet PivotTable:**

   - Rows: Product_Name

   - Values: Stock Value

   - Sort: Largest to Smallest

   - Filter: Top 10 items

2. **Results:**

   - Eco Art Kit: $53.38K (most capital tied up!)

   - Pro Board Game: $50.75K

   - Mini Robot: $50.51K

3. **Chart Formatting:**

   - Gradient bars: Purple (#9B6FED) → Pink (#F76BB7)

   - Background: #3B82F6 (blue)

- White data labels showing value in thousands
  - Categories reversed (largest on top)
4. **Title:** "Top 10 Products by Stock Value ($K)"

✅ **Final Result:** Procurement dashboard showing inventory health metrics, stock distribution revealing 56% in "Others" (fragmented inventory), and top products by stock value identifying where $426K+ is tied up.

📊 Key Insight from Dashboard

💡 **Procurement Problem Identified:**

- **218 days of inventory** = 7+ months of stock (3x industry standard!)
- **$3.12M tied up** in inventory (opportunity cost)
- **56% stock in "Others"** = fragmented, hard to manage
- **Top 10 products hold $426K** = consider reducing orders for these

Recommendation: Implement inventory reduction strategy, focus on fast-moving items, consider inter-store transfers.

7️⃣ Design System & Color Palette

🎨 Color Palette Selection

We chose the **"Modern Kids"** palette - professional yet playful, matching toy store branding.

Primary Colors

Color	Hex Code	Usage
🔵 Blue 900	#1E3A8A	Headers, primary text, navigation
🔵 Blue 500	#3B82F6	KPI cards, chart backgrounds, buttons
🟣 Purple 500	#8B5CF6	Secondary accents, chart elements
🌸 Pink 300	#F9A8D4	Highlights, gradients, emphasis

Gradient Combinations

- **Header:** Blue (#2B9FED) → Purple (#9B6FED) → Pink (#F76BB7)
- **KPI Cards:** Solid colors from palette
- **Bar Charts:** Purple (#9B6FED) → Pink (#F76BB7)

📝 Typography System

Element	Font	Size	Weight

Dashboard Title	Segoe UI	20-24pt	Bold
Chart Titles	Segoe UI	14-16pt	Bold
KPI Labels	Segoe UI	10-12pt	Semibold
KPI Values	Segoe UI	18-24pt	Bold
Chart Labels	Segoe UI	10pt	Regular

🎯 Design Principles Applied

- **Visual Hierarchy:** Logo → Title → KPIs → Charts (decreasing visual weight)
- **Color Consistency:** All elements use palette colors, no random colors
- **White Space:** Adequate spacing between components for readability
- **Rounded Corners:** All shapes use rounded corners for modern feel
- **Minimalism:** Removed unnecessary elements (legends, gridlines, excessive axes)
- **Contrast:** White text on colored backgrounds for readability

📐 Layout Grid

Sales Dashboard Layout:

```
Row 1-5:   [Gradient Header with Logo & Title]
Row 7-10:  [KPI Card 1] [KPI Card 2] [KPI Card 3] [KPI Card 4]
Row 12-25: [Line Chart: Monthly Trend] [Bar Chart: Top 10 Products]
```

Procurement Dashboard Layout:

```
Row 1-5:   [Gradient Header with Logo & Title]
Row 7-10:  [KPI Card 1] [KPI Card 2] [KPI Card 3] [KPI Card 4]
Row 12-25: [Donut: Stock by Category] [Bar Chart: Top 10 by Value]
```

8️⃣ Key Insights & Findings

💰 Sales Performance

> ☑️ **Strong Financial Health**
>
> - **$9.86M revenue** generated from 567K units sold
> - **43.7% profit margin** indicates healthy pricing strategy
> - **Consistent monthly revenue** with minor seasonal fluctuations
> - **Average transaction value:** $40.14 per transaction

🏆 Top Performers

- **Best Product:** Mega Board Game ($231,910 revenue)
- **Top 10 products** account for $1.48M (15% of total revenue)
- **Revenue concentration:** Moderate - not too dependent on few products

📦 Inventory Management

> ### ⚠️ Overstock Concerns
>
> - **218 days of inventory** = 7.3 months of stock (Target: 60-90 days)
> - **$3.12M capital tied up** in inventory (31.6% of annual revenue!)
> - **Slow inventory turnover:** 1.67x per year (should be 4-6x for retail)
> - **Stock-to-Sales ratio 59.8%** indicates potential overordering

📊 Stock Distribution

- **56% stock in "Others"** category = highly fragmented inventory
- **Top 5 categories** only account for 44% of stock
- **Arts & Crafts** has most stock (32,985 units) but is it selling?

💸 Capital Allocation

- **Top 10 products hold $426K** in stock value (13.6% of total)
- **Eco Art Kit:** $53.4K tied up (highest single product)
- **Question:** Are these high-value stocks justified by sales velocity?

🎯 Strategic Recommendations

> ### 💡 Action Plan
>
> 1. **Reduce Ordering Cycles:**
>   - Target: Reduce days of inventory from 218 → 90 days
>   - Action: Decrease purchase orders by 60% over next 6 months
> 2. **Optimize Product Mix:**
>   - Focus on fast-moving, high-margin items (e.g., Mega Board Game)
>   - Reduce orders for slow-moving high-value items
> 3. **Inter-Store Transfers:**
>   - Analyze stock distribution across 120 stores
>   - Transfer excess inventory from overstocked to understocked locations
> 4. **Inventory Clearance:**
>   - Consider promotions/discounts on high-stock items
>   - Free up $1M+ capital for better uses
> 5. **Implement JIT (Just-In-Time):**
>   - Move towards demand-driven ordering
>   - Use sales velocity data to inform procurement decisions

🔢 Lessons Learned & Best Practices

💡 Technical Lessons

1. Power Pivot > Regular PivotTables

Why?

- In-memory database handles 245K+ rows easily
- Relationships eliminate VLOOKUP hell
- DAX measures centralized and reusable
- Query performance significantly faster

2. DAX vs Excel Formulas

- **DAX Advantages:**

  - Context-aware (row context, filter context)
  - Works across relationships automatically
  - Single source of truth (measure defined once)
  - Optimized for large datasets

- **Excel Formula Use Cases:**

  - Display formatting (TEXT, ROUND)
  - Dashboard-specific calculations
  - Dynamic references to PivotTables (GETPIVOTDATA)

3. Data Modeling is Critical

Star Schema Benefits:

- Intuitive for business users
- Optimized query performance
- Easy to maintain and extend
- Clear separation: Facts (transactions) vs Dimensions (attributes)

4. Visualization Design Matters

- **Less is More:** Removed gridlines, simplified axes, minimized data labels
- **Color Purpose:** Used consistent palette for brand recognition
- **Chart Type Selection:**

  - Line chart for trends over time
  - Horizontal bar for rankings/comparisons
  - Donut for part-to-whole relationships

⚠️ Challenges Overcome

Challenge 1: Text Data in Numeric Columns

Problem: CSV import created text values "1.5" instead of numeric 1.5

Impact: DAX measures returned errors, SUM() didn't work

Solution: Power Query → Transform → Change Data Type → Decimal Number

Lesson: Always validate data types after import!

Challenge 2: Polish Excel Number Formatting

Problem: Polish Excel uses semicolons (;) not commas (,) in formulas

Impact: Custom number formats like `#,##0,"K"` didn't work

Solution: Used TEXT() and ROUND() functions instead:

```
="$"&ROUND(value/1000000,2)&"M"
```

Lesson: Regional settings affect formula syntax - be flexible!

Challenge 3: Excel Limitations for Complex Dashboards

Limitations Encountered:

- Textboxes don't support formulas (used shapes + cells instead)
- Limited interactivity (no drill-down without macros)
- Manual layout adjustments (no auto-sizing like Power BI)
- Chart customization requires multiple steps

Workarounds:

- Layered architecture (Data sheet + Dashboard sheet)
- Shapes as backgrounds, cells for dynamic content
- GETPIVOTDATA for robust references to PivotTables
- Careful planning of dashboard layout grid

🚀 Skills Developed

- ✅ **Advanced Excel:** Power Pivot, PivotTables, Advanced Formulas
- ✅ **DAX:** SUMX, DIVIDE, RELATED, context awareness
- ✅ **Data Modeling:** Star Schema, relationships, normalization
- ✅ **Business Intelligence:** KPI definition, metric selection
- ✅ **Data Visualization:** Chart selection, color theory, minimalism
- ✅ **Dashboard Design:** Layout, hierarchy, user experience
- ✅ **Business Analysis:** Interpreting data, generating insights
- ✅ **Problem Solving:** Overcoming technical limitations

📚 Resources & Learning

- **Microsoft Power Pivot Documentation** - Official reference
- **DAX Guide** - Comprehensive function reference
- **SQLBI.com** - Advanced DAX patterns and best practices
- **Excel Campus** - Power Pivot tutorials
- **Dashboard Design Principles** - Stephen Few, Edward Tufte

🎯 Next Steps & Improvements

Future Enhancements

1. **Add Interactivity:**
   - Slicers for date range, category, store selection
   - Dynamic filtering across dashboards

2. **Expand Analysis:**
   - Store performance comparison
   - Geographic analysis (sales by region)
   - Customer segmentation (if customer data available)

3. **Add Forecasting:**
   - Sales trend prediction
   - Inventory optimization models

4. **Migrate to Power BI:**
   - Enhanced interactivity
   - Real-time data refresh
   - Mobile-friendly dashboards
   - Easier sharing and collaboration

🎉 Conclusion

This project successfully demonstrated that **Excel can be a powerful Business Intelligence platform** when combined with Power Pivot and DAX. We transformed 245,800+ raw transaction records into two professional dashboards that provide actionable insights for both sales and procurement teams.

Key Achievements:

- ✅ Built enterprise-grade data model with Star Schema architecture
- ✅ Created 10 reusable DAX measures for business metrics
- ✅ Designed professional dashboards with Power BI-level quality
- ✅ Generated real business insights (identified $3.12M overstock issue!)
- ✅ Documented complete process for portfolio and learning

> 📊 **From Raw Data → Actionable Intelligence → Business Impact**

Project Repository: github.com/mbimarban/toy-store-dashboard