**Technical Report**

**Data Sprint Project: Byte & Beyond**

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**Framing:**

**Problem Statment**: The company currently does not have a structured system to identify which consumer commodities and trade partners drive the highest profitability. Decisions are often based on assumptions rather than data. Without clear insights into the top 10 commodities, profitable trade partners, and trends in value vs. quantity, the company risks focusing on low-margin products and overlooking strategic trade opportunities. This creates challenges in maximizing revenue, market share, and long-term competitiveness in Bahrain’s trading sector.

**Aim**: Analyze historical trade data to recommend promising goods and partners for growth.

**Objectives**:

1. Identify top consumer goods (2020–2024).
2. Find most profitable partners by trade type.
3. Analyze trade value vs. trade quantity trends.
4. Detect shifts in trade patterns and market demand.
5. Provide actionable insights to maximize revenue/market share.

**Extract:**

* **Data Source**: Bahrain Open Data Portal (2020–2024).
* **Files Collected**: Imports.csv, Exports.csv, ReExports.csv, HS Code Category list
* **Data Coverage**: Monthly transaction-level data, including partner country, commodity type, transaction value, weight, and quantity.
* **Data Dictionary**:
  + Date: Transaction date (monthly level)
  + Commodity No: HS code of the commodity
  + Commodity: Description/name of the commodity
  + [Import/Export/Re-Export] Value (BD): Trade value in Bahraini Dinars
  + [Import/Export/Re-Export] Weight (KG): Shipment weight in kilograms
  + [Import/Export/Re-Export] Quantity: Number of traded units
  + UM (Unit of Measure): Unit used for quantity (e.g., NO, KG, SQM)
  + Category: Broad classification of the commodity sector
  + Subcategory: Detailed classification within the category
  + Country: Partner country involved in the transaction
  + Subheading: sub-sub-category
  + TradeType: To distinguish observation trade type “Imports/Exports/ReExports”

**Data Wrangling:**

Python was used extensively to clean and structure the raw trade datasets (Imports, Exports, and Re-Exports). The main steps included:

1. **Data Type Corrections**
   * The date column was initially stored as object(string).
   * Converted into **datetime format** to enable time-series analysis such as yearly and quarterly trends.
2. **Handling Missing and Inconsistent Data**
   * Detected and addressed a small number of **null values** in trade records.
   * Corrected **spelling and formatting inconsistencies** in the country column. For example, *United States* appeared with both uppercase and lowercase variations, which caused duplicate entries. These were standardized to ensure accuracy.
3. **Enriching Data with Categories**
   * The raw extract did not include **Category** and **Subcategory** information.
   * Using the **HS code** as a key, additional classification was introduced to map each commodity into its proper **Category** and **Subcategory**.
   * This step was critical to align products under broader trade sectors for higher-level insights.
4. **Standardization for Consistency**
   * Ensured that key attributes such as Country were consistently formatted across all three datasets.
   * Created a unified dataset ready for comparative analysis of Imports, Exports, and Re-Exports and add a new column “TradeType” to distinguish which observations were from “Imports/Exports/ReExports”.
5. **Split Goods into Consumer and Non-Consumer Goods.**
   * Added a BEC column which correlated with HS codes to find which goods would be categorized as consumer and non-consumer.
   * Removed all non-consumer goods and removed all columns used to determine this like the new “BEC” column of a created “HS6” column to match the HS Code and BEC codes.

**Data Analyzing:**

Once the data was cleaned and enriched, structured analysis was performed to extract meaningful patterns and insights.

1. **Trade Flow Segmentation**

-Analysis was conducted separately for Imports, Exports, and Re-Exports.

-This separation revealed distinct dynamics in each trade type, such as import-heavy commodities vs. export-oriented ones.

2. **Commodity-Level Analysis**

-Identified the Top commodities by trade value.

-Focused deeper analysis on the Top 3 commodities with the highest significance:

-Processed Cheese

-Jeeps and Private Cars

-Jewellery of Gold

-This allowed comparisons across categories to highlight high-value vs. high-volume products.

3. **Partner Country Analysis**

-Aggregated data to determine the most significant trade partners by total value.

-Standardized inconsistent country names (e.g., United States variations) to ensure accurate rankings.

-Found that GCC partners (UAE, Saudi Arabia, Qatar) consistently dominated, while Japan, China, and India played crucial roles in imports.

4. **Value vs. Quantity Trends**

-Compared trade value with trade quantity to identify commodities that are high-value but low-volume (e.g., Jewelry), versus those that are high-volume and value-driven (e.g., Cars, Cheese).

-Seasonal fluctuations were detected, with dips in Q3 and recoveries in Q4, showing strong year-end demand cycles.

5. **Commodity Deep Dive: Key Findings**

**Jeeps – Exports (2024)**

-UAE led with 63% of exports, followed by China (19%) and Saudi Arabia (15%).

-Export value surged from ~6M BHD in Q3 to 18.6M BHD in Q4, showing strong year-end demand.

-Profitability heavily depends on the UAE market, with potential risk mitigation from growth in China and Saudi Arabia.

**Private Cars 1501–3000cc – Imports (2023)**

-Japan (30%) and China (29%) dominated, with South Korea (18%), Taiwan (13%), and India (10%) adding diversity.

-Import value peaked in Q2 at 25.1M BHD, dipped in Q3, then recovered in Q4 (21M BHD).

-Profitability supported by Japan and China, while Korea and Taiwan balance risk.

**Private Cars >3000cc – Re-Exports (2022)**

-UAE (60%) and Saudi Arabia (36%) were the key markets.

-Value peaked in Q2 (3.4M BHD), dipped in Q3, and stabilized at ~2.6M BHD in Q4.

-Profitability is GCC-driven but concentrated in two markets, signaling stability but also risk exposure.

**Jewellery – Imports (2022)**

-UAE dominated with 87% share, followed by India (7%).

-Value peaked at 22.1M BHD in Q2, then stabilized around 18M BHD in Q4.

-Profitability highly dependent on the UAE corridor, with India as limited diversification.

**Jewellery – Re-Exports (2023)**

-Qatar (43%), UAE (33%), and Saudi Arabia (14%) led destinations.

-Value dipped in Q2 (1.4M BHD) then surged to 5.8M BHD in Q4, reflecting seasonal demand.

-Profitability concentrated in GCC, with Qatar emerging as lead corridor.

**Jewellery – Exports (2024)**

-UAE dominated with 73% of exports, followed by USA (11%) and Kuwait (9%).

-Value started strong (29.9M BHD in Q1), dipped mid-year, and stabilized around 17M BHD in Q3–Q4.

-Profitability mainly UAE-driven, but diversification exists via USA and Kuwait.

**Cheese – Re-Exports (2022)**

-UAE (54%) and Saudi Arabia (18%) were the main buyers.

-Value spiked at 36.3K BHD in Q2, then dropped and stabilized (~8.5K BHD).

-Profitability heavily UAE-driven, with Saudi Arabia as secondary support.

**Cheese – Imports (2023)**

-Saudi Arabia (70%) was the dominant supplier, followed by Australia (14%).

-Import value peaked in Q1 (3.1M BHD), dipped in Q2 (2.1M), and recovered in Q3–Q4 (~2.6–2.7M).

-Profitability highly reliant on Saudi supply, with some diversification from Australia and USA.

**Cheese – Exports (2024)**

-Saudi Arabia (65%) and UAE (14%) were the top buyers, followed by Oman (8%) and Kuwait (7%).

-Export value peaked in Q1 (47M BHD), dipped mid-year, and recovered in Q4 (45M BHD).

-Profitability is Saudi-driven with stable GCC demand.

**Interpretation:**

The analysis revealed several important insights into Bahrain’s trade flows, highlighting both opportunities and risks for strategic decision-making.

1. **Dependence on Key Partners**

-Trade is highly concentrated in GCC markets: UAE, Saudi Arabia, and Qatar consistently dominate both exports and re-exports.

-Imports rely heavily on a few suppliers, notably Japan and China for cars and Saudi Arabia for cheese.

-While these corridors generate stability, they create risk exposure if demand or supply shifts.

2. **Seasonal Trade Patterns**

-Across most commodities, a Q3 dip followed by strong Q4 recovery was observed.

-This pattern suggests seasonal demand cycles, with year-end spikes in exports and re-exports (especially Jeeps, Jewelry, and Cheese).

-Companies can use this knowledge to optimize inventory planning and pricing strategies.

3. **Commodity Profitability Drivers**

-Jeeps and Private Cars: Core revenue drivers. Japan and China supply the bulk of imports, while UAE and Saudi Arabia dominate as re-export markets.

-Jewelry: High-value, low-volume trade dominated by the UAE. However, diversification exists with the US and Kuwait on the export side.

-Cheese: Volume-driven with Saudi Arabia as both the primary supplier and top buyer. Secondary GCC markets (Iraq, Oman, Kuwait) support additional demand.

4. **Strategic Trade Corridors**

-Japan , Bahrain , Saudi/UAE for automobiles is the most profitable corridor, combining large imports with high-margin re-exports.

-UAE and Bahrain is the strongest overall partner relationship, covering both Jewelry and Cheese.

-Qatar emerged as a surprising leader in Jewelry re-exports, highlighting potential to expand non-traditional partnerships.

5. **Implications for Business Strategy**

-Bahrain is positioned as a re-export hub for high-value commodities (Jewelry, Cars, Cheese) to GCC neighbors.

-Heavy dependence on a few partners underscores the need to diversify trade relations (e.g., expand car imports from South Korea, cheese from Australia/USA, and jewelry exports to the US/EU).

-By leveraging seasonal insights, the company can align supply chain planning with demand peaks, maximizing profitability and reducing risks.

**Communicate:**

The final stage of the analysis lifecycle focused on presenting the findings in a clear and interactive way.

1. **Tools & Format**
   * **Power BI dashboards** were developed to provide interactive exploration of the results.
   * Visuals such as **bar charts, line graphs, and partner share breakdowns** were used to highlight commodity-level and country-level insights.
   * A structured **slide deck** was prepared to guide the discussion, aligning with the analysis phases and commodity deep dives.
2. **Key Communication Choices**
   * **Brief text insights** were paired with visuals to make findings easily digestible.
   * Results were framed in terms of **profitability, partner concentration, and diversification opportunities**, ensuring alignment with business strategy.
   * Interactivity in Power BI allowed stakeholders to drill down into specific years, partners, and commodities.