

Analyzing Data in a Model Car Database with MySQL Workbench

A COMPREHENSIVE DATA ANALYSIS REPORT FOR MINT CLASSICS

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Introduction

In the competitive market of classic model vehicle retail, Mint Classics Company is committed to delivering exceptional service while optimizing operational efficiency. As part of a strategic initiative to streamline operations, the company is considering the closure of one of its storage facilities. This decision necessitates a thorough analysis of inventory management practices to ensure that customer service standards, particularly the ability to ship products within 24 hours of order placement, are maintained.

To address this challenge, this report presents a comprehensive data analysis conducted using a MySQL database that encompasses nine tables: products, warehouses, order details, orders, payments, employees, customers, offices, and product lines. The primary objective of this analysis is to provide data-driven recommendations for reorganizing or reducing inventory without compromising service levels.

However, the scope of this report extends beyond merely responding to the immediate business need. By leveraging MySQL's analytical capabilities, this analysis explores various dimensions of the company's operations, including inventory turnover rates, order fulfillment times, customer demand patterns, and product profitability. Additionally, we will identify the top-selling products, recognize the most valuable customers, evaluate the performance of sales representatives, and conduct a time series analysis of order trends.

The insights derived from this analysis will inform strategic decisions regarding inventory allocation and warehouse management, ultimately supporting Mint Classics Company in achieving its operational goals. The following sections will outline the methodology employed in the analysis, present the findings, and offer actionable recommendations to enhance inventory efficiency while ensuring timely service to customers.

Database Overview

The database under analysis is a well-structured relational database that models the operations of Mint Classics, a company specializing in model cars. The database consists of multiple interrelated tables, each capturing different aspects of the company's operations, including products, orders, payments, customers, and employees. These tables are interconnected through key relationships that allow for comprehensive data analysis. Table descriptions are as follows:

1. Products Table

- a. Purpose: Contains information on each model vehicle, including product details, availability, and pricing.
- b. Key Columns: productCode, productName, productLine, quantityInStock, buyPrice, MSRP.

2. Warehouses Table

- a. Purpose: Stores details about the company's storage facilities, focusing on capacity utilization.
- b. Key Columns: warehouseCode, warehouseName, warehousePctCap.

3. Productlines Table

- a. Purpose: Categorizes the product lines offered by the company, grouping similar products.
- b. Key Columns: productLine, textDescription, htmlDescription.

4. Orderdetails Table

- a. Purpose: Records specifics of each order, linking products to customer purchases.
- b. Key Columns: orderNumber, productCode, quantityOrdered, priceEach.

5. Orders Table

- a. Purpose: Tracks customer orders, including order dates, statuses, and fulfillment
- b. Key Columns: orderNumber, orderDate, shippedDate, status, customerNumber.

6. Payments Table

- a. Purpose: Logs payment transactions made by customers, crucial for financial tracking.
- b. Key Columns: customerNumber, checkNumber, paymentDate, amount.

7. Customers Table

- a. Purpose: Stores customer information, including contact details and account management data.
- b. Key Columns: customerNumber, customerName, contactLastName, phone, salesRepEmployeeNumber.

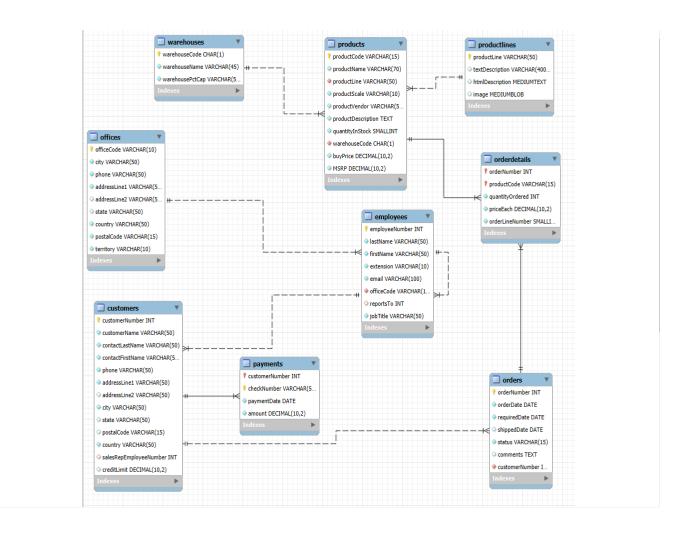
8. Employees Table

- a. Purpose: Contains employee details, including job titles and managerial relationships.
- b. Key Columns: employeeNumber, lastName, firstName, jobTitle, officeCode.

9. Offices Table

- a. Purpose: Holds information about the company's office locations, linking to employee data.
- b. Key Columns: officeCode, city, territory, phone, addressLine1.

The database's structure allows for robust queries that can yield insights into sales trends, customer behavior, product performance, and employee efficiency.



Methodology

This analysis was conducted using a structured, clustered approach to organize and analyze the data within the Mint Classics Company database. The database contains nine interrelated tables that capture various aspects of the company's operations, including product inventory, customer orders, employee management, and financial transactions. To ensure a focused and efficient analysis, I identified three distinct clusters of tables, each representing a different core area of the business. This clustered approach allowed for targeted analysis within each area, while also enabling a comprehensive understanding of the relationships between them.

Cluster Identification and Analysis

1. Products Cluster

- Tables Involved: products, warehouses, orderdetails, orders
- Objective: The products cluster focused on analyzing the inventory, sales, and
 profitability of the various model vehicles offered by Mint Classics. The primary
 goal was to identify which products return the least profit yet occupy significant
 storage space.

• Approach:

- A dedicated view, products_cluster_view, was created to combine relevant data from the products, orderdetails, and warehouses tables. This view includes all products, even those without sales data, ensuring a complete analysis.
- The COALESCE function was employed to handle NULL values for products without sales, enabling accurate profit calculations.
- Analysis included identifying top-selling products, examining the profitability of each product line, and assessing inventory levels across different warehouses.

2. Customers Cluster

- Tables Involved: customers, orders, payments, employees
- Objective: The customers cluster aimed to analyze customer behavior, order trends, and payment patterns to identify the most valuable customers and assess sales performance. Additionally, it provided insights into the geographic distribution of customers and the effectiveness of sales representatives.

• Approach:

- A view was created to link customer information with their orders, payments, and associated sales representatives. This view enabled a detailed analysis of customer purchasing behavior, payment reliability, and sales representative performance.
- Specific analyses included identifying top customers by revenue, examining the relationship between order frequency and customer location, and evaluating the performance of sales representatives based on the orders they managed.

3. Employees Cluster

- Tables Involved: employees, offices, customers
- Objective: The employees cluster focused on understanding the organizational structure of Mint Classics, including the relationships between employees, the offices they work in, and the customers they manage.

• Approach:

- A view was constructed to capture the relationships between employees and their managers, their office locations, and the customers they serve.
 This view provided insights into employee management, office performance, and customer allocation.
- The analysis included evaluating the hierarchy within the company, assessing the distribution of employees across different offices, and examining the geographic reach of each office in terms of customer management.

Data Analysis and Interpretation

Once the views were established, I conducted various SQL queries to extract meaningful insights from the data. The analysis included:

- **Inventory Analysis**: Identifying products with low profitability and high storage requirements.
- **Customer and Sales Analysis:** Assessing top customers, sales representative performance, and regional sales trends.
- Organizational Analysis: Evaluating employee hierarchy, office distribution, and customer management efficiency.

The results of these analyses were used to develop actionable recommendations aimed at optimizing inventory management, enhancing customer service, and improving overall operational efficiency.

Products Cluster Analysis

The analysis of the Products Cluster focuses on inventory levels, sales performance, warehouse utilization, and product profitability. The key findings from the SQL exploratory data analysis are as follows:

1. Inventory Overview

- Total Products: Mint Classics carries 110 products across 7 product lines.
- Total Stock: There are 555,131 items in stock distributed across 4 warehouses.
- **Product Line Assignment:** Every product is assigned to a product line; no products are unassigned.

- **Warehouse Storage:** All products are stored in Mint Classics' warehouses; none are stored externally.
- Unsold Products: The 1985 Toyota Supra (productCode: S18_3233) currently has no sales, with 7,733 units in stock in Warehouse B.

2. Warehouse Space Utilization

• Stock Distribution by Warehouse:

Warehouse Code	Warehouse Name	Total Stock	Warehouse Capacity Utilization
В	East	219,183	67%
С	West	148,887	85%
A	North	107,681	65%
D	South	79,380	75%

- Total Stock Across Warehouses: The sum of stock totals equals 555,131 units.
- **Observation:** Warehouse B holds the most items, indicating potential for inventory redistribution.

3. Product Line Revenue and Orders

- Top Performing Product Lines:
 - Classic Cars: Most ordered and highest selling, with 33,817 units sold generating \$3,670,560.34 in revenue.
 - Trains: Least ordered and lowest selling, with 2,651 units sold generating
 \$175,030.77 in revenue.
- Total Revenue from Completed Orders: \$9,060,489.30 from 99,398 units sold.
- Product Line Storage:
 - Product lines are stored in distinct warehouses, indicating a lack of distribution across warehouses.

4. Inventory Turnover Rates

- Product Turnover Rate: The inventory turnover rate highlights how efficiently stock is being sold. High turnover indicates strong demand, while a low rate signals underperformance.
 - The **1960 BSA Gold Star DBD34** has the highest turnover rate at **67.67**, followed by the **1968 Ford Mustang** with **13.37**. These products are in high demand, suggesting frequent restocking may be necessary.
 - On the other end of the spectrum, nearly **100 products** have a turnover rate below 1, indicating they are slow-moving and may require review for possible discounting or discontinuation.

- Warehouse Turnover Rate: Warehouse turnover rates give insights into stock movement across locations.
 - Warehouse D has the highest turnover rate of o.26, suggesting efficient stock movement.
 - Conversely, **Warehouse B**, despite holding the most stock, has the lowest turnover rate of **o.16**, indicating slower inventory movement in this region.

5. Product Discontinuation Candidates

- Products with low sales, high stock, and low demand are candidates for discontinuation.
 - Five products stand out as discontinuation candidates, including the 1985 Toyota
 Supra and 1966 Shelby Cobra 427 S/C, together accounting for 41,495 units in stock but generating only \$152,430.94 in sales.
 - These products occupy valuable warehouse space but yield minimal returns, suggesting they could be discontinued or heavily discounted to clear space for more profitable items.

6. Stock Increase Candidates

- Some products show **high profitability**, **low stock**, and **high demand**, suggesting they may require restocking to meet customer needs.
 - Notable candidates for a stock increase include the 1968 Ford Mustang, 1962
 Volkswagen Microbus, and 1957 Corvette Convertible. Combined, these
 products have a stock of 6,272 units, but their high demand has generated
 \$654,280.34 in profit.
 - Restocking these items would likely increase sales and revenue, as their turnover rates indicate high customer interest.

7. Outlier Detection

- Outliers were identified by calculating interquartile ranges (IQR) for stock, orders, and sales. Products falling outside these ranges warrant closer inspection.
 - o 1985 Toyota Supra is an outlier in terms of low total orders, with o units sold.
 - o **1957 Ford Thunderbird** falls below the lower bound for total orders at **665 units**, while the **2001 Ferrari Enzo** exceeds the upper bound for sales with **\$182,439.52**.
 - The 1992 Ferrari 360 Spider also stands out, exceeding upper bounds in both orders (1,720 units) and sales (\$264,132.78).

Summary of Insights for Product Management:

High-Demand Products: Items such as the 1968 Ford Mustang and 1960 BSA Gold Star DBD34 have high turnover rates and should be prioritized for restocking and promotion.

Discontinuation Candidates: Low-demand products, including the 1985 Toyota Supra, are tying up warehouse space with minimal sales. Discontinuing or discounting these products could free up space for better-performing items.

Outliers: Certain products, like the **1992 Ferrari 360 Spider**, exhibit extraordinary sales performance, warranting attention for targeted marketing and sales efforts.

Customers Cluster Analysis

This section provides an in-depth analysis of Mint Classics' customer data, focusing on customer purchasing behavior, revenue generation, geographic distribution, and the performance of sales representatives. The analysis leverages SQL queries to explore patterns and trends, providing actionable insights for decision-making.

1. Customer Overview

- Total Customers: There are 122 customers in Mint Classics' database.
- Non-purchasing Customers: 24 customers have no purchase history. Interestingly, two
 of them—American Souvenirs Inc and Precious Collectables—have assigned sales
 representatives despite no order or

2. Customers Without Purchase History

- Non-purchasing Customers: A total of 24 customers have no purchase history. Of particular note, American Souvenirs Inc and Precious Collectables have been assigned sales representatives but have yet to make any purchases.
 - All non-purchasing customers have a **credit limit of zero**, which may indicate a lack of trust or qualification from the company's side.

3. Top Customers by Payment Amount

- The **top 10 customers** by payment amount highlight the most valuable clients.
 - Euro+ Shopping Channel leads the pack, having paid \$715,738.98, while Saveley
 Henriot, Co. paid the least among the top customers with \$130,305.35.
 - These high-value customers significantly contribute to Mint Classics' overall revenue and should be prioritized for retention and special attention.

4. Order Patterns and Customer Retention

- Order Frequency: Customers with the most orders include Euro+ Shopping Channel, with 24 completed orders, while Bavarian Collectables Imports, Co. only completed one order.
 - Understanding order frequency can inform marketing and engagement strategies to target less frequent buyers.

• Customer Acquisition and Retention:

- o In 2004, Mint Classics acquired 24 new customers while retaining 88% of the customers from 2003. However, by 2005, the retention rate dropped to 49%, though data for that year may be incomplete as it ends in May.
- The retention rate drop in 2005 signals a potential problem that warrants investigation—whether due to operational inefficiencies or shifts in customer preferences.

5. Geographic and Credit Distribution

- Payments by Country: The United States generates the most revenue, contributing \$3,040,029.52. Spain follows with \$994,438.53, while countries like Israel, The Netherlands, and Poland have yet to make any payments.
 - This highlights the U.S. as Mint Classics' strongest market, with room for growth in underperforming regions.
- **Customer Distribution by Country**: The U.S. leads with **36 customers**, followed by **Germany** and **France**. This confirms the U.S. as the largest market, but it also points to opportunities for expansion, especially in countries with only one customer, such as **Hong Kong** and **The Netherlands**.
- Payments by Credit Limit: Customers are segmented into four credit limit quartiles:
 - **Premium Credit (4th Quartile)** customers contributed the highest payments, totaling **\$4,415,994.34**.
 - As expected, higher credit limit customers generate more revenue, but the analysis also shows that Low Credit Limit customers contributed \$169,126.62, which indicates even low-credit customers can be profitable.

6. Sales Representative Performance

- Total Revenue from 2003 to 2005: Mint Classics generated \$8,853,839.23 in total sales.
- Top Sales Reps by Total Payments:
 - Gerard Hernandez leads with \$1,112,003.81 in revenue, followed by Leslie Jennings with \$989,906.55.
 - On the lower end, **Martin Gerard**, **Julie Firrelli**, and **Leslie Thompson** each brought in less than **\$400,000**, pointing to a need for sales performance improvements or reassignment.

7. Shipping and Order Trends

- **Average Shipping Time**: On average, it takes **3.76 days** for Mint Classics to ship orders to customers.
- Yearly Orders: Completed orders peaked in 2004 with 146 orders, while 2005 shows a decline to 55 orders, though incomplete data may have impacted this result.
 - The majority of cancelled orders occurred in 2003 Q3 and 2004 Q2, while most completed orders occurred in the 4th quarter of each year, possibly due to the holiday shopping season.

8. Payments Over Time

- Payment Trends: Total payments show significant growth after 2003, with payments peaking in May 2005 at \$1,449,387.78. In December 2004, payments hit \$1,438,778.88, suggesting a pattern of increased activity during the holiday season.
 - These insights can inform Mint Classics' marketing strategy to maximize sales during peak seasons.

Summary of Insights for Customer Management:

- **High-Value Customers**: Customers such as **Euro+ Shopping Channel** should be prioritized for retention, given their significant contribution to total revenue. Offering personalized services or loyalty rewards could solidify their relationship with Mint Classics.
- **Geographic Opportunities**: Expanding in **underperforming regions** like **Japan** and **Australia** may lead to revenue growth, as these areas show potential with a few existing customers but untapped markets.
- Sales Representative Performance: There is room to improve sales representative performance, particularly for lower-performing reps like Martin Gerard and Julie Firrelli. Training and performance incentives could help boost their productivity.
- **Shipping Efficiency**: With an average shipping time of **3.76 days**, Mint Classics may need to assess its logistics to maintain or reduce this delivery time, ensuring customer satisfaction remains high.
- Seasonal Sales: Significant peaks in payment amounts during the holiday season suggest
 that Mint Classics should focus on ramping up inventory and marketing during these
 periods to capitalize on increased demand.

Employees Cluster Analysis

This section presents insights from the Employees Cluster, examining employee roles, geographic distribution, and customer management. The analysis reveals patterns in Mint Classics' workforce and managerial structure.

1. Employee Overview

- Total Employees: Mint Classics employs 108 people.
- **Job Title Distribution:** The majority of employees (**102 out of 108**) are Sales Representatives, reflecting the company's focus on sales activities.

2. Employees Without Assigned Customers

- Unassigned Employees: Out of the 108 employees, 6 employees in upper management do not directly manage any customers. These include key executives such as the President, VP of Sales, and VP of Marketing, along with sales managers for the APAC, NA, and EMEA regions.
 - Additionally, Tom King and Yoshimi Kato, both Sales Representatives, currently
 do not manage any customers. This could signal underperformance or a recent
 shift in responsibilities.

3. Geographic Distribution of Employees

- **Employees Assigned to Offices**: All employees are assigned to a specific office location, with no employees operating without a designated office.
- Employee Distribution by Country:
 - o **The United States** has the largest share of employees, with **43** employees, followed by **France** with **14**, and **Japan** with **6**.

 The concentration of employees in the U.S. aligns with Mint Classics' strong market presence there. Meanwhile, the relatively small number of employees in Japan suggests a potential for market and staffing expansion.

• Customers Managed by Office Location:

- Paris is a key market for Mint Classics, managing 29 customers, the highest for any single office.
- The United States manages a total of 39 customers across 3 office locations, reflecting the company's significant presence in the country. However, the Sydney and Tokyo offices manage fewer customers, with 10 and 5, respectively, suggesting potential growth opportunities in these regions.

4. Managerial Structure and Reports

Top Manager by Number of Reports:

- Gerard Bondur, the Sales Manager for the EMEA region, manages 46 employees, making him the manager with the most direct reports. This reflects the importance of the EMEA region for Mint Classics, as well as Bondur's central role in overseeing sales operations.
- In comparison, other managers, such as the APAC and NA Sales Managers, oversee fewer employees, which could indicate a more focused or smaller operational scale in those regions.

• Customers Managed by Sales Representatives:

- Pamela Castillo, a Sales Representative, manages the highest number of customers, handling 10 clients.
- On the lower end, Sales Representatives like Andy Fixter, Peter Marsh, and Mami Nishi each manage 5 customers. While they maintain a modest customer base, opportunities for expanding their client portfolios should be explored to boost performance and sales.

Summary of Insights for Employee Management:

- **Upper Management**: The lack of direct customer management for key executives is expected, as their roles are likely focused on high-level strategy rather than direct sales. However, Sales Representatives with no customers, like **Tom King** and **Yoshimi Kato**, may need to be reassigned or further trained to maximize their contributions.
- Geographic Expansion: The United States and France remain crucial markets with the
 most employees and customers, but Sydney and Tokyo show growth potential. Increasing
 the workforce and customer outreach in these regions could lead to new business
 opportunities.
- Managerial Focus: Managers like Gerard Bondur (EMEA) oversee large teams and are central to the company's operations in key markets. Ensuring that these managers are supported with resources and autonomy could further strengthen their impact.
- **Sales Representative Performance**: While some reps like **Pamela Castillo** excel at managing large customer bases, others with fewer clients should be evaluated for potential growth opportunities or additional training.

Inter-Cluster Analysis

This section presents a cross-examination of the relationships between products, customers, and employees, providing insights into sales performance, product popularity by region, warehouse utilization, and customer retention. By integrating data from the three clusters—Products, Customers, and Employees—this analysis offers a holistic view of Mint Classics' operations.

1. Top Sales Representatives by Product Revenue

- **Gerard Hernandez** and **Leslie Jennings** lead in product revenue, generating \$1,140,578.71 and \$1,021,661.89, respectively.
- The bottom three sales representatives—Martin Gerard, Julie Firrelli, and Leslie Thompson—generated a combined total of \$1,121,673.70 in sales. This mirrors their lower performance in total payments received, as seen in the Customers Cluster.

2. Warehouse Utilization by Region

• Warehouse B holds the lead in customer count (94 customers) and total products shipped (33,817 units). This correlates with previous findings that Warehouse B is the most stocked and profitable.

3. Product Popularity by Sales Region

- The **Paris** office in France leads in product orders, especially for **Classic Cars** and **Vintage Cars**, confirming their status as the most popular and profitable product lines.
- **Sydney** and **Tokyo** represent growth opportunities, with relatively lower product orders.

4. Customer Retention by Product Line

Classic Cars and Vintage Cars show the highest customer retention, with 57 and 51 repeat
customers, respectively. Conversely, Trains has the lowest retention rate, with only 4
repeat customers.

5. Non-Completed and Disputed Orders

- Analysis of non-completed and disputed orders reveals that:
 - Orders were cancelled due to errors like "mistakenly placed orders" or better offers found by customers.
 - o Disputes arose from claims of product damage or unmet expectations.
 - Orders on hold were placed by customers who exceeded their credit limits, all of whom had low credit ratings.

6. Sales Rep Performance by Customer Retention

- Pamela Castillo tops the list with 10 retained customers and 31 orders.
- Martin Gerard retains the fewest customers (5), with only 12 orders.
- **Gerard Hernandez** leads in total orders (43), but has retained only **7 customers**. This shows that while he excels at generating orders, his customer retention could be improved.

Recommendations

Based on the analysis of the Products, Customers, and Employees clusters in Mint Classics' database, here are strategic recommendations to address the business problem and optimize operations:

1. Addressing the Original Business Problem: Warehouse Closure

Mint Classics is considering closing one of its storage facilities. To determine which facility to close while maintaining timely customer service, the following factors should be considered:

- **Warehouse Utilization**: The analysis shows that **Warehouse B** is the most stocked and profitable, while **Warehouse D** has the least stock and turnover. Closing **Warehouse D** may be a viable option, as it would have the smallest impact on inventory availability and product movement.
- **Customer Proximity**: Warehouses located near key markets, such as **Warehouse B**, which supports the U.S. market, should be maintained for faster delivery. Lower-performing warehouses, particularly those with fewer associated customers, should be evaluated for closure.

However, the data provided in the Mint Classics database does not include detailed product dimensions or specific storage requirements, making it difficult to definitively recommend which facility to close. **Product scale** data (e.g., 1:18, 1:24) is available and can provide some insight into relative product sizes. While not as precise as full product dimensions, this data can be used as a proxy to estimate the amount of storage space each product occupies.

2. Inventory Management

- **Discontinue Low-Demand Products**: Products such as the **1985 Toyota Supra** and the **1966 Shelby Cobra 427 S/C** are slow-moving, with high stock levels and low profitability. These products should be discontinued or significantly discounted to free up space for higher-demand items.
- Restock High-Demand Products: High-turnover products like the 1968 Ford Mustang and the 1960 BSA Gold Star DBD34 should be prioritized for restocking to meet customer demand. These products have shown consistent sales and profitability.

3. Warehouse Optimization

- **Redistribute Inventory**: With **Warehouse B** housing the most products and showing the highest profitability, but having the lowest turnover rate (0.16), inventory redistribution could help balance stock across locations. Redistributing stock from **Warehouse B** to underutilized locations like **Warehouse D** could improve overall turnover and prevent overcrowding in any one facility.
- Leverage Product Scale for Storage Efficiency: The productScale data provides a ratio of product size, which can be used to optimize space. For example, products at 1:18 scale will require more storage space than those at 1:700 scale. By considering product scale

when organizing inventory, Mint Classics can better allocate storage space across warehouses, ensuring larger items are housed efficiently in facilities with greater capacity.

4. Customer Retention Strategies

- Focus on High-Value Customers: Customers such as Euro+ Shopping Channel and Saveley & Henriot, Co., who contribute significantly to total payments, should be prioritized for retention. Offering loyalty programs, exclusive discounts, or personalized services could help secure their continued business.
- Expand in Underperforming Regions: Regions such as Sydney and Tokyo have relatively few customers compared to larger markets like the U.S. and France. Expanding marketing efforts in these regions could increase customer acquisition, helping to offset any negative impact from warehouse closures.

5. Sales Representative Training and Incentives

• Improve Sales Performance: While sales reps like Gerard Hernandez and Leslie Jennings lead in revenue generation, reps such as Tom King and Yoshimi Kato, who are not currently managing any customers, could benefit from targeted training and performance incentives. This would increase overall sales effectiveness and customer management.

Conclusion

While the Mint Classics database lacks precise product dimensions, the available **product scale** data can be leveraged to make informed decisions regarding warehouse closures and inventory management. By focusing on discontinuing underperforming products, redistributing inventory based on product size, and retaining high-value customers, Mint Classics can streamline operations, improve profitability, and maintain high levels of customer service despite the reduction in storage facilities.