**Balancing Sparkle and Strategy: A Forecasting Approach for Jewelry Design Center**

**Executive Summary:**Jewelry Design Center (JDC) is a family-owned business with three locations across Washington and Montana, specializing in retail jewelry, repair services, and custom design. The focus of this project is retail sales forecasting to support inventory planning, with the goal of helping JDC better align supply with demand. Using five years of historical sales and inventory data (2020–2024), this analysis applies a data-driven approach to uncover seasonal trends, growth patterns, and inventory performance. By excluding high-variability items such as loose diamonds, and concentrating on finished retail products, the project ensures that the insights are grounded in JDC's core retail operations. The final deliverables include sales and inventory forecasts by product category through 2025, model comparisons using Prophet and SARIMA, and strategic recommendations to optimize inventory turnover, reduce overstocking, and strengthen demand planning.

What is forecasting and why use it? Forecasting is about predicting the future as accurately as possible. Sales forecasting is the process of predicting future revenue based on historical sales data, seasonal trends, and market conditions. Inventory forecasting involves estimating the quantity of products a business needs to have on hand in the future to meet customer demand without overstocking or running out. Together, these forecasts help a business anticipate what products will sell, when they’ll sell, and in what quantities.

**Overview of Historic Sales 2020-2024**

Taking a top-down approach allows us to first identify overarching patterns and trends across the entire business - such as seasonality, year-over-year growth, and category-level performance - before narrowing in on specific drivers of demand. Starting with a broad view ensures that forecasts are grounded in the bigger picture of company-wide performance. We start here with an overview of total sales revenue.

A graph showing the growth of sales

AI-generated content may be incorrect.

***Key Findings:***

**Strong Seasonality**

* Pronounced sharp peaks each year, representative of the holiday season November-December
* This suggests that forecasting should account for seasonal fluctuations (SARIMA or Prophet would be good models for this).

**General Upward Trend**

* Although there is some growth over time, it is not exponential, which means expansion (like a 3rd store opening) may not have had an immediate impact on revenue.

**April 2020 – COVID Impact**

* Sales dropped to near zero, likely due to store closures.
* Did sales recover quickly afterward, or was there a slow rebound? (check month-over-month % change)

Since we don’t have 2019 sales, there is no reference point for a 2020 YoY calculation. This means 2020 sales appear as the baseline, but 2020 was disrupted by Covid closures. If total sales in 2020 were unusually low, then 2021’s recovery seems massive by comparison. To understand the impact of the Covid closure and determine if 2021’s rebound is exaggerated, we need to verify if sales were abnormally low. Therefore, quantifying the Covid impact is necessary.

**How Did Covid Impact Sales/Recovery?**Sales in 2020 and 2021 follow similar seasonal patterns, confirming that Covid’s disruption was temporary. Revenue rebounded quickly, stabilizing by March 2021. Therefore, I won’t need special corrections when forecasting 2025. Moving forward, forecasting models should focus on growth drivers in store expansions, marketing impact, and product mix.

A graph of a graph showing the growth of a company

AI-generated content may be incorrect.

**New Store Opens (Missoula - October 2023)**

Another important aspect of overall sales is the opening of JDC’s third location in October 2023. Examining the impact of this new location on sales is presented in the chart below. We can see there was no immediate increase in overall sales, and (need to elaborate on this analysis)

A graph of sales by store

AI-generated content may be incorrect.

***Key Findings:***

* Sales Growth Was Strong in 2021-2022, Then Slowed
* Spokane: +57.69% in 2021 but slowed to +8.2% in 2022
* Kennewick: +82.55% in 2021, then slowed to +9.5% in 2022
* This suggests that the post-COVID recovery boosted sales initially, but growth leveled off in 2022

**Spokane’s Sales’ Decline in 2023 (-10.21%)**

* Happened the same year Missoula opened (2023).
* This suggests Missoula may have pulled some customers away from Spokane instead of bringing all-new business.

**Missoula Grew Rapidly (+301.76%) in 2024**

* Expected, since 2023 was its first partial year.
* However, Kennewick’s growth dropped to +2.18%, which is almost flat.
* Spokane only grew +5.89% in 2024, which is still relatively slow.

**Company-Wide Sales Growth is Weak in 2024**

* If Missoula’s launch was purely adding new customers, we’d expect stronger overall growth in 2024.
* Instead, Spokane and Kennewick’s growth has nearly stalled, meaning some Missoula sales were likely cannibalized from other locations.

**Seasonal Decomposition**

The 4 components that make up the graph below are: Observed (Raw Sales Data), Trend (Long-Term Growth), Seasonality (Repeating Yearly Patterns), and Residuals (Unexplained Variability).

A graph of a graph of a graph

AI-generated content may be incorrect.

***What the lines in each of these component graphs tell us:*Observed (Raw Sales Data)**

* This is the actual sales data over time.
* There are big spikes in Nov/Dec, indicating holiday shopping.
* The overall shape mirrors what we’ve already seen in our line charts earlier.

**Trend (Long-Term Growth)**

* The trend plot shows the underlying long-term pattern in sales.
* Sales increase sharply in 2020-2021 (post-Covid recover).
* Growth slows down from 2022 onward.
* Flattens slightly in 2023-2024 confirming that sales growth is not accelerating.

**Seasonality (Repeating Yearly Patterns)**

* This shows recurring patterns in sales, independent of long-term growth.
* The graph has clear holiday spikes every year.
* Other months are relatively stable.
* Since these seasonal spikes are very pronounced, they are a key feature of the business.

**Residuals (Unexplained Variability)**

* The Residuals plot shows what’s left over after removing the trend and seasonality.
* If this were pure noise, the values would fluctuate randomly around zero.
* In this case, there are some visible dips and spikes, meaning: there are unexpected factors affecting sales, e.g. economic downturns, store closures, promotions, etc.

***Key Findings:***

Trend: Strong growth until 2022, then flattens.  
Seasonality: Huge holiday spikes (important for forecasting).  
Residuals: Some volatility, but not extreme - forecasting is feasible.

**Understanding the Makeup of JDC’s Business Model**

Jewelry Design Cetner is driven by three core revenue streams: retail (or finished, ready-to-wear items), repair services, and custom design. Because JDC’s stakeholders requested this project focus on retail sales only, the first task was to determine retail sales as a percentage of total sales. An analysis of five years (2020–2024) of sales data reveals that JDC’s revenue streams are broken down as follows:

* **Retail Sales (79.7%)** The largest contributor, encompassing finished jewelry, watches, and other retail items.
* **Repair Services (12.2%)** A significant portion of JDC’s business, reinforcing its role as a trusted service provider.
* **Custom Design (8.1%)** A reflection of JDC’s expertise in creating one-of-a-kind jewelry pieces tailored to individual clients.

A graph of sales and retail sales

AI-generated content may be incorrect.

**Exploring Retail Sales Data**  
Within the retail sales segment of JDCs overall revenue is an important aspect of their business model – the sale of loose diamonds. JDC hand-selects the finest diamonds offered in the world and has become the largest supplier of loose diamonds in the Northwest region of the United States, making this sub-segment of retail sales a unique and substantial revenue driver. However, to ensure we have an appropriate dataset to perform an accurate forecast, it was imperative to exclude Loose Diamonds - both Natural and Lab-grown. Including these sub-categories in a retail sales analysis would distort trends due to their distinct purchasing behavior.

A further breakdown of retail sales, shown in the graph below, tells us that Loose Diamonds (natural and lab-grown) make up roughly 32% of all retail sales. As a result, this forecasting analysis will focus on the 68.3% of revenue derived from finished retail products, ensuring that inventory planning is aligned with the true retail segment of JDC’s business model.

A graph of sales

AI-generated content may be incorrect.

**Filtered Retail Sales** - **Descriptive Statistics**

The cleaned and filtered sales data for years 2020-2024 results in the following descriptive statistics. The dataset contains 41,421 sales records and offers a detailed view of transaction-level retail activity across the three JDC locations.

**Sales Revenue (sale\_total)**

* Average sale total: $866.02
* Standard deviation: $2,102.55 — indicating a wide range of variability in transaction values
* Minimum sale total: -$18,990.00
* Maximum sale total: $136,000.00
* Total sales revenue: $38,536,062.05

***Interpretation:*** The high max and large standard deviation suggest a few very large purchases (or returns) are inflating the spread. The negative minimum could reflect refunded transactions or corrections in the system.

**Quantity Sold (qty)**

* Average quantity per transaction: 0.93
* Standard deviation: 0.65
* Min quantity: -1
* Max quantity: 33
* Total quantity sold: 41,421 units

***Interpretation:*** Most transactions involve the sale of 1 item or fewer (likely many 1-to-1 sales). A negative quantity likely reflects a return or error, which should be flagged for further review.

**Gross Profit (gross\_profit)**

* Average gross profit per transaction: $426.24
* Standard deviation: $1,000.05
* Minimum gross profit: -$21,744.00
* Maximum gross profit: $55,027.00

***Interpretation:*** The spread of gross profit mirrors that of sales revenue, reinforcing the presence of high-value outliers. Negative values again likely indicate returns, markdowns, or data issues.

**Cost of Goods Sold (cogs)**

* Average COGS: $439.45
* Standard deviation: $1,208.27
* Min COGS: -$11,400.00
* Max COGS: $80,973.00

***Interpretation:*** The average cost of goods is slightly higher than the average gross profit, which may suggest pricing strategies with variable markups or high-cost custom orders. The large max and negative min again suggest high-value transactions and data inconsistencies worth deeper investigation.

**Possible Data Quality Issues?**

* Negative values in sale\_total, qty, gross\_profit, and cogs should be examined more closely - especially if they’re not explicitly coded as returns.
* The large spread in all monetary metrics implies some high-ticket items or special orders significantly influence the data.

**Exploring JDC Inventory Data**

To prepare the inventory dataset for forecasting, I began by filtering the data to align with the five-year sales window from 2020 to 2024. I ensured that all date fields, including sold\_date, purchase\_date, and date\_entered, were cleaned and formatted consistently to allow for accurate time-based analysis. Items outside the relevant date range were excluded, and I removed entries with missing SKUs or invalid financial data such as zero or negative cost or margin.

I also segmented the inventory by sold and unsold status to better understand turnover and potential demand. Special attention was given to categorization - verifying that category names and numbers matched those in the sales dataset, and assigning a dedicated "Special Orders" category for custom-built items. To support forecasting at the category level, I preserved key fields such as SKU, cost, sale price, and margin, and calculated inventory age to identify long-held items. This structured, filtered inventory data now serves as a clean foundation for strategic forecasting aligned with sales trends.  
  
**Filtered Inventory** - **Descriptive Statistics**

The inventory dataset contains 90,286 items, each with associated cost, sale price, age, and margin data. This gives us a comprehensive snapshot of the company’s inventory profile, both in value and lifecycle stage.

**Cost (cost)**

* Average cost per item: $502.84
* Standard deviation: $1,437.64 — indicating significant variation across inventory types
* Cost range: $0.00 to $176,944.36
* Total inventory cost: ~$45.4 million

***Interpretation:*** The extremely wide cost range and high standard deviation suggest a mix of small, inexpensive items and extremely high-value inventory, signifying JDC’s customs or luxury items.

**Sale Price (saleprice)**

* Average sale price: $1,023.88
* Standard deviation: $2,450.71 — again indicating wide variation
* Sale price range: $0.02 to $300,000.00
* Total potential sales value: ~$92.4 million

***Interpretation:*** The average markup from cost to price appears to be about 2x, which aligns with the gross profit margin and custom pricing strategies. The wide price range further supports the presence of both entry-level and high-ticket items.

**Gross Margin (margin\_corrected)**

* Average dollar margin per item: $521.05
* Median dollar margin per item: $256
* Standard deviation: $1,075.70
* Range: $0.00 to $123,055.64

***Interpretation:*** There’s a large spread in profit levels, indicating a business model that accommodates both lower-priced and luxury items. High-value outliers can skew average performance metrics, so evaluating the median in this case is necessary. See histogram below.

A graph with a number of bars

AI-generated content may be incorrect.

Using $100 bin widths in the histogram above, reveals a clearly right-skewed distribution of gross margins. Most of the inventory items fall into the lower margin range, with the highest concentration in the $0–$500 range. Frequencies decrease steadily as margin increases, indicating that most products are low- to mid-margin, and high-margin items are relatively rare. Despite a few items exceeding $3500 in gross margin, these are outliers contributing to a long right tail. This binning approach reveals that the bulk of inventory is concentrated below $1000, reinforcing that a large portion of sales is driven by high-volume, lower-margin items.

**Inventory Age**

* Total Items: 90,088
* Average age: 272 days (~9 months)
* Median age: 129 days (~4.3 months)
* Standard deviation: ~389 days — some items are extremely old
* Range: 0 to 6,593 days (~18 years)
* % over 1 year: 25.09%
* % over 2 years: 9.79%

***Interpretation:*** While the average inventory age is within a reasonable timeframe, the max value reveals the presence of extremely stale inventory that may require reevaluation.

A graph with numbers and a red line

AI-generated content may be incorrect.

As seen in the histogram above, most of the inventory is relatively fresh. The median of 129 days mean half of JDC inventory is less than 4.5 months old. This is a healthy sign, with a strong pipeline of new inventory turnover. With about 25% greater than 1 year, and nearly 10% over 2 years of age, these most likely represent higher-cost, luxury items with slower turnover. The histogram shows a long tail to the right with some items greater than 5 years (including a few ~18 years old. These outliers inflate the mean of 272 days well above the median of 129 days.

**Margin Percent (margin\_percent)**

* Average margin percent: 55%
* Standard deviation: 12%
* Range: 0% to 100%

***Interpretation:*** JDC maintains healthy markups on average, with some items achieving full 100% margin. The relatively low standard deviation suggests pricing consistency across most inventory lines, with strategic exceptions for premium products.

**Pre-Modeling Diagnostics: Identifying Key Trends and Anomalies for Accurate Forecasting**

Before building forecasting models, it is essential to explore and understand the underlying structure of the sales data. This pre-modeling diagnostic step focuses on identifying recurring trends, seasonal patterns, and anomalies across product categories. By visualizing the distribution of sales within each category, we can pinpoint unusual spikes or dips in performance that could skew model accuracy if left unaddressed. This step not only validates the presence of consistent patterns over time but also highlights any outlier behavior—such as sudden demand surges—that may require special consideration in the forecasting process.

A graph with red squares and white squares

AI-generated content may be incorrect.

**Identified Outliers:**

* Quarter: 2021 Q4
* Category: Diamond Fashion Rings - Women's
* Total Sales Revenue: $146,005.35
* Z-Score: 3.044082

***Z-score: 3.04 - What does this mean?***   
A Z-score is a statistical measure that tells you how far a particular data point falls from the mean of a dataset and is used to identify outliers. Identifying outliers in the context of categorical sales for JDC helps us understand how trends or seasonality affects overall sales. A Z-score above 3 means the sales in this quarter were more than 3 standard deviations above the mean which tells us that sales were significantly higher than a typical sales number for this category and timeframe. It suggests a spike in demand that is not consistent with previous quarters or years.

**Top-Selling Categories:**  
Women's Diamond Wedding Bands and Diamond Engagement Rings have the highest median sales and significant variability. These categories are contributing the most to overall revenue.

**Mid-Range Performers:**  
Diamond Studs, Watches, Live Bridal, and Diamond Pendants also have high median sales, but with more spread (variability) between quarters.

**Lower-Selling Categories:**  
Of the top 10 best-selling categories, Gold Chains, Women’s Diamond Fashion Rings and Women’s Colored Stone Rings have the lowest median sales, meaning they contribute less to total revenue.

**Understanding Outliers & Variability:**

* Large Spreads (High Variability in Sales) - Diamond Studs, Watches, and Live Bridal show larger interquartile ranges (IQRs), indicating fluctuating demand between quarters.
* These categories may be harder to forecast because their sales are less consistent.
* Frequent Outliers (Spikes in Sales)
* Outliers (points above the whiskers) suggest quarters where sales surged unexpectedly.
* Women's Diamond Wedding Bands, Diamond Engagement Rings and Watches show several high outliers, like due to seasonal spikes, e.g. holiday shopping in Q4.

**Consistent Performers (Lower Variability)**

* Gold Chains and Women's Colored Stone Rings have smaller IQRs, meaning their sales are more stable over time. These categories are likely easier to forecast.

**Some possibilities for the spike?**

* Historically strong quarter for jewelry sales due to the holidays.
* Economic factors? Did consumer spending on luxury items increase in late 2021?
* One-off large purchases? A few high-value transactions could have pushed up sales.

**Impact on Forecasting?**

* May adjust for seasonality: if this spike is seasonal, the model should incorporate seasonality.
* Handle Anomalies carefully: if this was a one-time event, using raw historical data could lead to overestimated forecasts.
* Compare to other Q4 data: check sales for Q4 in other years to help determine if this is a recurring trend or a true anomaly.  
    
  A graph of sales comparison for a fashion ring

  AI-generated content may be incorrect.

***Diamond Fashion Rings – Women’s***  
Q4 2020 Total Sales = $64,099.11  
Q4 2021 Total Sales = $146,005.35  
Q4 2022 Total Sales = $71,621.20  
Q4 2023 Total Sales = $81,537.60  
Q4 2024 Total Sales = $113,159.47

**Post-2021 Dip & Recovery:**

* Sales dropped sharply in 2022 ($71,621.20) after the 2021 spike.
* Sales recovered in 2023 ($81,537.60) and jumped again in 2024 ($113,159.47).

**Analyzing Sales & Inventory by Category – Using the Pareto Principle (80/20 Rule)***Why Category-Level Analysis Matters in Inventory Management and Forecasting*

Analyzing sales and inventory at the category level provides clearer insight than working at the SKU level alone. This approach reveals meaningful patterns in turnover, margin, and aging trends across product types, supporting more accurate forecasting and better-aligned inventory decisions. By focusing on the product categories that contribute most significantly to revenue and profit, we reduce complexity while improving model accuracy. Identifying the subset of categories that accounts for approximately 80% of gross sales allows forecasting efforts to be directed where they will have the most meaningful impact.

In the table below, we see the Top 12 Categories by Total Sales, with their cumulative contribution. This is reflective of the sales data from 2020-2024, making up approximately 80% of gross sales.

A screenshot of a graph

AI-generated content may be incorrect.

**Observations of the Top 12 Categories:**

* Jewelry with Diamonds dominate JDC sales: Between Diamond Wedding Bands - Women's, Diamond Engagement Rings, Diamond Fashion Rings - Women's, Live Bridal, and Diamond Earrings, diamonds account for a majority of the 80% - showing they are the core business drivers.
* The Top 5 Categories – which include Watches – make up over 53% of overall sales.
* Gold Wedding Bands (Men’s) and Colored Stone Rings round out the top performers.

**Model Building  
Sales Forecast Model Comparison (Prophet vs. SARIMA)**

*A Single Category: Live Bridal*

To evaluate forecasting approaches for high-impact product categories, I performed a side-by-side comparison of two time series models - Prophet (Meta Open Source) and SARIMA (Seasonal ARIMA) - using sales data for the “Live Bridal” category from the top11\_forecast\_sales table.

**Dataset & Scope**

The analysis focused on monthly total sales for the “Live Bridal” category from 2020 through early 2025. The data was sourced from a curated BigQuery table containing only the top 12 categories contributing to ~80% of gross revenue, ensuring relevance to business-critical forecasting.

**Model 1: Prophet**

Prophet is an open-source forecasting model developed by Meta (formerly Facebook) that is designed to handle time series data with multiple components - such as trend, seasonality, holidays, and outliers. It uses a modular and flexible framework, allowing users to easily customize these components to better fit the data. One of its key strengths is its ability to detect recurring patterns - like seasonal sales spikes - with minimal data preprocessing. The model uses an additive regression approach that combines these components to generate forecasts while also giving us confidence intervals that reflect uncertainty in the predictions.

The chart below visualizes both historical and forecasted monthly sales of the Live Bridal category. The black dots represent actual observed monthly sales (historical data). The maroon line is Prophet’s forecast of monthly sales and the shaded area shows the 80% confidence interval – meaning the model estimates there is an 80% chance the actual sales will fall within this range.

A graph of a graph showing the weather

AI-generated content may be incorrect.

**MAPE: 41.36%**

**RMSE: $24,017.56**

Two common performance metrics used to evaluate forecasting models are: MAPE (Mean Absolute Percentage Error), and RMSE (Root Mean Squared Error). MAPE expresses forecast accuracy as a percentage by averaging the absolute percent errors between predicted and actual values. RMSE is a measure of the average magnitude of error between predicted and actual values, reported in the same units as the target variable – in this case, US dollars. Together, these metrics give us a sense of both relative and forecast accuracy.

* MAPE for our model is 41.36% indicating that, on average, the forecast was off by about 41% from actual sales.
* RMSE of $24,017.56 means that the model’s predictions deviate from actual sales by about $24,000 on average each month.

It is important to interpret these accuracy metrics in the context of this single category, “Live Bridal”. These are high-value, lower-frequency items (relatively), which can retail for thousands of dollars per piece. This makes even small errors in unit volume translate into large percentage errors in revenue. With that, the 41.36% MAPE should not be viewed as a failure of the model, but perhaps a reflection of the category’s inherent variability. Despite the sensitivity of this category, the model still captured the seasonal spikes and produced a reasonable forecast with tight confidence intervals, offering valuable insights for planning.

**Model 2: SARIMA**

SARIMA (Seasonal AutoRegressive Integrated Moving Average) is a classical time series model that accounts for both non-seasonal and seasonal components in the data. It is especially useful when there’s autocorrelation - meaning, when past values influence future values - and when patterns repeat over time. The model was implemented using the statsmodels library with a base configuration of (1,1,1)(1,1,1,12), where the second set of numbers captures annual seasonality (12 months).

Unlike Prophet, SARIMA requires more manual tuning and assumes more regularity in the patterns it models. While it’s a statistically rigorous model, it can struggle with high volatility and irregular seasonal spikes, as is often the case with high-value, low-frequency categories like Live Bridal.

The black line in the chart below shows us the actual observed monthly sales of Live Bridal, while the maroon line represents the model’s forecast from 2024 on. The gray shaded region around the maroon line is the confidence interval range, or where the model expects future sales to fall. The forecast is failing to capture the sharp seasonal spikes, and the wide, uneven confidence intervals suggest the model lacks confidence and shows high uncertainty.

A graph showing a line of a graph

AI-generated content may be incorrect.

**MAPE: 72.52%**

**RMSE: $37,952.59**

* MAPE of 72.52% is a very high percentage error and indicates SARIMA’s predictions, on average, deviated significantly from actual sales, meaning the model missed the mark.
* RMSE shows that the forecasted values were off by nearly $38,000 on average per month showing a substantial deviation, even considering the nature of the Live Bridal category.

**Model Tuning & Evaluation - SARIMA**

To see if I could improve the SARIMA model’s accuracy, I tested a wide range of settings to find the best combination. This process is called a **grid search**, and it involves trying different model configurations to see which one fits the data best. I chose the version that had the lowest AIC score - a statistic that helps compare models by balancing how well they fit the data with how complex they are. The best version I found was a model with the parameters (2,2,2)(1,1,0,12), and it had an AIC score of 778.29.

However, after fitting the tuned model and comparing the performance metrics, the results showed that the tuned model underperformed comparatively. Specifically, the MAPE resulted in a higher percentage error with 77.74%, and the RMSE resulted in $39,420.96, indicating larger deviations from actual sales.

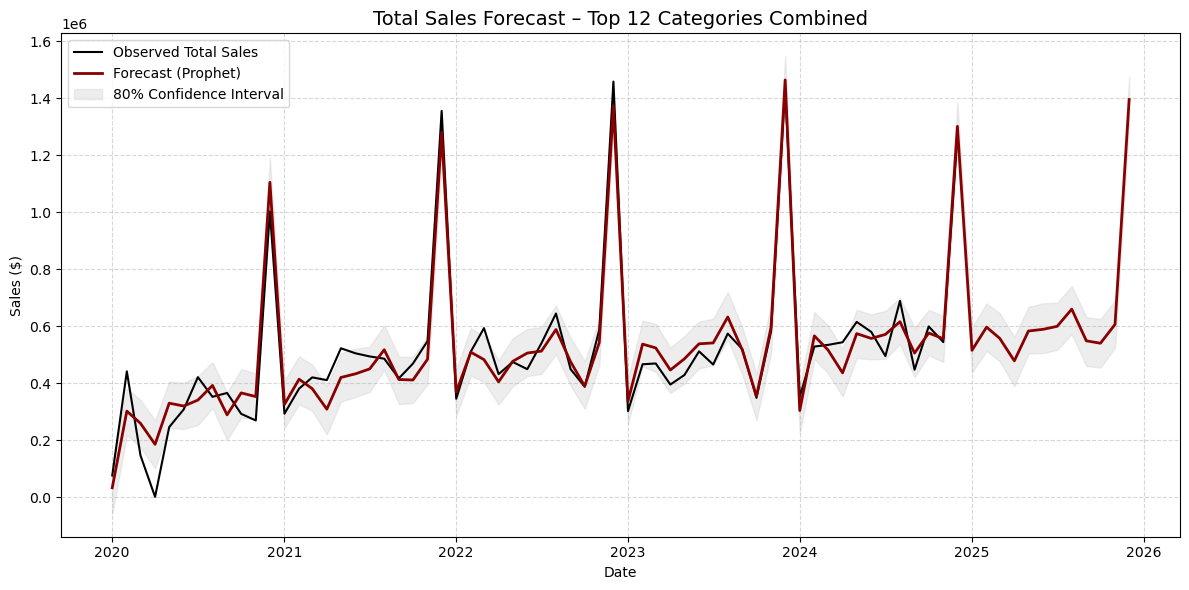
Given these results, the default model proved more effective for this dataset and will be retained for comparison against the Prophet model.

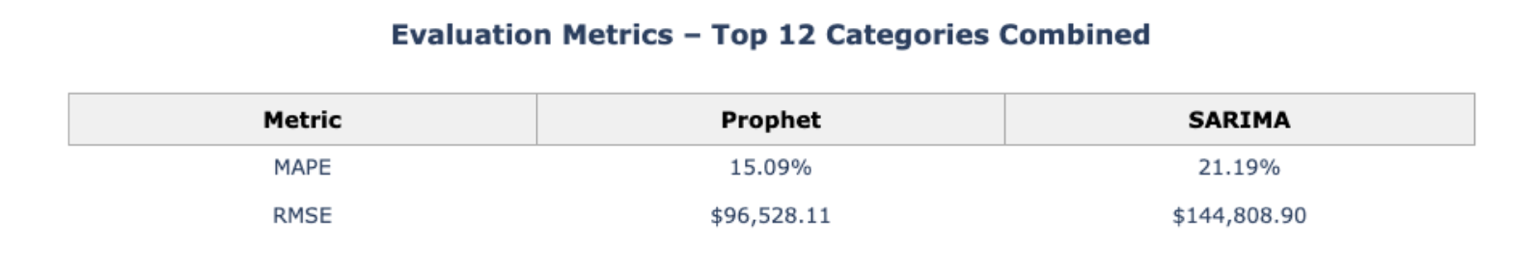
For the “Live Bridal” category, Prophet outperformed SARIMA significantly, delivering lower error rates and stronger seasonality detection with minimal tuning. Based on this comparison, Prophet appears to be the more suitable model for scaling across the remaining top-performing categories.

**Sales Forecast Model Comparison (Prophet vs SARIMA)**

*Top 12 Categories Aggregated*

Using the same model comparison approach, I evaluated Prophet and SARIMA, on the aggregated monthly sales data from the Top 12 Categories, which altogether account for over $30 million (~80%) in gross sales from 2020–2024.



****

***Key Insights:***

* Both models perform well, but Prophet outperforms SARIMA by about 6% with a lower Mean Absolute Percentage Error (MAPE) and Root Mean Squared Error (RMSE).
* Prophet’s RMSE is just 0.32% of total actual sales ($30.8M), indicating strong accuracy and low deviation from the true values.
* This level of precision is particularly useful for planning and budgeting purposes, where even small percentage gains can represent significant dollar value.
* The model effectively captures holiday seasonality spikes, which are critical for forecasting revenue during peak months.

**Inventory Forecasting**

Forecasting inventory involves anticipating how much stock JDC will need on hand over future periods to meet forecasted demand without overstocking. There are 2 ways to look at inventory – either unit-based or value-based. Both have pros and cons but after evaluation I’ve chosen to go with value-based forecasting for the following reasons: 1) more strategic for financial planning, 2) can highlight categories that tie up a lot of capital, and 3) captures differences in item value (which is useful for luxury items or mixed categories).

The first step is to align the forecasted monthly sales revenue with current inventory value by category. This helps estimate how long the current inventory will last and guide future purchasing needs.

This chart below presents a high-level comparison of inventory on-hand (as of December 31, 2024) versus the average monthly forecasted sales for 2025 across JDC's Top 12 product categories.

The **maroon bars** represent current inventory value in dollars, shown on the left axis. The **gray dots** represent the forecasted average monthly sales for each category, shown on the right axis.

Together, this chart illustrates whether a category is potentially **overstocked, understocked, or balanced** relative to expected demand. While each category has a different turnover rate and seasonal sales pattern, this view offers a strategic snapshot of how well inventory is aligned with sales expectations for the entire year - helping guide merchandising, purchasing, and promotional planning going forward.

A graph of sales

AI-generated content may be incorrect.

The table below gives a snapshot of where things stand with inventory and expected sales for JDC’s Top 12 product categories. It compares how much product is currently sitting in inventory with how much we expect to sell each month in 2025. The final column - *months of inventory* - shows how long that stock might last if sales go as forecasted. It’s a quick way to spot which categories might be overstocked, understocked, or just right, and can help guide smarter purchasing decisions going forward.

A screenshot of a spreadsheet

AI-generated content may be incorrect.

***Key Observations:***

* Live Bridal has the highest unsold inventory value at $1.79M, but with relatively modest forecasted monthly sales ($65K), it has one of the highest months of inventory (27.45 months), indicating potential overstocking or slower demand turnover.
* Colored Stone Rings – Women’s and Diamond Fashion Rings – Women’s also stand out with months of inventory exceeding 24 months, highlighting categories where current stock could significantly outlast forecasted sales pace.
* In contrast, Diamond Studs and Gold Chains show the lowest months of inventory (6.47 and 9.69 months, respectively), suggesting a tighter alignment between inventory levels and forecasted demand—potentially even understocked if demand increases.
* Watch and Diamond Engagement Rings categories are relatively well-balanced, with strong sales forecasts and inventory levels yielding a manageable 14-month coverage window.

**Balanced Categories**

* Diamond Engagement Rings and Diamond Wedding Bands - Women's show a healthy relationship between inventory value and forecasted sales, suggesting inventory is aligned with expected demand.

**Overstocked Categories**

* Live Bridal has one of the highest inventory values, but its forecasted sales are much lower in comparison. This could indicate overstocking or slowing demand—an opportunity for markdown strategies or promotion.
* Colored Stone Rings - Women's and Diamond Pendants show a similar pattern—high inventory with relatively modest forecasted sales.

**Potential Understocked/High-Turn Categories**

* Diamond Fashion Rings - Women's and Gold Chains have low forecasted sales and low inventory, which may be appropriate. But if demand changes or promotions occur, these could face stockouts.
* Watch shows strong forecasted sales with moderate inventory levels, suggesting efficient turnover and likely good sell-through rates.

**Inventory Turnover Rate**

Looking at inventory turnover gives us a backward glance at how efficiently each category performed in 2024. It compares the cost of goods sold (COGS) last year to what we currently have in stock, and answers the question, “How many times did we sell through our inventory in the past year?” The table below highlights three key figures: Unsold Inventory Value, 2024 COGS, and Inventory Turnover Rate.

* The following patterns stand out:  
  Categories like Gold Chains (0.65) and Diamond Wedding Bands – Women’s (0.52) had strong turnover, suggesting demand has been consistently high and inventory is moving.
* On the flip side, categories like Colored Stone Rings – Women’s (0.15) and Diamond Bracelets (0.22) are turning more slowly. These are areas where inventory is sitting longer and could be tying up cash flow unnecessarily.

A table with numbers and text

AI-generated content may be incorrect.

**Interpreting Inventory Health**

The table below provides a snapshot of inventory health by category, based on current stock levels, forecasted 2025 sales, and 2024 turnover rates. Categories flagged as **Risk of Overstock** are moving slowly and may require adjustments to future purchasing. **Risk of Stockout** flags indicate fast-moving inventory with limited months of coverage — suggesting a need for tighter inventory control or increased replenishment. Categories marked **Healthy** show a strong balance between supply and demand, with turnover and stock levels aligned to forecasted sales.

A close-up of a list

AI-generated content may be incorrect.

**Open-To-Buy Analysis Summary (full year 2025)**

This full-year Open-to-Buy analysis provides a clear, forward-looking snapshot of inventory alignment by category. By comparing current unsold inventory against forecasted 2025 sales, it highlights where we may be overstocked (negative OTB) or where additional purchasing may be needed (positive OTB). Most categories currently exceed forecasted demand, suggesting an opportunity to optimize buying decisions and rebalance where appropriate.

*Note: This analysis uses full-year forecasted sales as a planning benchmark. Q12025 sales are already in the books and are not subtracted here, as the focus is on aligning total 2025 inventory with total expected demand.*

**A graph of a bar graph

AI-generated content may be incorrect.**

**Conclusion & Strategic Recommendations**

This analysis equips Jewelry Design Center (JDC) with clear, data-driven guidance for aligning inventory and sales strategies through 2025. By forecasting demand at the category level and assessing current inventory positions, this project identifies where capital is tied up, where opportunities are emerging, and how JDC can optimize decision-making to support future growth.

1. **Use Forecasting to Drive Smarter Inventory Decisions**

* Prophet outperformed SARIM across key categories, capturing seasonal spikes and delivering more accurate forecasts with less tuning.
* Applying Prophet-based models across JDC’s top-performing categories can strengthen purchasing decisions, reduce guesswork, and improve demand alignment.

1. **Rebalance Inventory to Improve Turnover**

* Categories like Live Bridal, Colored Stone Rings – Women’s, and Diamond Pendants show signs of overstocking, with 24+ months of inventory on hand.
* These areas may benefit from markdown strategies, promotional pushes, or revised reorder points to improve turnover and free up cash flow.
* In contrast, Diamond Wedding Bands – Women’s and Gold Chains show strong turnover and tight inventory levels. These may need more aggressive restocking to avoid lost sales.

1. **Implement Lifecycle Inventory Strategies**

* Nearly 10% of inventory is more than two years old. Introducing aging-based KPIs and lifecycle pricing strategies (e.g. discounts on items older than 12-18 months) can minimize sunk costs and improve cash efficiency.

1. **Integrate Seasonality into Sales & Marketing Plans**

* Holiday-season spikes are a defining feature of JDC’s retail pattern. Forecasting and promotions should be tailored to peak months to ensure stock availability and capitalize on demand surges.

1. **Support New Store Growth with Strategic Marketing and Ramp-up Planning**

* The Missoula store’s launch in late 2023 introduced JDC to a new market with strong long-term potential. While early sales followed a natural ramp-up pattern, preliminary 2025 data already shows promising momentum – Q1 is up significantly year-over-year.
* Growth in a new location often builds over time and may depend on customer awareness, inventory availability, and tailored local marketing. Strengthening these areas can accelerate store performance and ensure each new location reaches its full potential.
* Future expansion strategies should incorporate longer runway periods and coordinated marketing efforts to maximize visibility and demand from the outset.

JDC’s ability to stay agile and customer-focused while making smarter, data-backed inventory decisions will be a key competitive edge. With forecasting as part of the toolkit, the company will be well positioned to reduce excess stock, improve turnover, and respond confidently to market trends in the years ahead.