BUSINESS ANALYTICS CAPSTONE

FINAL PROJECT REPORT

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INTRODUCTION

Novica is an online marketplace that connects artisans from around the world with a global audience seeking unique and handcrafted treasures. Founded in 1999, Novica serves as a bridge between talented artisans, often located in remote or developing regions, and conscious consumers looking for one-of-a-kind art, jewelry, and home decor. With a mission to empower artists by providing them with a platform to showcase their craftsmanship, Novica's platform not only enables cultural preservation but also fosters fair trade practices. Through Novica, shoppers can discover and acquire ethically sourced, handmade products that embody the rich traditions and stories of artisans, creating a meaningful connection between creators and consumers across continents.

PROBLEM STATEMENTS

Amazon.com is a significant retail channel for NOVICA. NOVICA is characterized by rapid product development and many SKUs. NOVICA faces multiple challenges in trying to increase sales on Amazon.com.

- The primary challenge involves the development of precise and dependable sales forecasts. Accurate forecasting is paramount for ensuring optimal stocking levels of products at Amazon's warehouses through Fulfillment by Amazon (FBA). Inaccuracies in forecasting can lead to either overstocking or stockouts, both of which pose significant financial risks.
- The secondary challenge is rooted in the diverse performance of numerous SKUs across different sales channels, with a particular emphasis on those struggling to gain traction on Amazon.com. While some SKUs thrive, others face challenges in achieving comparable success. The aim is to conduct a comprehensive analysis including Traffic Analysis and Sales Funnel Analysis to pinpoint the factors contributing to these performance disparities.

DATA DESCRIPTION AND DATA PREPROCESSING

We received 2 different data sources to address our problem statements:

Part 1: Forecasting

- **Data Description:** The dataset for our time series forecasting analysis primarily consists of two key variables: the date and various target variables, with a focus on top sales SKUs (Stock Keeping Units) historical data. Each SKU serves as a unique identifier for individual product items, enabling precise tracking and analysis. The dataset features a detailed breakdown of weekly unit sales data, providing insights into the week-by-week sales performance of these SKUs. This structured approach allows for an in-depth examination of sales trends and patterns over time, laying the groundwork for accurate forecasting and strategic decision-making in inventory and sales management.
- **Preprocessing Steps:** Data preprocessing was meticulously carried out using Python and Excel, encompassing several key steps to ensure data quality and readiness for analysis. The process began with Data Integration, where we combined multiple datasets into a single, comprehensive dataset. This was followed by Imputation to address missing values, and Deletion of irrelevant or extraneous data. We then conducted Outlier Checking and Null/Missing Values Checks to identify and rectify any anomalies in the data. A Time-Based Split was implemented to segregate the data chronologically, ensuring a valid analysis framework. Consistency Checks were performed to maintain data uniformity, while Data Type Format Adjustments were made to align data types with analytical requirements. The preprocessing phase culminated in a thorough Validation process, confirming the data's integrity and suitability for effective time series forecasting. This rigorous approach, leveraging the capabilities of Python and Excel, was critical in laying a solid foundation for accurate and reliable forecasting analysis.

Part 2: Traffic and Sentiment Analysis

- **Data Description:** In our traffic and sales funnel analysis, we considered columns such as SKU, Country of Origin, No. of Product Reviews, Average Star Rating, Category, Sale Price, Sessions (Total), Featured Offer (Buy Box) Percentage, fulfilled by, and Seasonality to gain valuable insights into product performance and conversion rates.
- **Preprocessing Steps:** In our preprocessing phase, we did feature engineering, introducing new key metrics such as Price per Session and Review Impact score. To enhance the dataset, we created dummy variables for 'Fulfilled by?' and 'Seasonality' columns, enabling a more detailed analysis. We then segmented the data based on 'Sessions - Total,' facilitating targeted Traffic Analysis for sessions ranging from 0 to 30, followed by a comprehensive Funnel Analysis for sessions exceeding 30. This approach provides valuable insights for both traffic and conversion dynamics.

EXPLORATORY DATA ANALYSIS

The frequency table **(Exhibit 1)** underscores that a significant number of Stock Keeping Units (SKUs) recorded fewer than 30 total sessions, with over 700 SKUs showing zero sessions. Notably, the Jewelry category exhibited the highest session total, followed by Tableware, Hammock, and so forth. Correlation analysis revealed minimal correlation among the various variables. Considering the exploratory analysis, the chosen course for the project involves segmenting the Traffic Report data based on its relevance for Traffic and Sales Funnel analysis.

HYPOTHESIS

➔ **Claim:** We hypothesize that understanding historical sales patterns for NOVICA's top 9 SKUs on Amazon will provide valuable insights into their future performance. Examining trends, seasonality, and cyclical patterns can help identify recurring behaviors.

➔ **Reasoning and Technique:**

- **Reasoning - Historical Sales Data Analysis:**
  - Understanding past sales patterns, trends, and seasonality provides insights into SKU behaviors.
  - Recognizing cyclicality helps anticipate periodic variations in demand.
- **Technique - Advanced Forecasting Models:**
  - Implementing models like ARIMA and Prophet enables a detailed examination of time series data.
  - These models capture intricate relationships and dependencies in sales patterns.

METHODOLOGY AND ANALYSIS

Part 1: Forecasting

1.1 - ARIMA: The ARIMA (Autoregressive Integrated Moving Average) model is a widely used statistical approach for time series forecasting, applied in fields like economics, finance, and weather forecasting. It is characterized by three key parameters: p, d, and q.

- **AR (Autoregressive) Term - p:** Captures the relationship between an observation and a specified number of lagged observations.
- **I (Integrated) Term - d:** Represents the order of differencing needed to make the time series stationary.

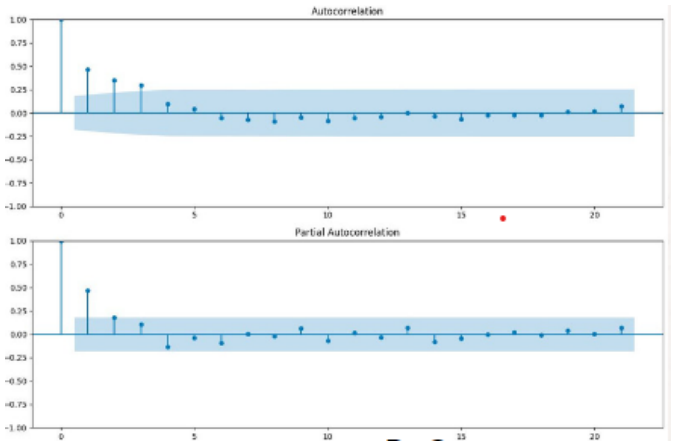
- **MA (Moving Average) Term - q:** Indicates the order of the 'Moving Average' part, incorporating the relationship between an observation and a residual error from a moving average model applied to lagged observations. Together, these components allow ARIMA models to effectively capture diverse time series behaviors, with the choice of p, d, and q values determined through a combination of statistical tests and heuristic methods.

- **Results and Analysis for ARIMA model**:

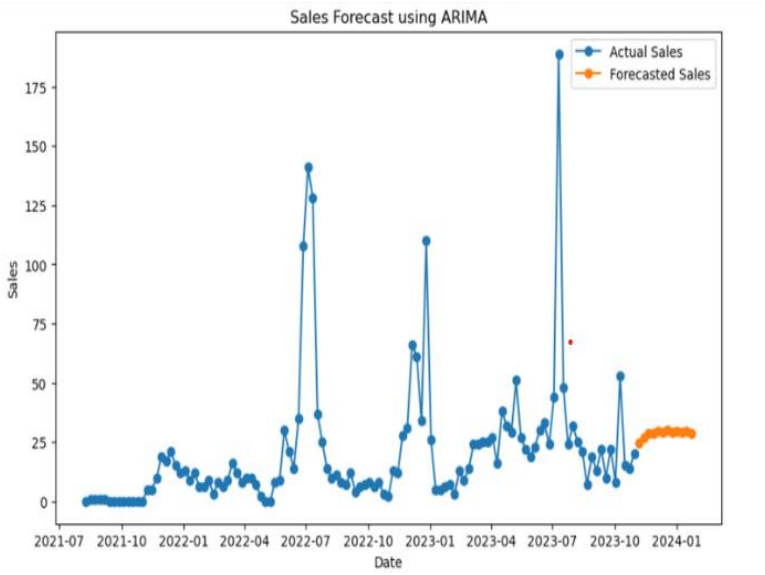
Analysis for SKU: **11461**

We will demonstrate one SKU's result to show our analysis, additional results and graphs will be there in the code file:

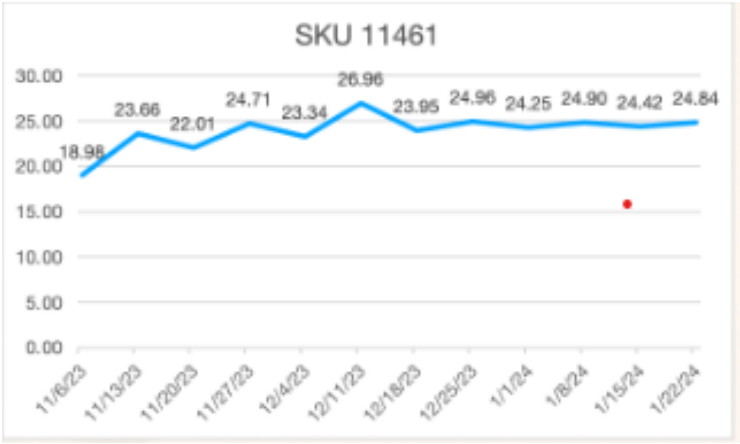
According to the partial autocorrelations plot, we can decide the starting point of p, which is 2 or 3 we decided to use 3 after multiple experimental and accuracy comparisons on the model. And according to the autocorrelations plot, we can decide the starting point of 1, which is 3 or 4. and we decided to use 3 after multiple experimental and accuracy comparisons on the model.



In the prediction plot, we can say the prediction line slightly increases between October to December, which makes sense. Because it is Thanksgiving period and Christmas holiday.



This visualization gives us insights about restocking a certain number in a specific period will fulfill the demand. We can see the peek point of demand shows on Dec 11th, 2023.



- **Performance Metrics:**

Root Mean Square Error (RMSE): 21%

Mean Absolute Error (MAE): 15.86

The RMSE indicates the model's forecast error and, at 21%, suggests moderate predictability. The MAE provides a clear measure of prediction accuracy, averaging 15.86 units away from actual values.

1.2 - PROPHET: The Prophet forecasting model is a specialized tool designed for time series forecasting, particularly in business applications. Developed by Meta (Facebook), it excels in handling daily observations that display patterns such as holidays and seasonal effects. Prophet operates by decomposing time series data into three main components: trend, seasonality, and holidays. It employs

an additive model that combines these components, making it robust to various time series patterns. Prophet is known for its ease of use and ability to handle missing data and outliers, making it a valuable tool for accurate and user-friendly time series predictions.

- **Results and Analysis for Prophet model:**

Taking the forecasting results for SKU: 194533 using the Prophet forecasting tool. We have evaluated the forecast performance using standard metrics, specifically the Root Mean Square Error (RMSE) and the Mean Absolute Error (MAE). These metrics help us understand the model's accuracy and precision in predicting future values based on historical data.

- **Performance Metrics:**

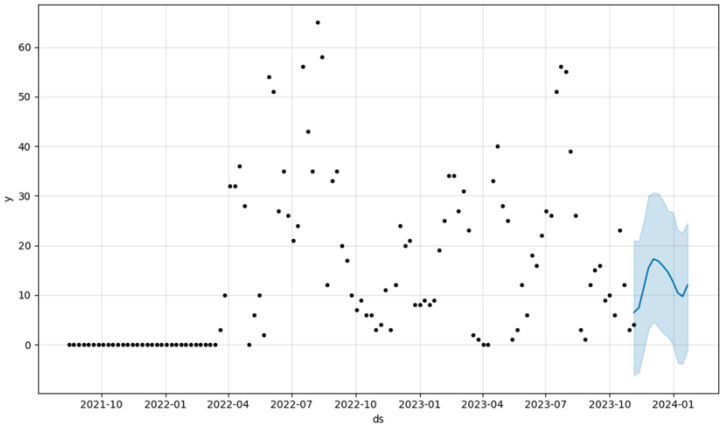
The performance of Prophet on SKU 194533 is -

Root Mean Square Error (RMSE): 17.9%

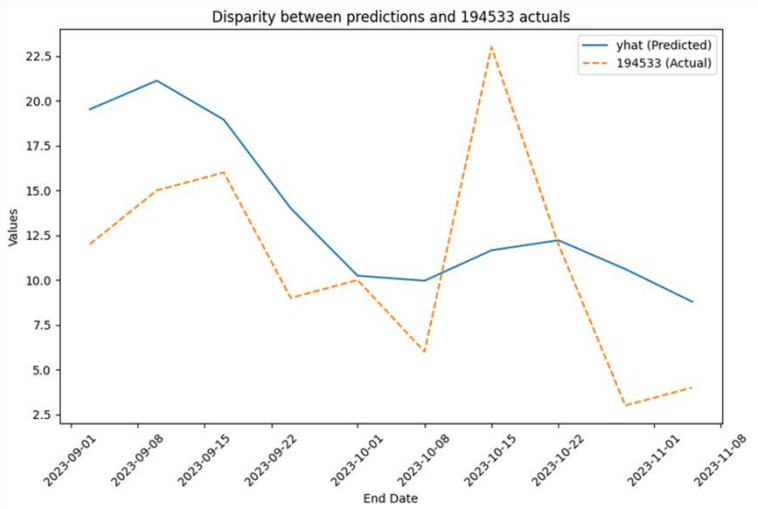
Mean Absolute Error (MAE): 4.98

The RMSE indicates the model's forecast error and, at 17.9%, suggests moderate predictability. The MAE provides a clear measure of prediction accuracy, averaging at 4.98 units away from actual values.

Forecast Graph: The graph above illustrates the forecast results over time, juxtaposing actual data points with the predicted values and confidence intervals.



Validating Fit Graph: The validation graph presents a validation of the model's fit by comparing the predicted (yhat) values against the actual data points for SKU 194533. Discrepancies between the lines indicate periods where forecast accuracy deviated from the actual.



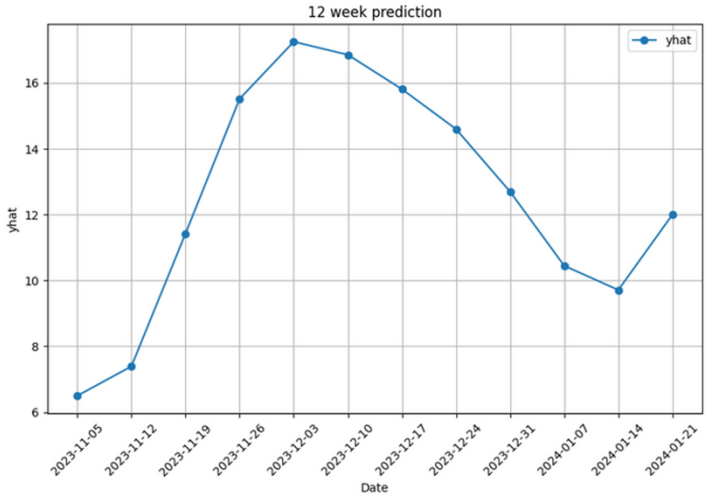
Upon reviewing the forecast graph, we observe a forecast trend, depicted on the right side of the graph, indicates an expected increase in values within the projected confidence interval.

In the validating fit graph, the actual values show volatility in contrast to the forecasted values, which are smoother in transition. This divergence points to the model's limitations in capturing rapid shifts or anomalies in the sales data.

The RMSE percentage reflects the forecast's overall deviation from actual sales, and although not negligible, it is within a manageable range for initial forecasting. The MAE indicates that the model, on average, forecasts within approximately 5 units of the actual sales, denoting reasonable accuracy.

Weekly forecast for next 12 weeks:

Looking at the forecasts in more detail we observe that the highest demand is during the first week of December and gradually decreases, which is in line with our seasonality assumption.



The forecasting model for SKU 194533 demonstrates an adequate level of accuracy with some variability. While the RMSE suggests that the forecast has some discrepancies, the MAE provides a more optimistic view of the model's capability to predict sales.

Further details of remaining model predictions are provided in **Exhibit 5** of the appendix.

Model Comparison:

We now delve into the comparative performance of Prophet and ARIMA forecasting models for three SKUs: 11461, 97696, and 194533, with an emphasis on how well each model captures seasonality in the data.

- **SKU 11461**

For SKU 11461 shows that Prophet is particularly adept at capturing seasonality patterns in sales data. Although the RMSE is higher for Prophet, indicating overall less accuracy, its ability to map recurring trends over time is apparent, which is critical for anticipating seasonal demands.

Prophet Model:

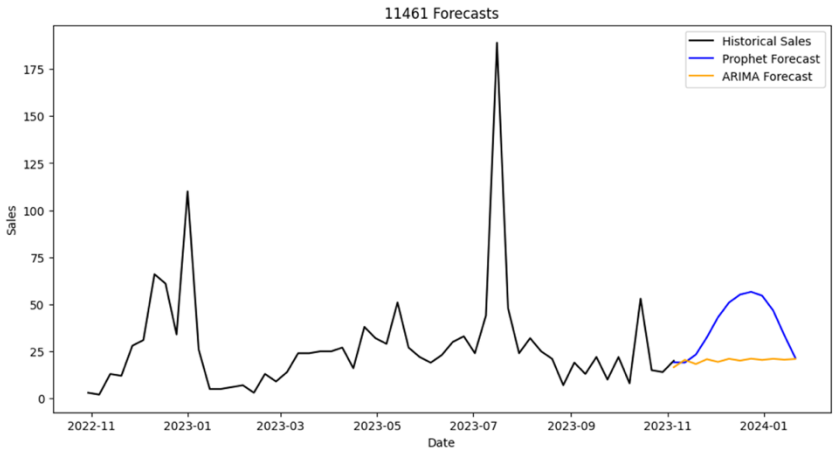
RMSE: 28.62%

MAE: 8.21

ARIMA Model:

RMSE: 21%

MAE: 15.86



- **SKU 97696**

This highlights the forecasts for SKU 97696. Despite a higher RMSE, the Prophet model's lower MAE suggests it is consistently close to actual sales, potentially capturing underlying seasonal patterns that are not as apparent with the ARIMA model.

Prophet Model:

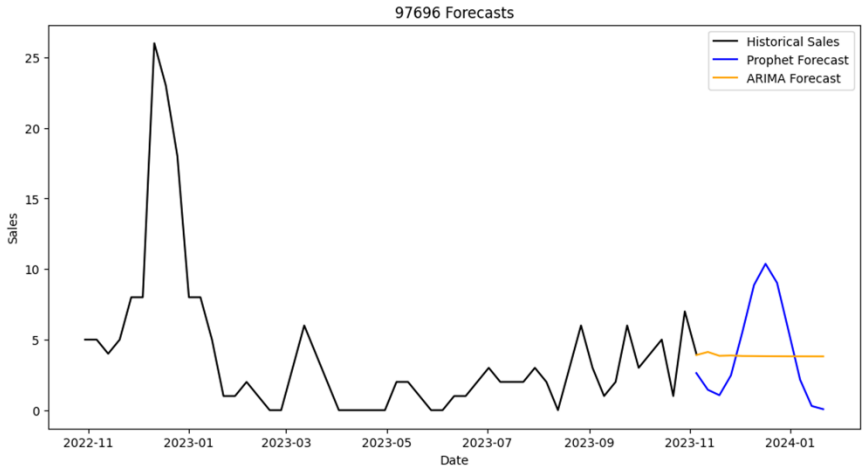
RMSE: 61%

MAE: 2.9

ARIMA Model:

RMSE: 27%

MAE: 1.6



- **SKU 194533**

This displays the forecasts for SKU 194533. Prophet's lower RMSE compared to ARIMA indicates a superior grasp of the sales pattern's seasonality. This is reflected in the model's ability to follow the historical cyclical trends more closely.

Prophet Model:

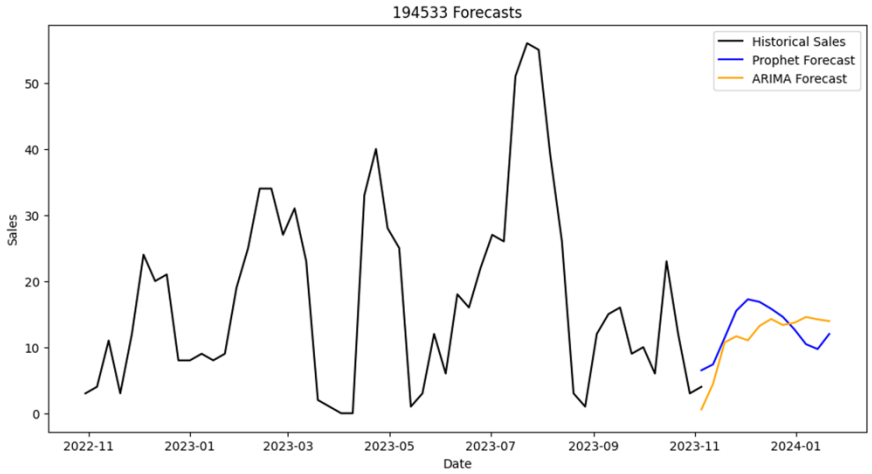
RMSE: 17.9%

MAE: 4.98

ARIMA Model:

RMSE: 29%

MAE: 11.64



The comparison particularly highlights Prophet's strength in capturing seasonality, which is a common pattern in sales data where certain trends repeat over a set period. This ability is critical for businesses to prepare for expected increases or decreases in demand. Prophet's performance, as indicated by the MAE, suggests that while it might be influenced by outliers, it is reliable for predicting seasonal peaks and troughs.

The analysis concludes that the Prophet model is better suited for datasets with strong seasonal patterns. Despite sometimes having a higher RMSE, Prophet's strength lies in identifying and adapting to seasonal trends, which is invaluable for strategic planning and inventory management. We recommend using Prophet for forecasting tasks where seasonality plays a significant role in sales variations.

Link to the Python File - Hyper Link

Part 2.1: Traffic Analysis

Traffic analysis was conducted for the 5000 SKUs. It involved categorizing SKU data based on session totals into 3 segments: 1) those with 0 sessions, 2) 1-15 sessions, and 3) 16-30 sessions. In the specified context, segmenting SKU data aligns with the objective of assessing performance based on sessions.

For segments 2 and 3, Ordinary Least Squares (OLS) Regression analysis was conducted within the top 5 categories. Additionally, comprehensive Keyword Analysis was performed across all three segments. OLS Regression, assuming linearity, identifies trends in SKU categories. This method is crucial for structured SKU analysis, generating actionable insights for optimization.

- **Results and Analysis**:

Segment 1: Zero Sessions

Keyword Analysis: The keyword analysis for SKUs with zero sessions assessed the efficacy of product titles, crucial due to limited order history and reviews. The word cloud for ASINs B07KS35ZSW and B07KS35ZSW revealed the prevalent use of non-effective words instead of useful keywords. Displayed in Exhibit 2.

Segment 2: 1-15 Sessions

- **Regression:**

Category	% Fulfilled by Amazon	Avg Buy Box Percentage
Clothing	0.42%	0.974
Jewelry	0.24%	0.986
Tableware	0%	0.975
Sculpture	0%	0.88
Accessories	0%	1

Categories	Buy Box Percentage	FBA Fulfilled	Review Impact Score	Seasonal?
Clothing	0	0	0.45	0.89
Jewelry	4.17	0	0	0
Tableware	0	0	0	0

Sculpture	0	0	0	0
Accessories	2.49	0	0	2.49

- **Keyword Analysis** (Exhibit 2)

The regression analysis, combined with the provided table, reveals insights into the significance of factors across categories. In Clothing and Sculpture, the regression results indicated that Buy Box Percentage and FBA Fulfilled were statistically insignificant. This aligns with the corresponding table, where % Fulfilled by Amazon are minimal. Conversely, for Jewelry and Accessories, despite the low % Fulfilled by Amazon, the regression analysis showed varying significance. The word cloud for ASIN B0CDCKF21T (Exhibit 2) revealed the prevalent use of non-effective words instead of useful keywords.

Segment 3: 16-30 Sessions

- **Regression**:

Categories	Buy Box Percentage	FBA Fulfilled	Review Impact Score	Seasonal?
Jewelry	0	0	8.03	0
Clothing	0	0	0	0
Tableware	0	0	0	0
Sculpture	0	0	0	0
Accessories	0	0	0	0

Category	% Fulfilled by Amazon	Avg Buy Box Percentage
Jewelry	1.17%	0.993
Clothing	5.80%	0.989
Tableware	0%	0.976
Sculpture	0%	0.881
Accessories	0%	0.991

- **Keyword Analysis (**Exhibit 2)

The results of the regression analysis highlight significant insights within the specified categories. In the Jewelry category, the Review Impact Score emerges as a critical factor with a value of 8.03, signifying its substantial influence on outcomes. Conversely, for the remaining categories, none of the factors—Buy Box Percentage, FBA Fulfilled, or Seasonal—demonstrate statistical significance. The word cloud for ASIN B09QGT2864 (Exhibit 2) revealed the prevalent use of non-effective words instead of useful keywords.

Part 2.2: Sales Funnel Analysis

The methodology applied in this report includes segmenting data with over 30 sessions into four distinct segments. The choice to employ Ordinary Least Squares (OLS) Regression for each segment assumes that the data variables exhibit homoscedasticity and independence. OLS is favored for its ability to estimate model parameters efficiently and unbiasedly under these assumed conditions. Coupled with Sentiment Analysis, this methodology extracts valuable insights, guiding the formulation of strategic recommendations.

Results of analysis - Top 5 Categories

Segment 1: Low Price Per Session and Low Conversion Rate

Category	Featured Offer (Buy Box) Percentage	Fulfilled by Amazon	Fulfilled by Merchant	Review Impact Score	Seasonality
Hammock	0.21	0.24	-0.12	-2E-05	0.12
Tableware	0.14	0.23	-0.06	8E-05	0
Jewelry	-0.52	0.38	0.15	5E-04	0
Jewelry Boxes	0.37	0.15	-0.01	-8E-05	0
Decor Accessories	0.09	0.13	-0.03	7E-04	0

Category	Avg Buy box Percentage	Avg Price per Session	Avg Conversion Rate	Percentage Fulfilled by Amazon
Hammock	0.39	0.18	0.13	13.04%

Tableware	0.65	0.22	0.27	20.00%
Jewelry	0.98	0.20	0.24	10.33%
Jewelry Boxes	0.67	0.39	0.40	25.00%
Decor Accessories	0.59	0.11	0.14	5.26%

Fulfilled by Amazon and Buy Box positively influences Hammock, Tableware, Jewelry Boxes and Decor Accessories. Meanwhile Review Impact and seasonality has minimal impact across most categories. The sentiment report **(Exhibit 3)** revealed that 73.7% of users primarily utilize the product as a perfect birthday gift for someone special. Additionally, 50% of the people expressed a positive response, citing the product as beautiful.

Segment 2: Low Price Per Session and High Conversion Rate

Category	Featured Offer (Buy Box) Percentage	Fulfilled by Amazon	Fulfilled by Merchant	Review Impact Score	Seasonality
Jewelry	2.32	0.35	-0.12	0.0003	0.45
Clothing	-0.34	0.64	0.72	-0.0006	0.67
Tableware	0.97	0.41	0.53	3.72E-05	0
Sculpture	1.55	0.39	0.30	0.0006	0
Wall Decor	1.87	0.74	-0.15	0.0004	0

Category	Avg Buy box Percentage	Avg Price per Session	Avg Conversion Rate	Percentage Fulfilled by Amazon
Jewelry	0.97	1.10	2.75	55.23%
Clothing	0.99	1.14	1.93	61.70%
Tableware	0.91	1.12	2.31	46.81%
Sculpture	0.75	1.00	2.25	42.22%
Wall Decor	0.91	1.15	2.68	47.37%

Buy Box significantly influences Jewelry, Sculpture, Wall Décor, and Tableware positively. While Fulfilled by Amazon and Fulfilled by Merchant show varied effects across categories. The sentiment report **(Exhibit**

3) reveals that 31% of customers appreciate its excellent quality as a gift for everyday use. However, 23% express dissatisfaction with perceived poor quality.

Segment 3: High Price Per Session and Low Conversion Rate

Category	Featured Offer (Buy Box) Percentage	Fulfilled by Amazon	Fulfilled by Merchant	Review Impact Score	Seasonality
All 9 Products	-0.81	0.61	0.47	0.0003	0.00

Avg Buy box Percentage	0.97
Avg Price per Session	1.91
Avg Conversion Rate	0.81
Percentage Fulfilled by Amazon	25.00%

Segment 3 consists of a total of 9 SKUs. A small number of data records may limit the reliability and generalizability of regression results, which shows all the 9 products influenced by FBA fulfilled. The sentiment analysis report **(Exhibit 3)** reveals a predominantly positive perception, with 77% of users incorporating it into their daily lives, often as a preferred gift option. However, there is notable concern among 45.5% of purchasers who perceive the product as being of poor quality.

Segment 4: High Price Per Session and High Conversion Rate

Category	Featured Offer (Buy Box) Percentage	Fulfilled by Amazon	Fulfilled by Merchant	Review Impact Score	Seasonality
Jewelry	2.63	0.75	0.59	0.0005	-1.4312
Tableware	4.96	-0.95	0.68	0.0005	0
Masks	6.15	-0.85	-1.04	-0.0014	0
Clothing	-1.32	2.06	1.62	-0.0059	-0.8668
Sculpture	-4.81	3.31	2.21	1.69E-05	0

Category	Avg Buy box Percentage	Avg Price per Session	Avg Conversion Rate	Percentage Fulfilled. by Amazon
Jewelry	0.99	2.63	4.79	60.02%
Tableware	0.93	2.79	4.28	53.42%
Masks	0.97	2.21	2.91	64.71%
Clothing	0.99	3.91	3.32	20.48%
Sculpture	0.89	2.49	3.76	27.27%

Buy Box Percentage positively influences Jewelry, Tableware, and Masks categories. Fulfilled by Amazon and Fulfilled by Merchant have varying effects across categories. The sentiment analysis reports (Exhibit 3) that 57.7% of users associate the product primarily with being a perfect Christmas gift for someone special. Additionally, 46.8% of respondents express satisfaction, noting the product's perceived good quality and comfort.

Insights and Recommendations

Part 1: Forecasting Models

Recommendation

Based on our model and key metric value comparison. We recommend the Prophet forecasting model for forecasting future sales, as it takes into consideration seasonality and has a higher efficiency in predicting the restock values for the SKU's.

Insights

The insights and forecasted sales we gained performing the Prophet forecasting model about the predicted restocking value for the top 9 SKU's for Fulfill by Amazon are:

The time we predicted for is from December to the 3rd week of January, these are the peak trends –

- SKU 11461: 4th, 5th and 6th weeks of December.
- SKU 83019: 2nd and 3rd week of December.
- SKU 97696: 2nd, 3rd and 4th weeks of December.
- SKU 105324: Downward trend.
- SKU 193895: 3rd week of December.

- SKU 194533: 1st and 2nd week of December.
- SKU 232240: 1st week of December.
- SKU 292869: 3rd and 4th week of December.
- SKU 300838: 1st week of December.

Exact values predicted –

- SKU 11461: **362**
- SKU 83019: **355**
- SKU 97696: **42**
- SKU 105324: **1**
- SKU 193895: **24**
- SKU 194533: **109**
- SKU 232240: **12**
- SKU 292869: **89**
- SKU 300838: **101**

Part 2.1: Traffic Analysis

Segment	Insights	Recommendations
0 Sessions	• Less impactful words were prevalent in the product titles, evident in the word cloud, suggesting the potential for substitution with more useful terms.	• Choose more impactful keywords to enhance visibility and session engagement effectively. • Ensure alignment between the product title and corresponding images to enhance clarity and customer expectations. • Implement a competitive pricing strategy and conduct A/B testing, particularly when the average buy box is near zero.
1-15 Sessions	• The Buy Box percentage significantly influences the Jewelry and Accessories categories, underscoring its	• Optimize product listings by incorporating more impactful keywords to augment visibility.

	pivotal role in driving visibility and session views. • Across all categories, the prevailing trend reveals that nearly all products lack fulfillment by Amazon, indicating a notable pattern in distribution strategies. • Seasonality strongly impacts traffic in the Accessories category, while clothing experiences a moderate influence.	• For the Clothing and Accessories categories, leverage the "Fulfilled by Amazon" option, especially during peak seasons. This ensures reliable and efficient order fulfillment. • Evaluate competitor strategies, pricing models, and promotions to enhance your market positioning in Clothing and Accessories, where the Buy Box holds substantial influence.
16-30 Sessions	• The traffic for Jewelry is notably influenced by the number of reviews and ratings, emphasizing their crucial role in driving visibility. • Despite competitive pricing across the top 5 categories, overall traffic remains low. • A prevailing trend is observed where most products in all categories lack fulfillment by Amazon.	• Incorporating more impactful keywords across product listings in all categories. • Conduct a thorough trend analysis for competing products to discern optimal times for opting for Fulfillment by Amazon (FBA) and Sponsored options.

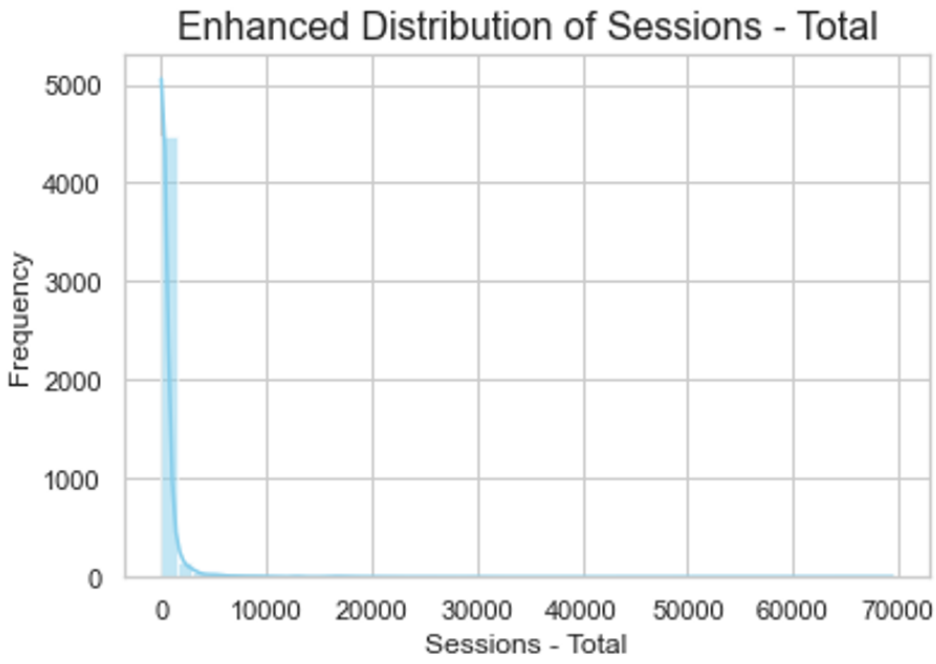
Part 2.2: Sales and Funnel Analysis

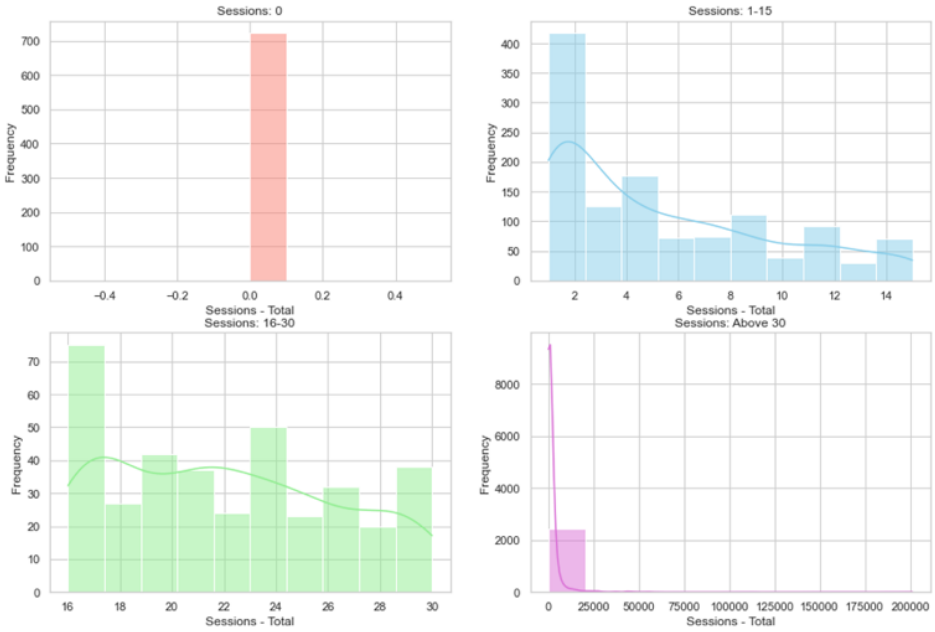
Segment	Insights	Recommendations

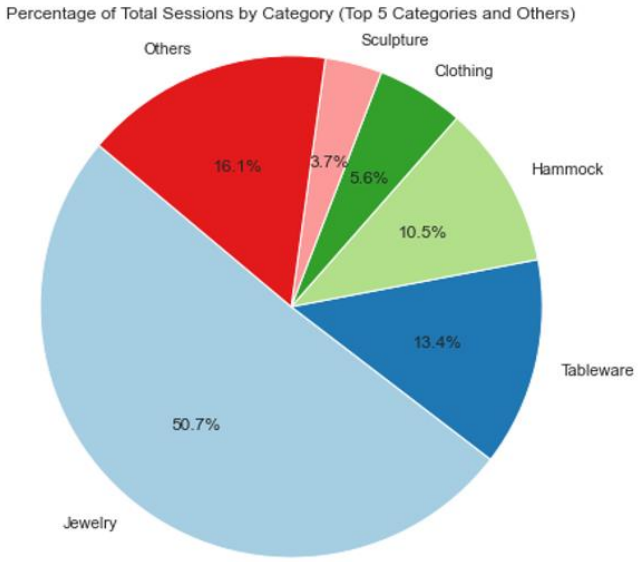
Low Price Per Session and Low Conversion Rate	• FBA has a significant impact on Hammock, Tableware and Jewelry Categories. • Among all the categories, Hammock has the highest no of session views with low avg conversion rate.	• Opt for FBA for Hammock, Tableware and Jewelry categories. • Offer competitive pricing for Hammock.
Low Price Per Session and Low Conversion Rate	• The Buy Box option has a significant impact on Jewelry & Sculpture Category. • Seasonality has a significant impact on Clothing Category.	• Perform A/B testing for higher sales prices. • Adjust pricing for clothing categories during peak seasons.
High Price Per Session and Low Conversion Rate	• Out of all the high price per session SKU's only 9 products have low conversion rate. • Only 4 out of 9 SKU's are fulfilled by Amazon.	• Opt for FBA for the remaining 5 products. • Implement quality checks and address the design issues.
High Price Per Session and High Conversion Rate	• Buy Box percentage has significant impact on Tableware category. • More than 70% of the Clothing and Sculpture products are not fulfilled by Amazon.	• Work on these products to get featured tag. • Improve Product color, fit, and quality.

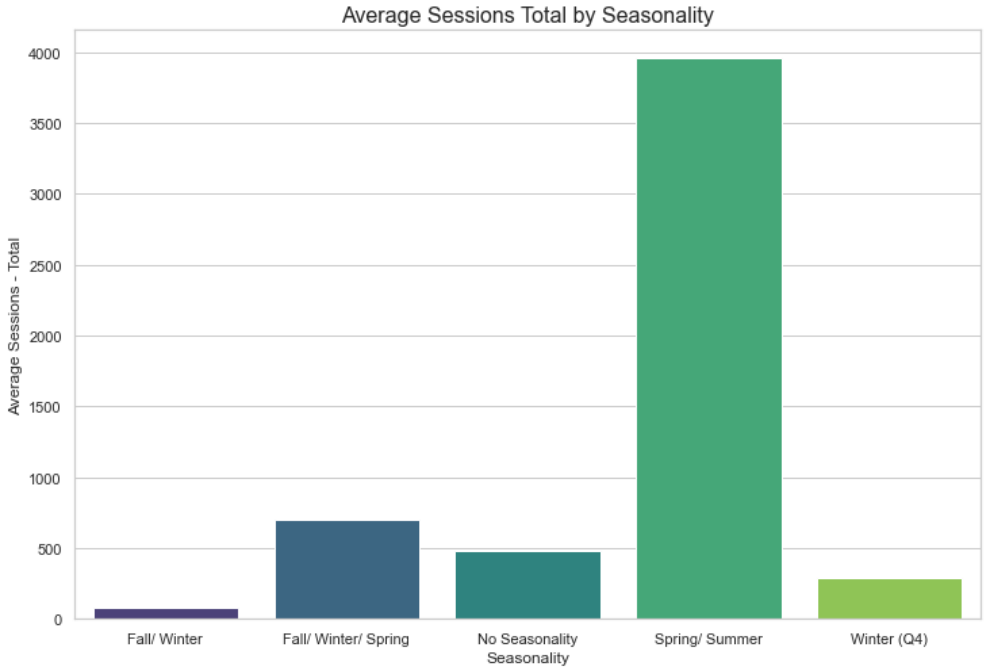
APPENDIX

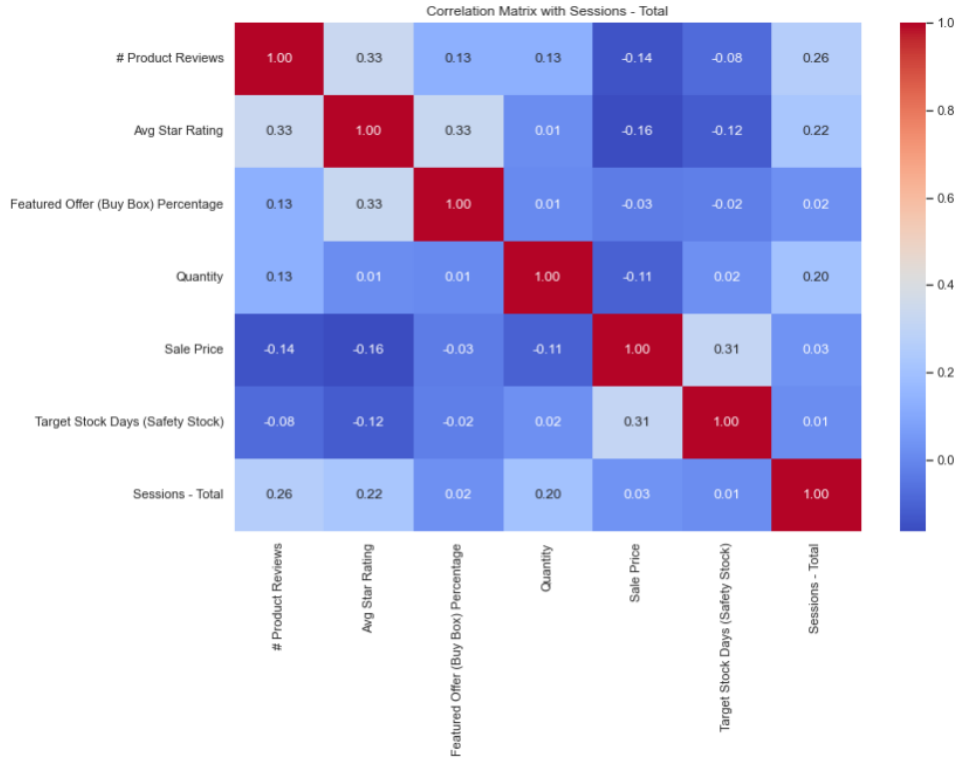
Exhibit 1 - EDA






Percentage of Total Sessions by Category (Top 5 Categories and Others)
Others
Sculpture
Clothing
Hammock
Tableware
Jewelry
16.1%
3.7%
5.6%
10.5%
13.4%
50.7%


Average Sessions Total by Seasonality
Average Sessions - Total
4000
3500
3000
2500
2000
1500
1000
500
0
Fall/ Winter
Fall/ Winter/ Spring
No Seasonality
Spring/ Summer
Winter (Q4)
Seasonality


Correlation Matrix with Sessions - Total
Product Reviews
Avg Star Rating
Featured Offer (Buy Box) Percentage
Quantity
Sale Price
Target Stock Days (Safety Stock)
Sessions - Total
1.00 0.33 0.13 0.13 -0.14 -0.08 0.26
0.33 1.00 0.33 0.01 -0.16 -0.12 0.22
0.13 0.33 1.00 0.01 -0.03 -0.02 0.02
0.13 0.01 0.01 1.00 -0.11 0.02 0.20
-0.14 -0.16 -0.03 -0.11 1.00 0.31 0.03
-0.08 -0.12 -0.02 0.02 0.31 1.00 0.01
0.26 0.22 0.02 0.20 0.03 0.01 1.00
1.0
0.8
0.6
0.4
0.2
0.0

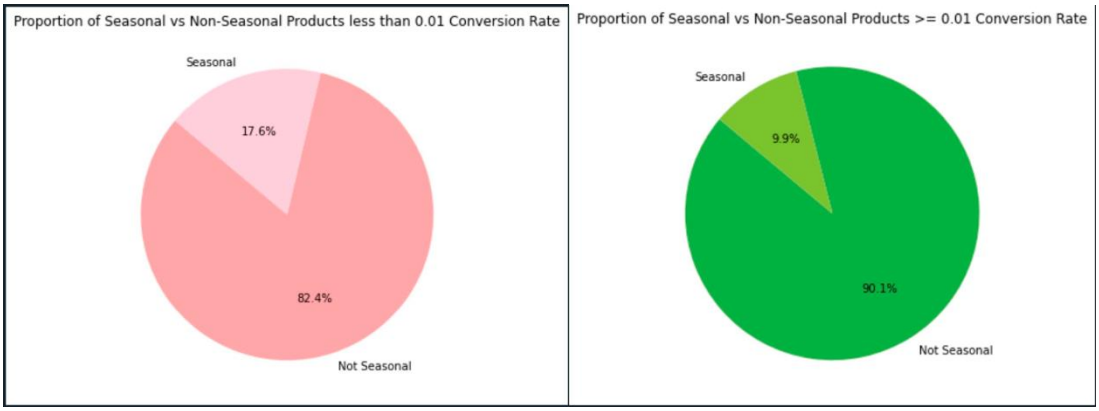
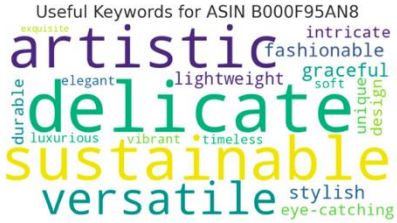

Proportion of Seasonal vs Non-Seasonal Products less than 0.01 Conversion Rate
Seasonal
17.6%
82.4%
Not Seasonal
Proportion of Seasonal vs Non-Seasonal Products >= 0.01 Conversion Rate
Seasonal
9.9%
90.1%
Not Seasonal

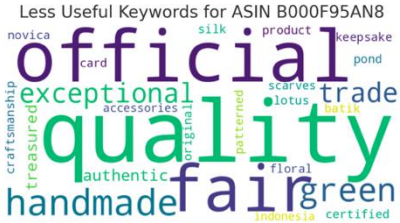
Exhibit 2: Keyword Analysis

Segment 1: Zero Sessions

Useful Keywords for ASIN B000F95AN8



Less Useful Keywords for ASIN B000F95AN8



Useful Keywords for ASIN B07KS35ZSW

Less Useful Keywords for ASIN B07KS35ZSW

Segment 2: 1-15 Sessions

Useful Keywords for ASIN B0CDCKF21T

Less Useful Keywords for ASIN B0CDCKF21T

Segment 3: 16-30 Sessions

Useful Keywords for ASIN B09QGT2864

Less Useful Keywords for ASIN B09QGT2864

Link to all Keyword analysis Segment wise -

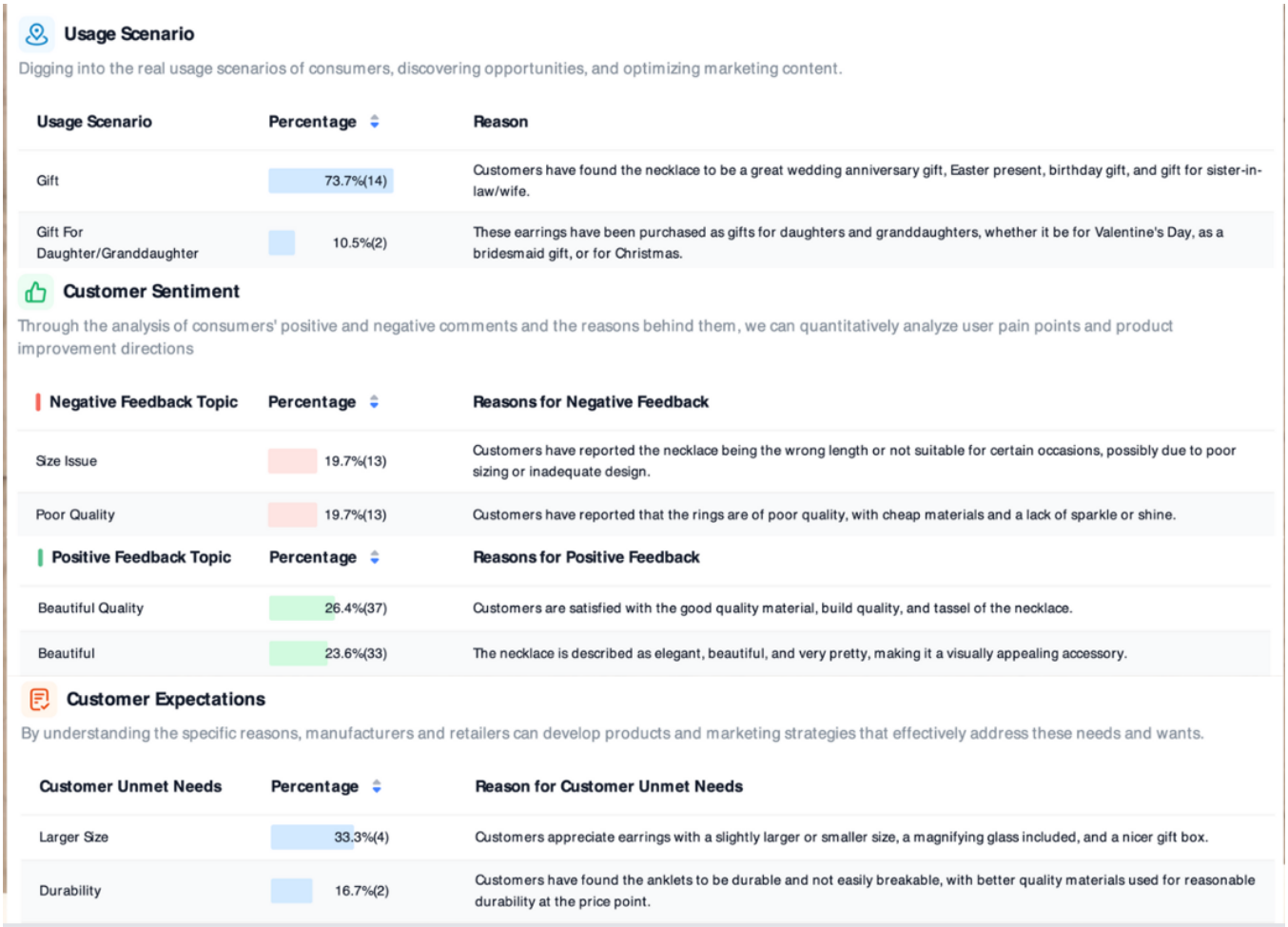
https://drive.google.com/drive/folders/1pCEFMriquPMS57jOL8466MqmTkpqhuvk

https://drive.google.com/drive/folders/1pCEFMriquPMS57jOL8466MqmTkpqhuvk?usp=sharing

HYPER - LINK

Exhibit 3: Sentiment Analysis

Segment 1: Low Price Per Session and Low Conversion Rate



Usage Scenario

Digging into the real usage scenarios of consumers, discovering opportunities, and optimizing marketing content.

Usage Scenario	Percentage	Reason
Gift	73.7%(14)	Customers have found the necklace to be a great wedding anniversary gift, Easter present, birthday gift, and gift for sister-in-law/wife.
Gift For Daughter/Granddaughter	10.5%(2)	These earrings have been purchased as gifts for daughters and granddaughters, whether it be for Valentine's Day, as a bridesmaid gift, or for Christmas.

Customer Sentiment

Through the analysis of consumers' positive and negative comments and the reasons behind them, we can quantitatively analyze user pain points and product improvement directions

Negative Feedback Topic	Percentage	Reasons for Negative Feedback
Size Issue	19.7%(13)	Customers have reported the necklace being the wrong length or not suitable for certain occasions, possibly due to poor sizing or inadequate design.
Poor Quality	19.7%(13)	Customers have reported that the rings are of poor quality, with cheap materials and a lack of sparkle or shine.
Positive Feedback Topic	**Percentage**	**Reasons for Positive Feedback**
Beautiful Quality	26.4%(37)	Customers are satisfied with the good quality material, build quality, and tassel of the necklace.
Beautiful	23.6%(33)	The necklace is described as elegant, beautiful, and very pretty, making it a visually appealing accessory.

Customer Expectations

By understanding the specific reasons, manufacturers and retailers can develop products and marketing strategies that effectively address these needs and wants.

Customer Unmet Needs	Percentage	Reason for Customer Unmet Needs
Larger Size	33.3%(4)	Customers appreciate earrings with a slightly larger or smaller size, a magnifying glass included, and a nicer gift box.
Durability	16.7%(2)	Customers have found the anklets to be durable and not easily breakable, with better quality materials used for reasonable durability at the price point.

Segment 2: Low Price Per Session and High Conversion Rate

Usage Scenario

Digging into the real usage scenarios of consumers, discovering opportunities, and optimizing marketing content.

Usage Scenario	Percentage	Reason
Gift	56.4%(44)	Customers have given these tumblers as gifts and have found them to be the perfect size for daily use.
Everyday Use	9.0%(7)	Customers have used these tumblers for everyday use, including on-the-go, at their work desk, and for soda.

Customer Sentiment

Through the analysis of consumers' positive and negative comments and the reasons behind them, we can quantitatively analyze user pain points and product improvement directions

Negative Feedback Topic	Percentage	Reasons for Negative Feedback
Poor Quality	23.0%(23)	Customers have reported that the lid leaks and breaks easily, or that the tumbler breaks easily or rusts, leading to disappointment with the quality of the product.
Breakage	20.0%(20)	Customers have reported that the glasses easily break or fall over, even with minimal force. Some have also experienced the bottom of the glasses splitting, leading to breakage.
Positive Feedback Topic	**Percentage**	**Reasons for Positive Feedback**
Excellent Quality	31.1%(178)	Customers have found the glasses to be of proper thickness and able to hold liquid, making them great for crafting or other uses.
Elegant Glass	24.3%(139)	Customers have found that the glasses look like glass and are a great set to have. The glasses have a cute appearance and are perfect for any occasion.

Customer Expectations

By understanding the specific reasons, manufacturers and retailers can develop products and marketing strategies that effectively address these needs and wants.

Customer Unmet Needs	Percentage	Reason for Customer Unmet Needs
Larger Size	16.3%(7)	Customers have found that the tumbler fits in car cup holders, but some have wished it was larger while others have found it too big to hold comfortably.
Durability	11.6%(5)	Customers have found the mixed drinkware sets to have restaurant-level durability, be more durable, and have durable plastic cups.

Segment 3: High Price Per Session and Low Conversion Rate

Usage Scenario

Digging into the real usage scenarios of consumers, discovering opportunities, and optimizing marketing content.

Usage Scenario	Percentage	Reason
Gift	77.8%(7)	Customers have found the jewelry boxes to be a great gift for jewelry lovers and travelers, providing a practical and stylish solution for storing their jewelry.
Jewelry Storage For Trips	22.2%(2)	Customers have found the jewelry boxes to be a great solution for storing their jewelry during trips, providing a compact and convenient storage solution.

Customer Sentiment

Through the analysis of consumers' positive and negative comments and the reasons behind them, we can quantitatively analyze user pain points and product improvement directions

Negative Feedback Topic	Percentage	Reasons for Negative Feedback
Poor Quality	45.5%(5)	Customers have found the jewelry box to be of poor quality, with loose hinges, cheap materials, and a tendency to fall apart easily.
Plastic Smell	18.2%(2)	Customers have reported a strong smell of glue or chemicals, indicating poor quality materials and manufacturing.
Positive Feedback Topic	**Percentage**	**Reasons for Positive Feedback**
Well Made	43.2%(16)	Customers have found the bracelet to have nice craftsmanship and value, be beautifully made, and be well-made.
High Quality	35.1%(13)	Customers have complimented the mirror for its excellent quality, indicating that

Customer Expectations

By understanding the specific reasons, manufacturers and retailers can develop products and marketing strategies that effectively address these needs and wants.

Customer Unmet Needs	Percentage	Reason for Customer Unmet Needs
Color Options	20.0%(1)	Customers have appreciated the variety of color and material options available for the jewelry boxes, providing a personalized and stylish storage solution for their jewelry.
No Carved Design	20.0%(1)	A few customers have mentioned disappointment in the lack of carved design on the snuffer.

Segment 4: High Price Per Session and High Conversion Rate

Usage Scenario

Digging into the real usage scenarios of consumers, discovering opportunities, and optimizing marketing content.

Usage Scenario	Percentage	Reason
Christmas Gift	57.7%(15)	Customers have purchased these robes as gifts for Christmas, birthdays, or just as a present for someone special.
Comfortable Lounge Wear	15.4%(4)	Customers have found these robes to be somewhat comfortable, ignoring any shedding issues. They are great for lounging around the house or for wearing during virtual work meetings.

Customer Sentiment

Through the analysis of consumers' positive and negative comments and the reasons behind them, we can quantitatively analyze user pain points and product improvement directions

Negative Feedback Topic	Percentage	Reasons for Negative Feedback
Low Quality	17.3%(9)	Customers have reported being disappointed with the quality, finding quality issues, or feeling that it is expensive for poor quality.
Poor Fit	15.4%(8)	Customers have reported poor fit, with the robe running small, sliding open in front, or not being snug.
Positive Feedback Topic	**Percentage**	**Reasons for Positive Feedback**
Good Quality	23.7%(40)	Customers are satisfied with the quality of the sweater, stating that it is nice for the price. They also mention that it is a good quality sweater and of decent quality, indicating that the sweater is well-made and durable.
Comfortable	23.1%(39)	Customers have praised the pullovers for their comfort. They found them to be suitable for office wear, very comfy, and soft and cozy, enhancing their overall experience with the product.

Customer Expectations

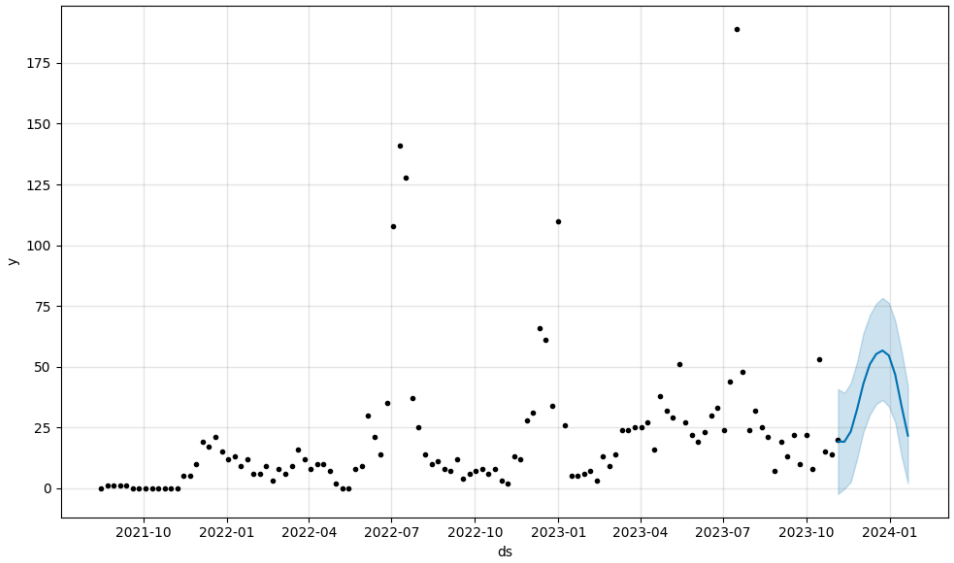
By understanding the specific reasons, manufacturers and retailers can develop products and marketing strategies that effectively address these needs and wants.

Customer Unmet Needs	Percentage	Reason for Customer Unmet Needs
Belt Loops	35.0%(7)	Customers have reported that these robes have an adjustable tie option and the ability to tie shut, making for a better closure mechanism.
Better Quality	15.0%(3)	Customers have reported that these robes do not break upon opening, have poor quality/flimsy material, and poor overall production quality.
Color Variety	10.0%(2)	Customers have reported that these robes have richer brown and attractive color options, with more vibrant colors available.

Link to all Dashboards Segment wise -
HYPER LINK

Exhibit 5

SKU 11461



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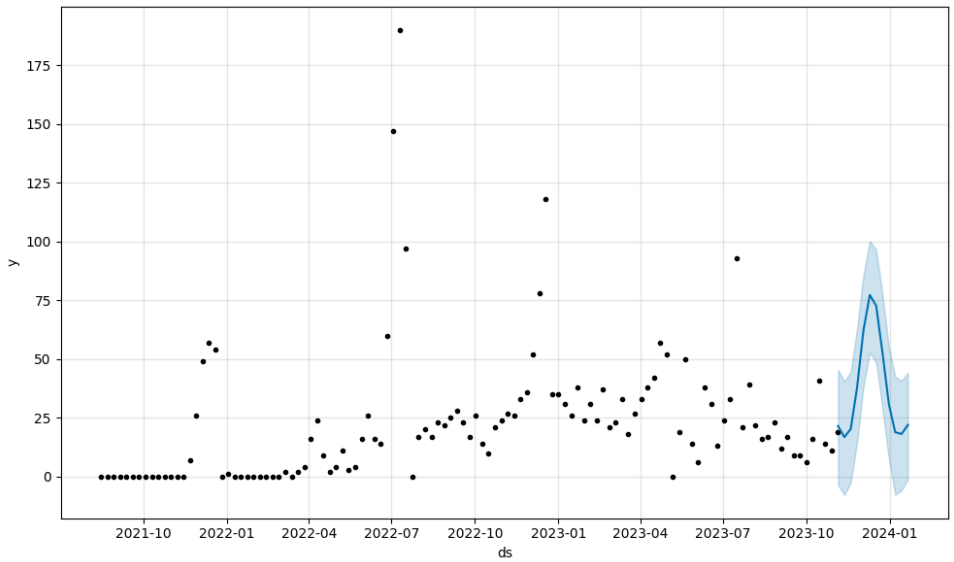

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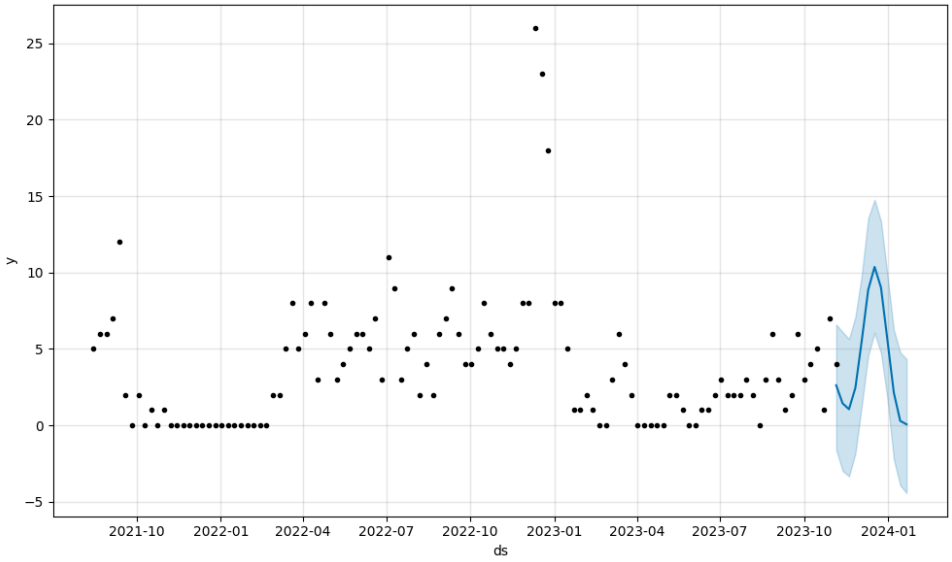

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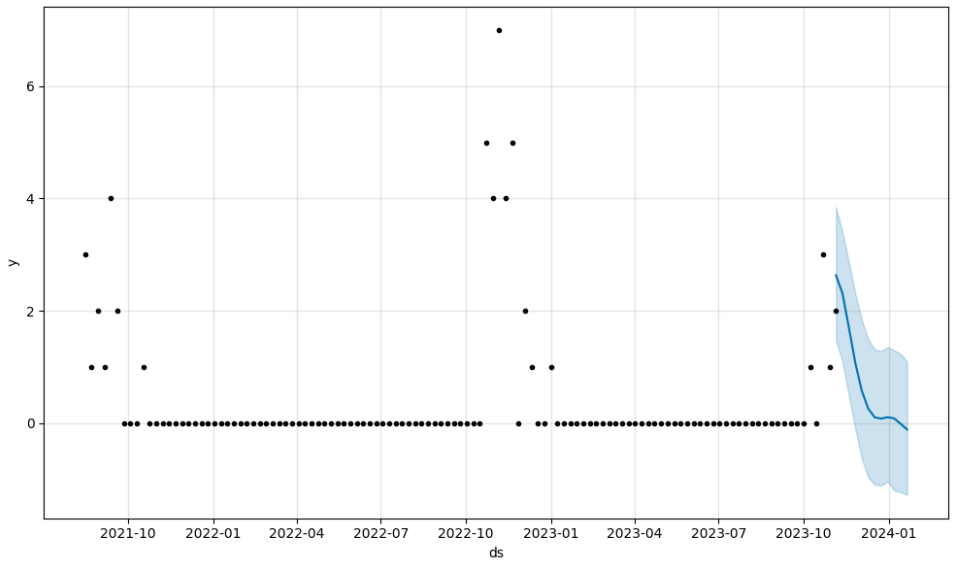

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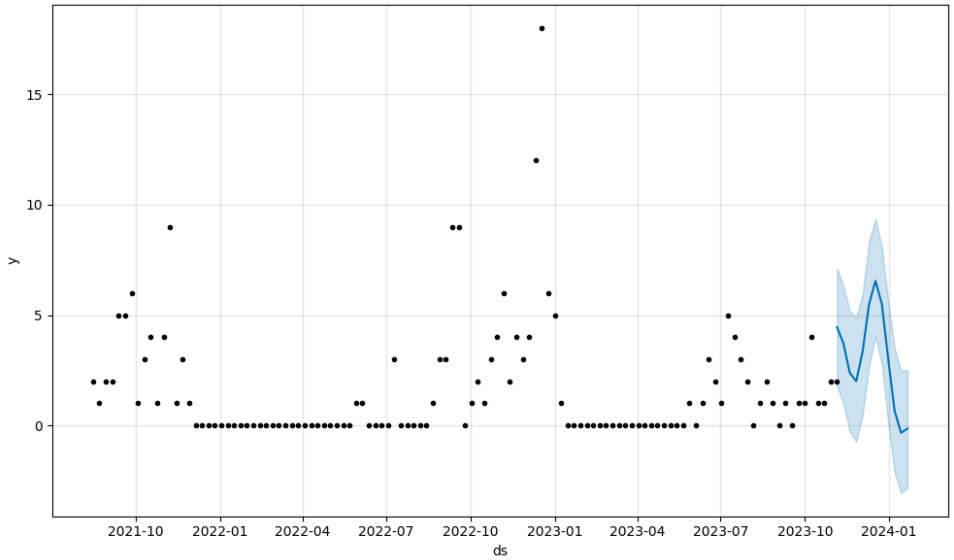

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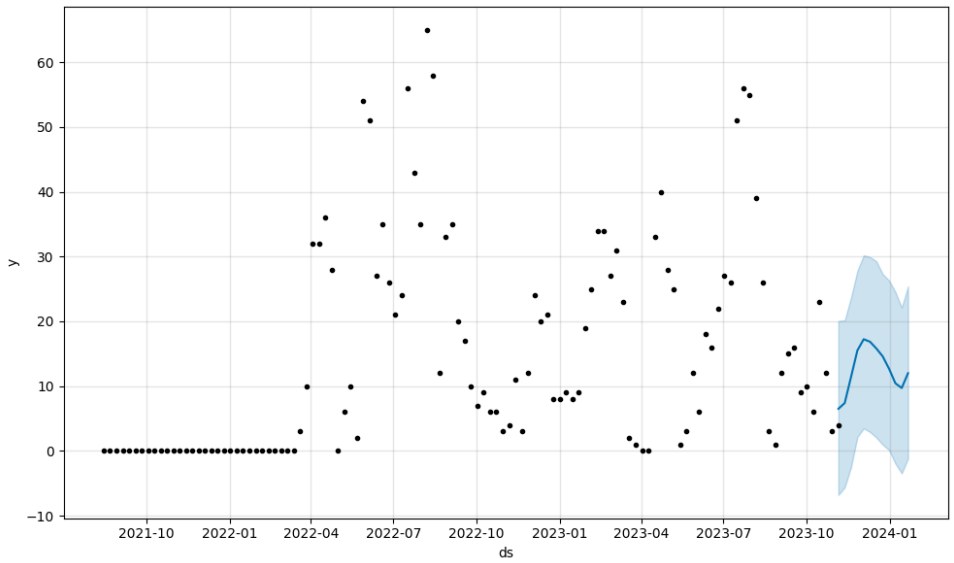

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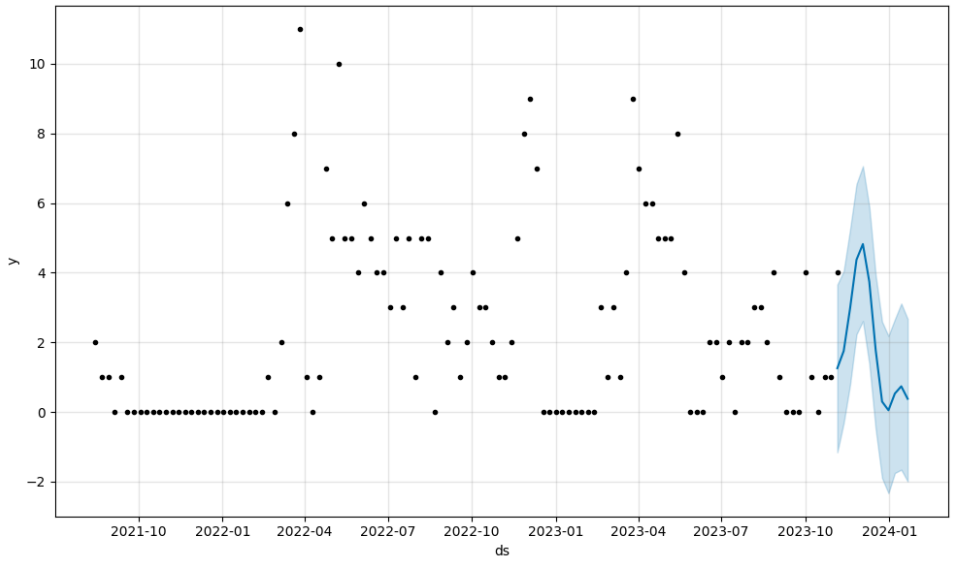

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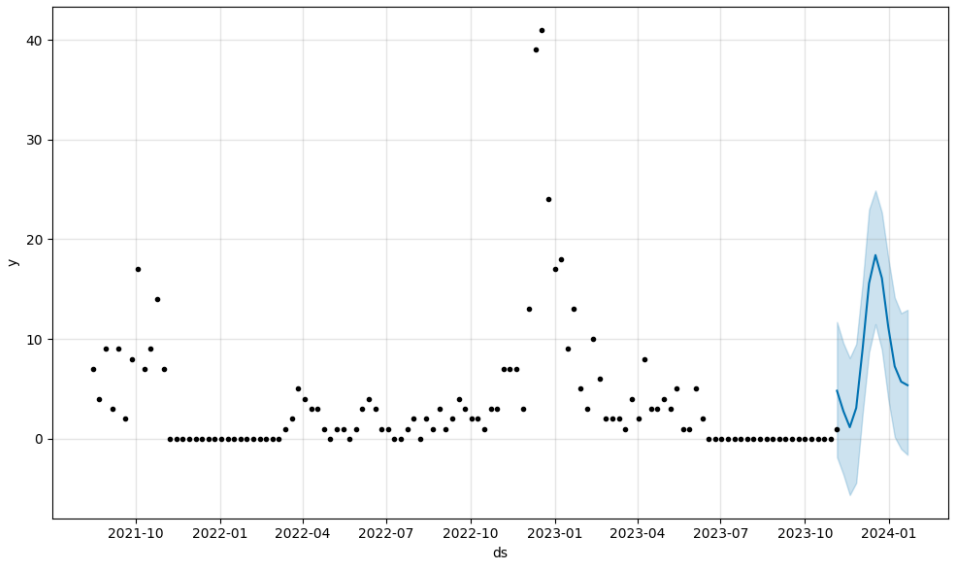

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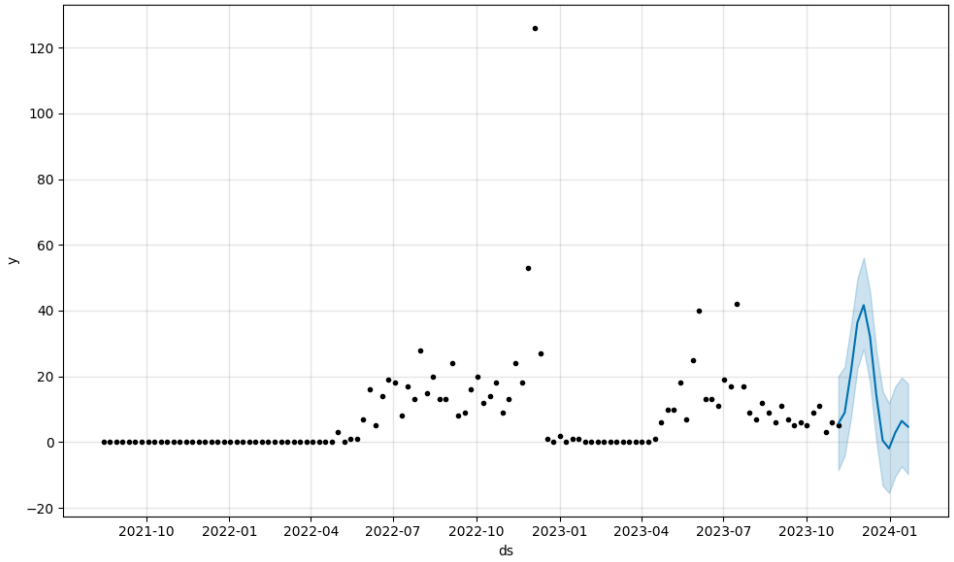

TOOLS, SOFTWARE'S & ALGORITHMS USED

OLS Regression Analysis(Jupyter Notebook), ARIMA, PROPHET: **Python**

Sentiment Analysis -
Shulex Voc AI - Tool Link

Keyword Analysis -
Tool 4 Seller - Tool Link
Fake Spot - Tool Link

Link to all Files and Documents including Python file, Sentiment Analysis Dashboard, Keyword Analysis - Drive Link