

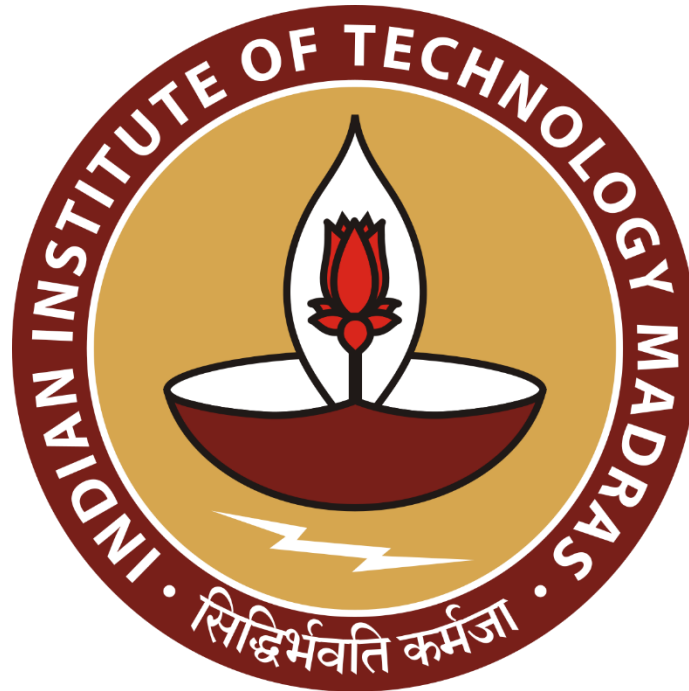
Data-Driven Analysis of Nakshatra Fab

A Final Submission Report for the BDM Capstone Project

Submitted by

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Declaration Statement

I am working on a Project titled “**Data-Driven Analysis of Nakshatra Fab.**” I extend my appreciation to **Nakshatra Fab**, for providing the necessary resources that enabled me to conduct my project.

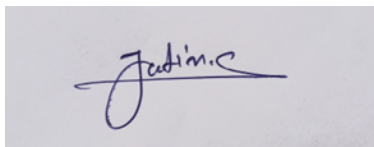
I hereby assert that the data presented and assessed in this project report is genuine and precise to the utmost extent of my knowledge and capabilities. The data has been gathered from primary sources and carefully analyzed to assure its reliability.

Additionally, I affirm that all procedures employed for the purpose of data collection and analysis have been duly explained in this report. The outcomes and inferences derived from the data are an accurate depiction of the findings acquired through thorough analytical procedures.

I am dedicated to adhering to the principles of academic honesty and integrity, and I am receptive to any additional examination or validation of the data contained in this project report.

I understand that the execution of this project is intended for individual completion and is not to be undertaken collectively. I thus affirm that I am not engaged in any form of collaboration with other individuals, and that all the work undertaken has been solely conducted by me. In the event that plagiarism is detected in the report at any stage of the project's completion, I am fully aware and prepared to accept disciplinary measures imposed by the relevant authority.

I understand that all recommendations made in this project report are within the context of the academic project taken up towards course fulfillment in the BS Degree Program offered by IIT Madras. The institution does not endorse any of the claims or comments.

A handwritten signature in blue ink, appearing to read 'Jatin', is centered within a light gray rectangular box.

Name: Dhanani Jatinbhai Chimmanbhai ([22f1000801](#))

Date: 18/12/2023

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Executive Summary:

Nakshatra Fashion, located in Surat, Gujarat, is a well-established business co-founded by Bavanbhai Senjaliya and Bhavin Panchal. They specialize in crafting various products, including Normal Saree, Nylon Sarees, Filament Yarn, and Fabrics. Nakshatra Fashion is highly regarded for its creative and innovative approach, offering a wide range of saree designs that align with the ever-evolving preferences of customers in a competitive market. This company operates within a B2B framework.

Amid Surat's competitive embroidery market, Nakshatra Fab, a prominent manufacturer of nylon sarees, filament yarn, and ladies' dresses, grapples with challenges related to demand analysis, product performance, and inventory management. The dynamic nature of the industry and the excessive inventory levels pose hindrances to efficient production and customer satisfaction. Nakshatra Fab encounters internal intricacies due to its wide array of designs and stiff competition in the external market. To flourish, Nakshatra Fab actively pursues data-driven solutions, such as monthly demand analysis, forecasting, assessing product and design performance, and optimizing inventory. These strategies are not just about streamlining operations but also about meeting customer demands effectively. Ultimately, they are the keys to staying competitive and thriving in the ever-evolving embroidery sector.

This project leverages data-driven solutions to enhance Nakshatra Fab's profitability by addressing the following objectives:

1. Study monthly saree demand for efficient production and inventory management.
2. Predict future demand for better inventory and production planning.
3. Evaluate products' sales and revenue performance, finding top sellers and improvements.
4. Analyze design popularity for informed production decisions.
5. Optimize inventory to avoid shortages and cut holding costs.

Details About Company

Email: nakshatrafab1230@gmail.com

Address: Plot No. 1230-31, Road No-3, Diamond Industrial Park, Near Sachin Railway Station, Sachin, Surat-394230

Detailed Explanation of Analysis Process/Method:

The data for this project has been sourced from Nakshatra Fab, provided by Haresh Senjaliya, the company's manager. The information was initially in the form of soft copy bills spanning the last six months and was subsequently transformed into a well-organized CSV format using Python through web scraping. This dataset encompasses detailed sales records from October 2022 to July 2023, including critical information like transaction dates, product names, design codes, quantity sold, unit prices, and total amounts.

	Date	Description of Goods	HSN No	Design	Pcs.	Meter	Rate	Amount
0	03-10-2022	SAREE	54074240	MG-145	59	0	874	51,566.00
1	03-10-2022	SAREE	54074240	MG-120	78	0	943	73,554.00
2	03-10-2022	SAREE	54074240	NF-67	60	0	900	54,000.00
3	03-10-2022	SAREE	54074240	NF-68	60	0	910	54,600.00
4	03-10-2022	SAREE	54074240	NF-39	140	0	890	1,24,600.00
...

The Brief Description About Data:

- **Date:** Data is gathered from 03/10/2022 to 19-07-2023.
- **Description of Goods:** Saree, Nylon Saree, Polyester Dyed Fabrics, etc.
- **HSN No.:** 54074240. This code is used to classify businesses that are involved in making embroidered products and woven fabrics from artificial yarn made of synthetic fibers.
- **Design:** Many different types of designs are printed on sarees, and there are around 103 different types of designs, "MG-145" is a code for a specific design.
- **Pcs.:** No of Pieces of goods sold to customer
- **Meter:** It pertains to polyester-dyed fabrics, predominantly marketed and sold based on a unit price per meter.
- **Amount:** Total price of each product to a particular customer.

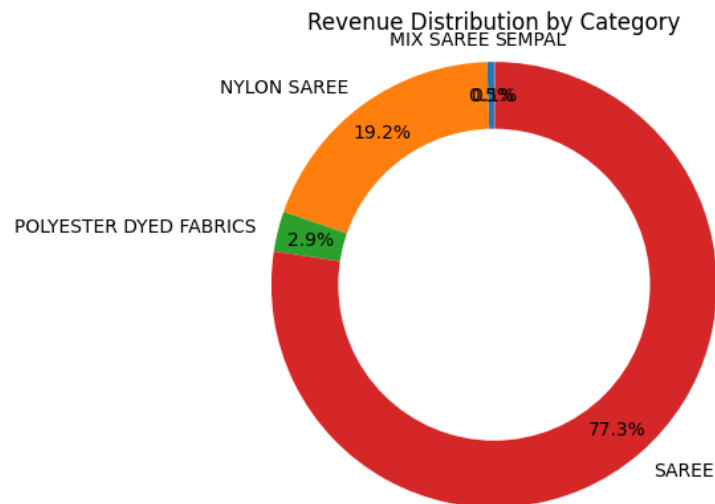
There are a total of 532 rows and eight columns in the dataset, representing 532 distinct sales entries.

After extracting data from the PDF bills, I noticed some rows did not align with the original data. I had to adjust the formatting to correct this issue manually.

There were also some null values in the "Design" column, particularly for "Polyester Dyed Fabrics" since they don't have specific design codes like sarees. I resolved minor categorical variations and identified and excluded a category called "SEMPAL," which turned out to be sampled for testing.

The "normal saree" category actually represents intricate and fancy saree designs, distinct from nylon sarees.

Now, the data is now ready for analysis with these improvements.



- The primary source of revenue for Nakshatra Fab is derived from Normal Saree, contributing to approximately 77% of the total revenue. The subsequent significant revenue stream is attributed to Nylon Saree, accounting for about 20% of the total.

Sales Entries for "Mix Saree"

	Date	Description of Goods	HSN No	Design	Pcs.	Meter	Rate	Amount
147	22-11-2022	MIX SAREE	54074240	NaN	316	0	661	2,08,876.00
243	15-12-2022	MIX SAREE	54074240	NaN	2	0	875	1,750.00

Sales Entries for "Polyester Dyed Fabrics"



	Date	Description of Goods	HSN No	Design	Pcs.	Meter	Rate	Amount
454	11-04-2023	POLYESTER DYED FABRICS	54074240	NaN	44	4,550.25	90	4,09,522.50
482	25-04-2023	POLYESTER DYED FABRICS	54074240	NaN	47	4,750.00	90	4,27,500.00
497	13-05-2023	POLYESTER DYED FABRICS	54074240	NaN	420	4,232.75	90	3,80,947.50

- The revenue generated from "Polyester Dyed" and "Mixed Sempal Sarees" is notably minimal, with only three and two sales, respectively. These products do not significantly contribute to overall revenue.
- This low sales volume is because they are typically based on specialized orders from specific business parties rather than regular offerings. Therefore, excluding them from our analysis is reasonable as they have minimal impact on the company's revenue.

Leveraging Python's Pandas and NumPy libraries, we delved into exploratory data analysis. Monthly saree demand, product and design evaluations, and inventory optimization were key focuses. Various visualizations, including bar charts, pie charts, and scatter plots, were employed for insightful representations.

A detailed analysis of design and product performance unveiled revenue disparities among designs. Top-performing designs were identified, and their contribution to total revenue was assessed. This guided recommendations for strategic production planning.

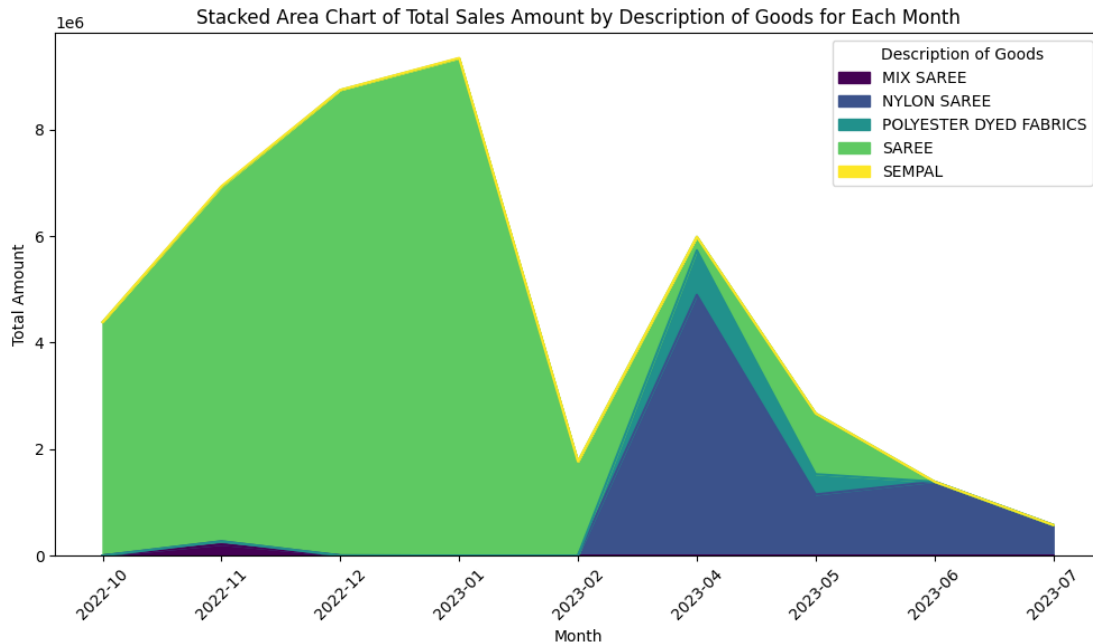
The analysis harnessed the power of extensive Python libraries, primarily Pandas and NumPy, to manipulate and process the sales data efficiently. Visualization, a crucial component, was facilitated by Matplotlib and Seaborn, offering a spectrum of charts like bar charts, pie charts, and scatter plots.

The versatility of these libraries allowed for detailed explorations into monthly demand patterns, future forecasting, and design evaluations, providing Nakshatra Fab with a rich visual narrative of its sales landscape.

This robust utilization of Python tools not only streamlined the analytical process but also empowered Nakshatra Fab with data-driven insights to steer strategic decisions and optimize its operational landscape.

Results and Findings:

Monthly Sales Analysis



- Normal sarees, often considered as everyday wear, see a steady demand throughout the year. In contrast, Nylon sarees, which have their own unique charm, experienced a significant boost in sales from April to July.
- This seasonality highlights the need for Nakshatra Fab to adjust its production and inventory plans to match these trends. In a nutshell, Nakshatra Fab's major profits come from sarees, particularly the normal and nylon varieties.

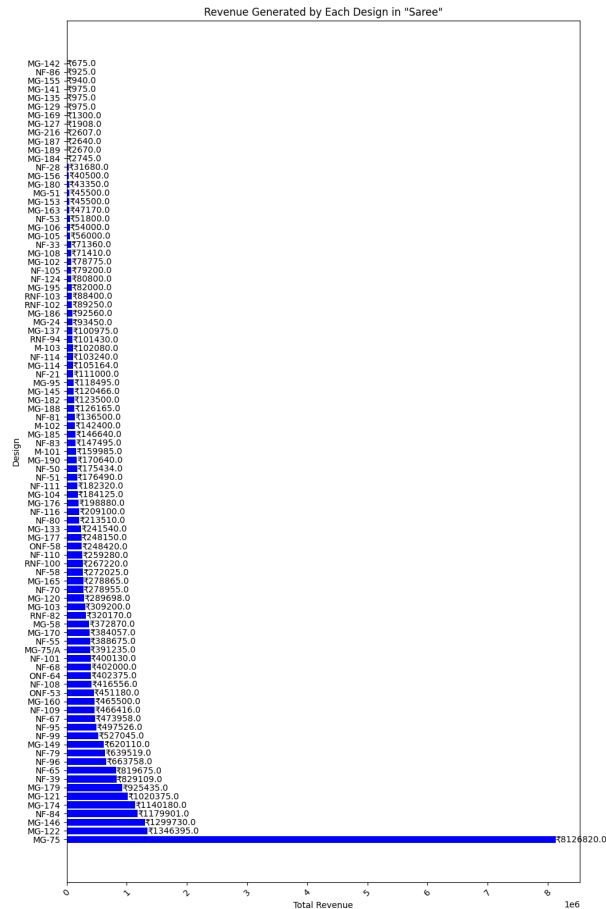
Further, I analyzed sales of different designs for the two categories,

(i) Normal Saree (ii) Nylon Saree

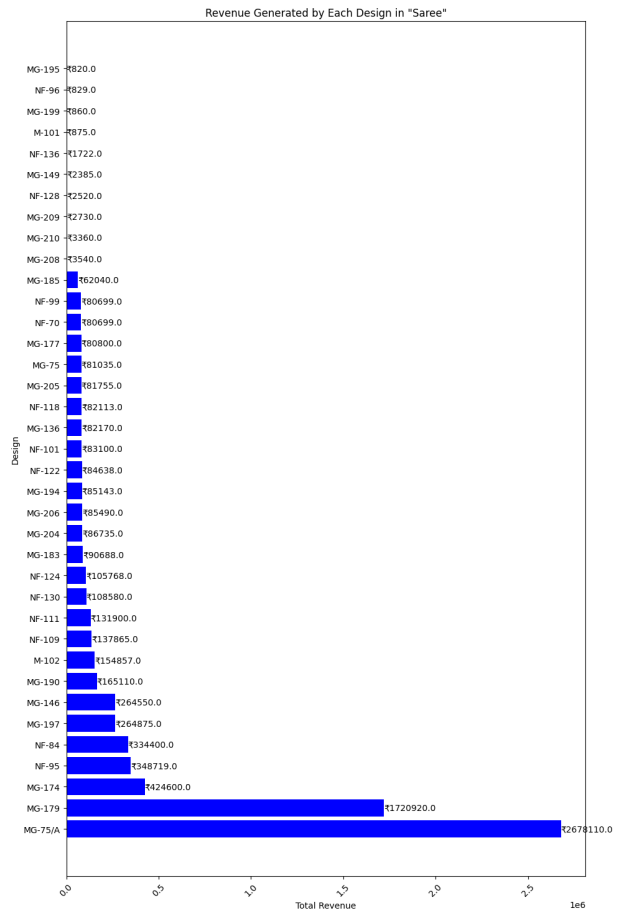
Sales Analysis of Each Design

A comprehensive analysis of sales patterns and customer preferences has been conducted for designs within both the normal and nylon saree categories.

The analysis reveals significant revenue disparities among different designs, with some contributing substantially and others generating minimal returns.



(i) Normal Saree



(ii) Nylon Saree

Here, We can see the

- Certain designs exhibit higher customer preferences, while others are less favored.

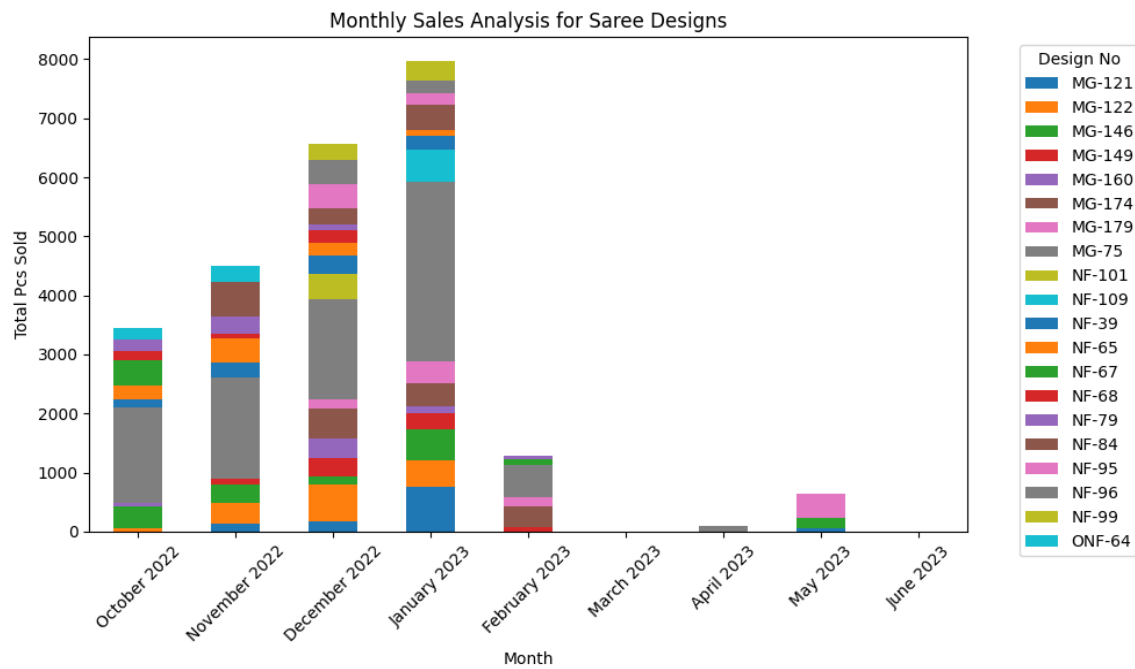
Some of the Most Preferable Designs are

Normal Saree Category: 'MG-75', 'MG-122', 'MG-146', 'NF-84', 'MG-174', 'MG-121', 'MG-179', 'NF-39', 'NF-65', 'NF-96', 'NF-79', 'MG-149', 'NF-99', 'NF-95', 'NF-67', 'NF-109', 'MG-160', 'ONF-64', 'NF-68', 'NF-101'

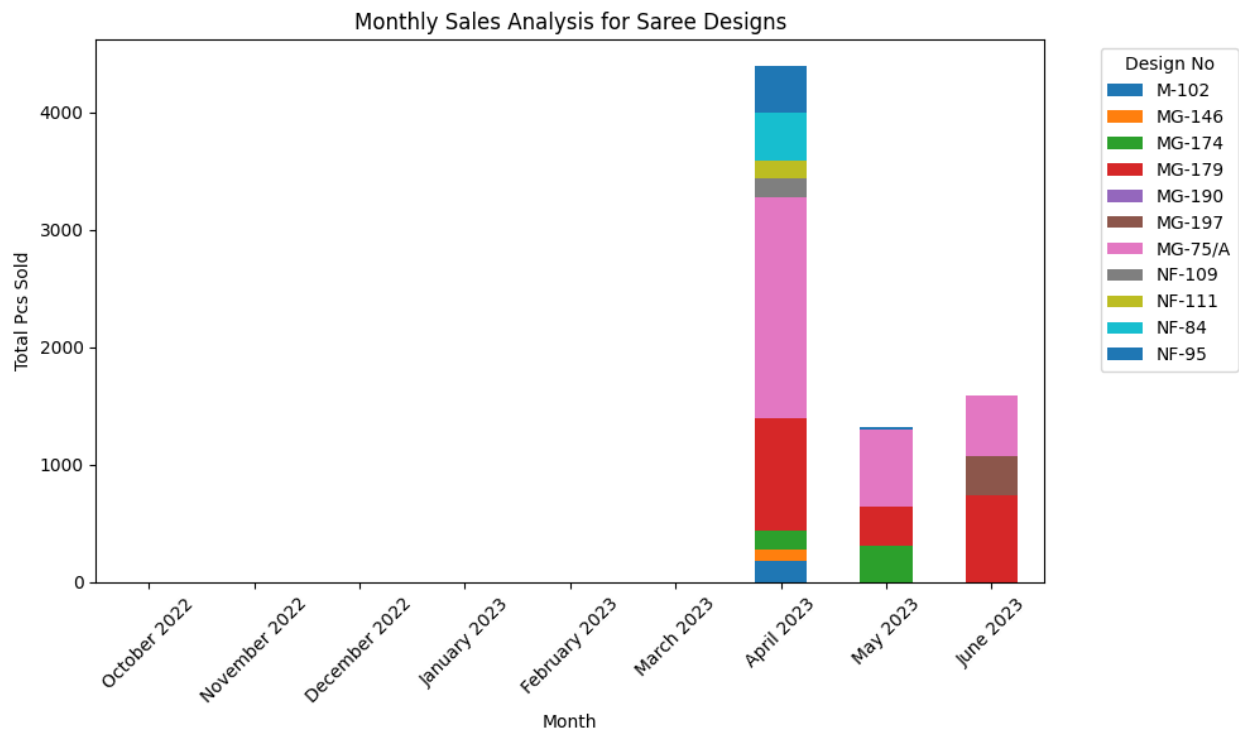
Nylon Saree Category: 'MG-75/A', 'MG-179', 'MG-174', 'NF-95', 'NF-84', 'MG-197', 'MG-146', 'MG-190', 'M-102', 'NF-109', 'NF-111'

- This indicates that Nakshatra Fab should concentrate on specific designs to optimize inventory management and avoid excess stock.

1) Monthly Sales Analysis of Each Design in Normal Saree and Nylon Saree Category



(i) Normal Saree



(ii) Nylon Saree

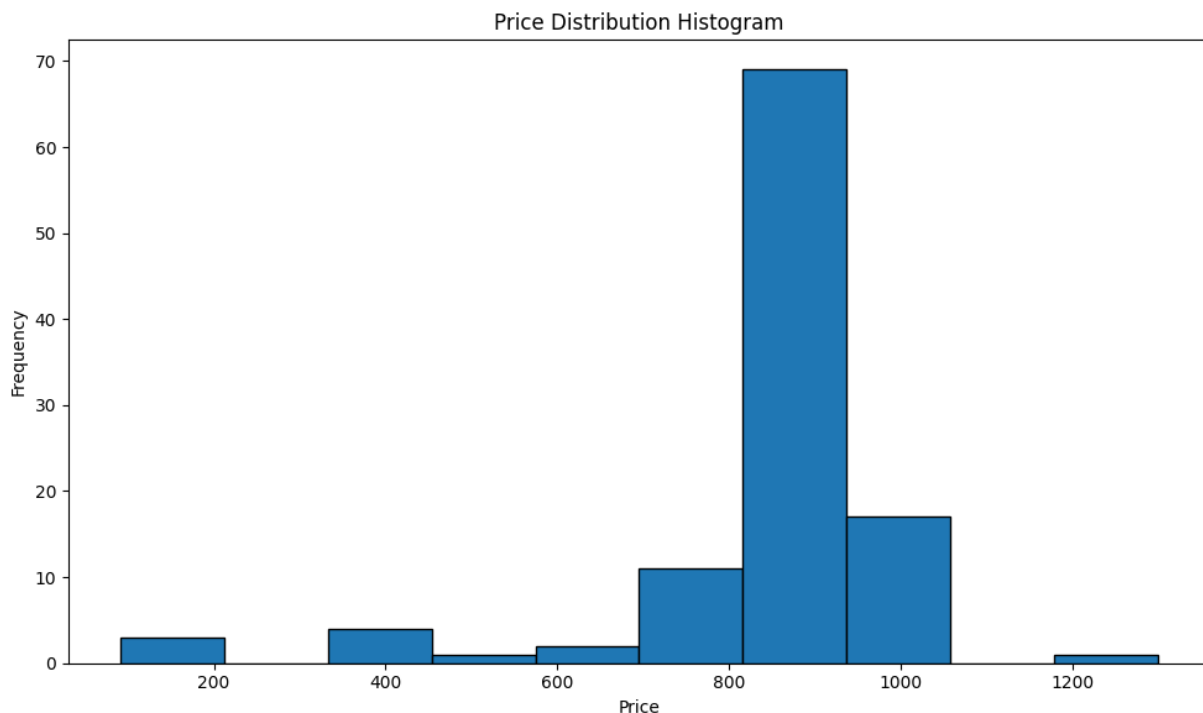
I have visualized the monthly sales analysis for the top 15 best-selling designs within the normal and Nylon saree categories. These visuals provide a detailed insight into the sales trends and performance of these specific designs during the analyzed period.

From the previous chart(i), we can clearly see that the demand for Normal Saree designs experienced a significant increase during the Months from October to January. This timeframe corresponds to a peak in customer interest and demand for this particular type of saree.

Throughout the seasons, sarees bearing design codes such as 'MG-75', 'MG-122', 'MG-146', 'NF-84', 'MG-174', 'MG-121', and 'MG-179' in *Normal Saree* and "MG-75/A," "MG-179," and "MG-174," in *Nylon Saree* consistently excel in performance.

Analysis For Inventory Management

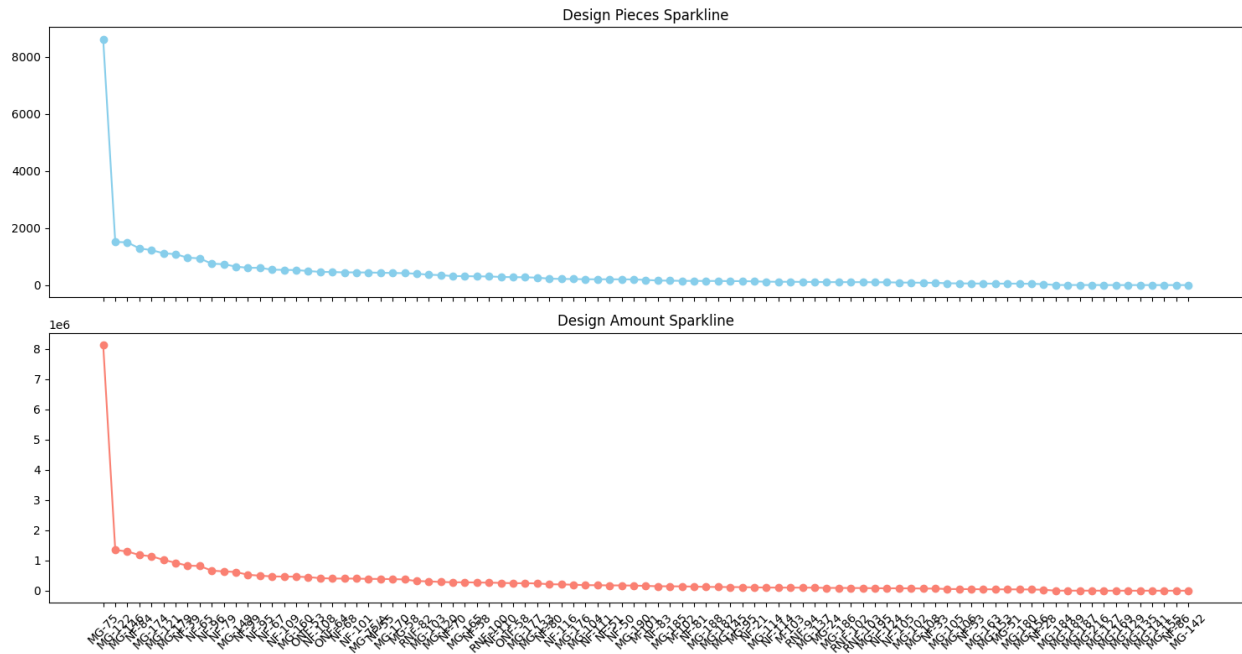
1. Rate Analysis



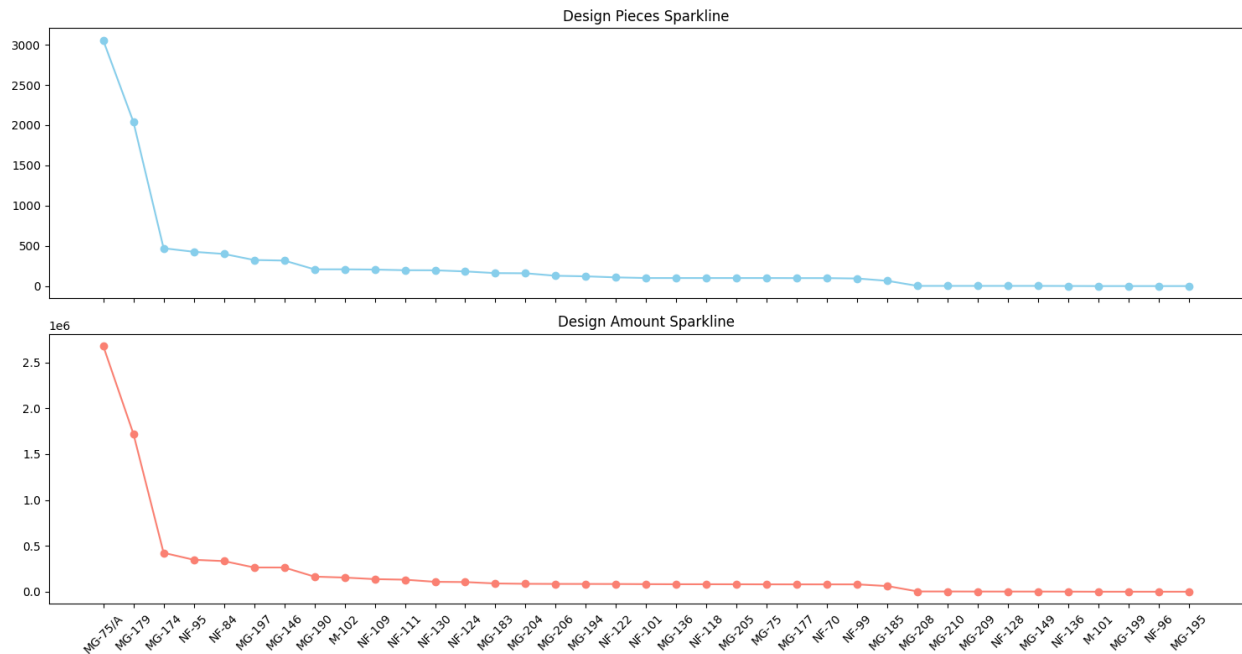
- The histogram reveals that approximately 50% of the product designs have rates falling in the range of 800 to 1000.
- This histogram underlines an essential insight: a significant portion of designs falls within the rate range of 800 to 1000, where many high-revenue-generating designs are located.

For Nakshatra Fab, this suggests a production strategy focusing on designs within this range can lead to optimized costs and enhanced profitability.

2. Relation Between “Piece” and “Amount”



(i) Normal Saree



(ii) Nylon Saree

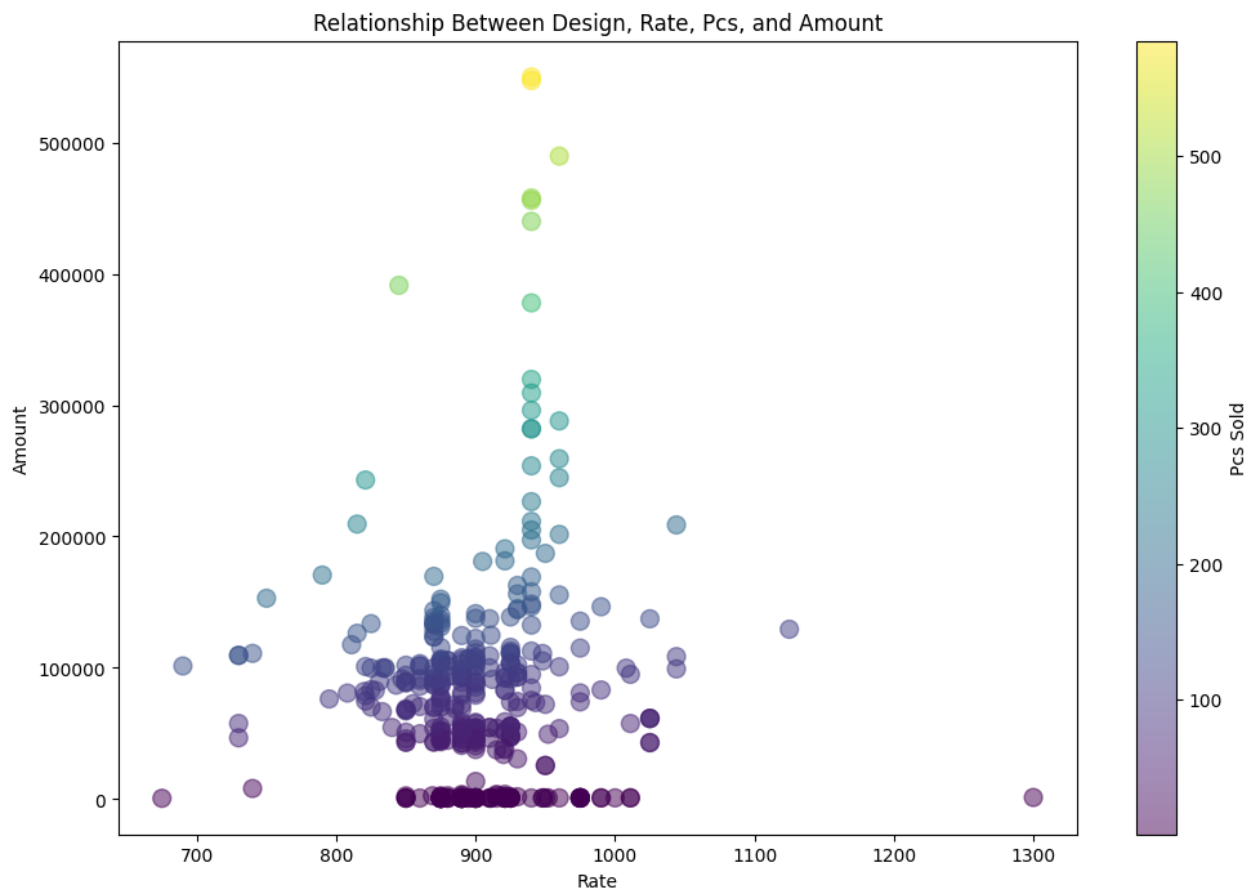
This graph effectively illustrates the connection between the quantity of products sold and the total revenue generated by each category.

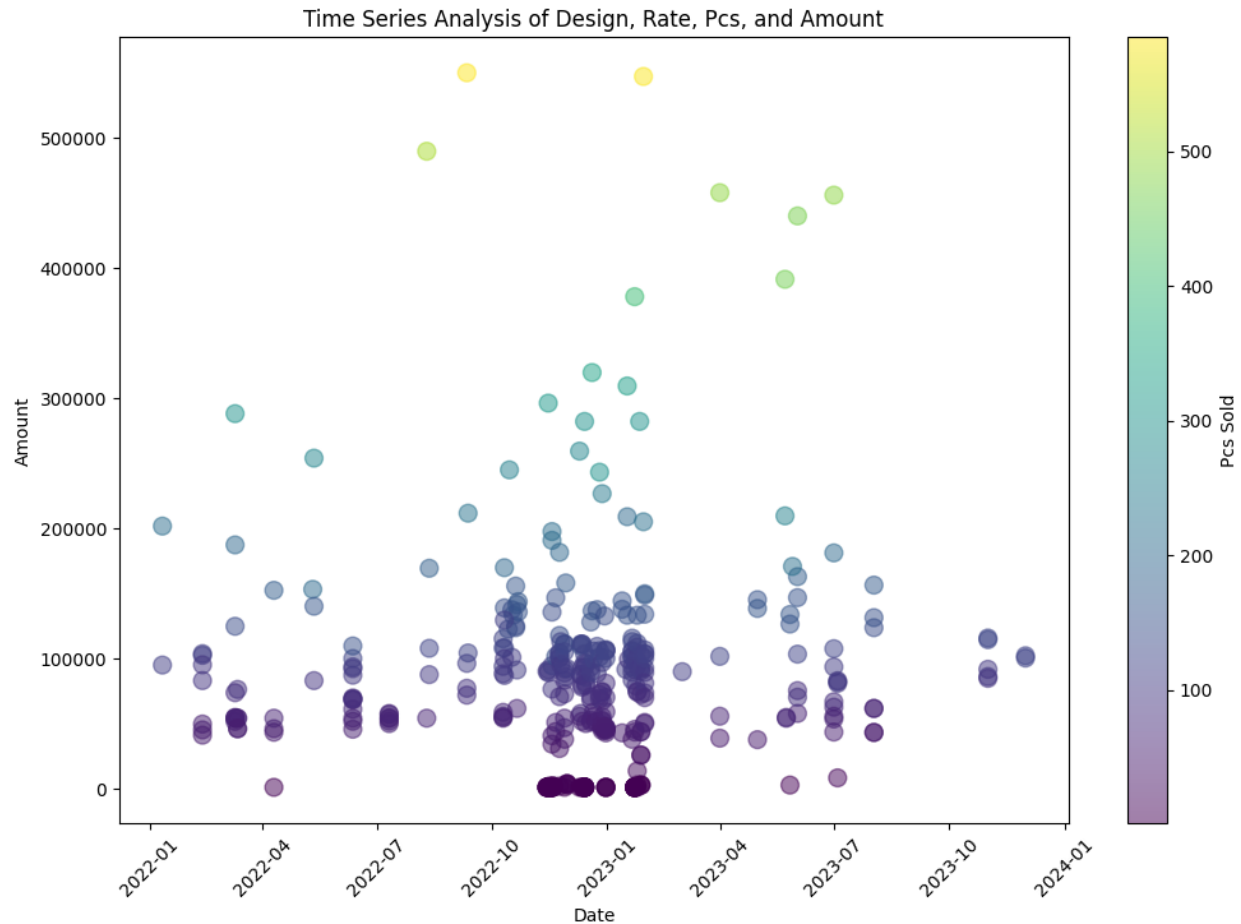
To demonstrate that products with a lower unit price but sold in higher quantities can yield higher revenues than those with higher prices but smaller quantities. This insight emphasizes the importance of balancing price points and sales volume to maximize revenue.

- It's evident that there are similarities in the number of designs sold and the revenue generated by each design. This suggests that customer preferences are closely aligned with revenue generation.
- Understanding these patterns can guide Nakshatra Fab in making informed production decisions to cater to popular designs and optimize revenue.

3. Relation Between “Design,” “Rate,” “Pieces,” “Amount,” and “Time”

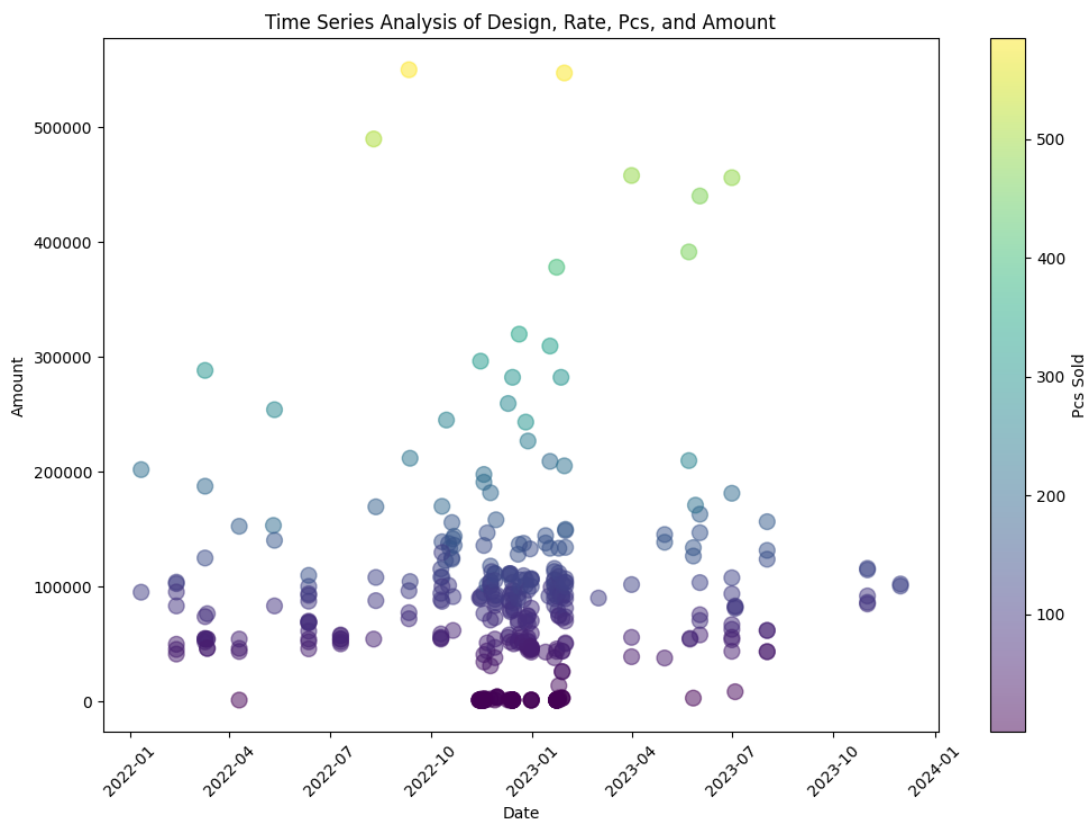
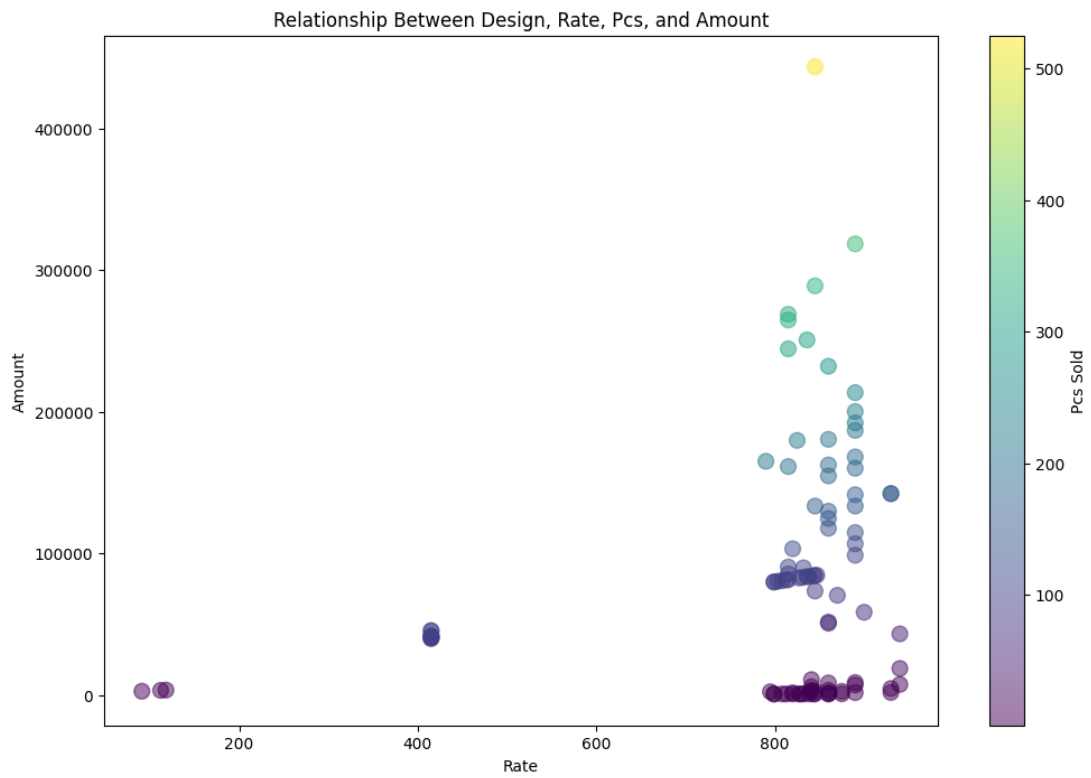
(i) Normal Saree





- These two graphs show that most designs fall within the price range of 800 to 1000, and a significant portion of the quantities sold hovers around 300 pieces.
- These insights offer opportunities for Nakshatra Fab to optimize production costs and enhance inventory management
- Proactively manufacturing around 300 pieces of these popular designs will optimize production costs and ensure timely availability to meet customer demand during the peak season.
- Simultaneously manufacturing high-demand products, such as "**MG-75**," can greatly benefit Nakshatra Fab
- This strategy establishes a strong relationship between "Piece" and "Amount" from October to January, aligning production with customer preferences and maximizing sales revenue.
- This strategic approach aligns production with customer demand, reducing inventory costs and optimizing sales revenue during these months.

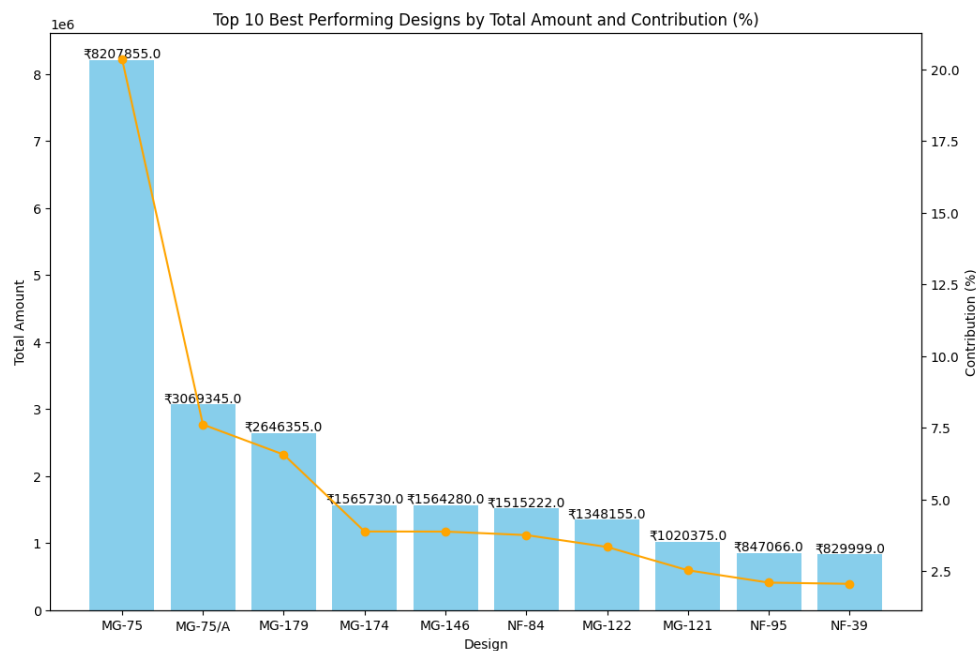
(ii) Nylon Saree



- Similar to Normal Sarees, the sales analysis for Nylon Sarees reveals a noticeable trend.
- The price range of most designs in the Nylon Saree category falls within the 800 to 900 range.
- Additionally, the quantity sold is typically distributed within the 100 to 300 range, highlighting a similar trend in customer preferences.
- During the season from April to July, a distinct surge in demand for Nylon Sarees is observed. This period marks a peak in customer demand for this specific saree category.

4. Identifying Key Designs for Targeted Production Optimization

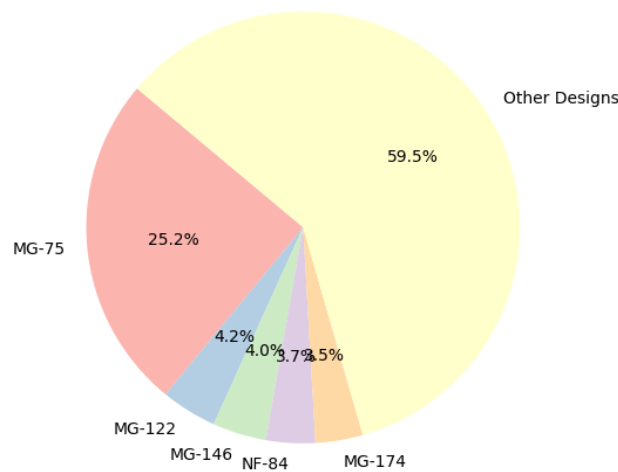
(i) Top 10 Best Performing Designs



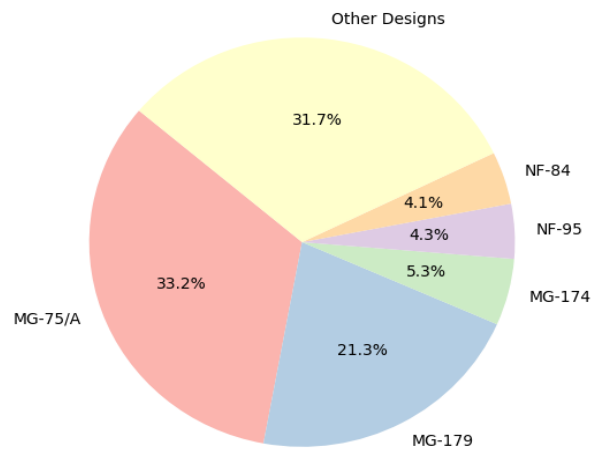
“The top 10 designs significantly impact Nakshatra Fab's revenue, contributing approximately 54% to the total earnings. Notable designs driving this contribution include [MG-75, MG-75/A, MG-179, MG-174, MG-146, NF-84, MG-122, MG-121, NF-95, NF-39].”

Focusing on producing and promoting these designs is crucial for maximizing revenue and sustaining business growth.

(ii) Top 5 Best Performing Designs In “Normal Saree” and “Nylon Saree” Category



(i) Normal Saree



(ii) Nylon Saree

- "Within the category of Normal Sarees, the top 5 designs are pivotal contributors, accounting for approximately **39.6%** of the total revenue generated by Normal Saree.
- Notable designs such as [**MG-75, MG-122, MG-146, NF-84, MG-174**] play a crucial role in Nakshatra Fab's financial success.
- "In the Nylon Saree category, the top 5 designs play a substantial role, contributing significantly to the company's revenue. These designs, including [**MG-75/A, MG-179, NF-95, NF-84, MG-174/A**], collectively make up a significant portion, approximately **68.2%**, of the total revenue generated by Nylon Saree.

>> "Strategically focusing on the top 10 designs in our product portfolio is pivotal, as these designs collectively drive approximately 60% of our annual sales. This underscores the importance of optimizing production, inventory, and marketing efforts for these key designs to maximize overall business performance."

Interpretation of Result and Recommendations:

To optimize profits and minimize excess inventory, Nakshtra should adhere to the production chart outlined below:

Time Period	Category	Designs	Rate	Min. Qty Ready Before
Sept - Feb	Normal Saree Only	MG-75 MG-122 MG-146 NF-84 MG-174	900 - 950	>= 300 Qty. Each
Mar - Aug	Nylon Saree Only	MG-75/A MG-179 NF-95	900 - 950	>= 300 Qty. Each

- To enhance inventory management, a dynamic production approach is advised. From September to February, the priority should be on scaling up the production of normal sarees, aligning with seasonal demand
- Conversely, during March to August, a strategic shift towards increasing the production of nylon sarees is recommended.
- As per the current market demand trends, Nakshatra Fab should strategically focus on designs within the price range of 800 to 1000. These designs are currently trending in the market and have shown significant demand.
- Allocating resources and production efforts to designs outside this range or with lower demand may escalate production costs and compromise profitability, given the lower prices or quantities associated with these designs.
- "Designs like MG-75 and MG-75/A are highly trending, and to meet the anticipated demand during the upcoming season, Nakshatra Fab should proactively produce a minimum of 500 quantities for each of these designs.
- This strategic approach ensures timely availability of these popular designs, enhancing customer satisfaction and optimizing sales during the peak season."
- "In addition to the designs listed in the table, Nakshatra Fab should be well-prepared with significant quantities (Min 200) of other popular designs such as MG-121, MG-179, NF-39, NF-65, NF-96, NF-79, and MG-149 during Sept to Feb.

- To meet market demand efficiently, the company should allocate resources for the production of designs like NF-99, NF-95, NF-67, NF-109, MG-160, ONF-64, NF-68, and NF-101. (Around More Than 100 Qty. Each)
- This proactive approach ensures flexibility and responsiveness to dynamic market trends, enhancing Nakshtra's ability to meet customer demands effectively."
- Similarly, For Nylon Saree category, Nakshatra Fab should anticipate the market demand for designs such as MG-197, MG-146, MG-190, M-102, NF-109, and NF-111. To ensure readiness and meet customer requirements promptly, it is advisable to allocate resources for the production of at least 200 quantities for each of these designs.
- Additionally, for any external orders, Nakshtra Fab should evaluate the profitability and quantity before proceeding with production. This selective production strategy helps maximize profitability, reduce unnecessary costs, and ensures a strategic response to both internal and external demands.

Focus Only on These Designs Only:

	Highly Trending	Emerging Designs
Normal Saree	MG-75, MG-122, MG-146, NF-8, MG-174, MG-179	MG-121, NF-39, NF-65, NF-96, NF-79, MG-149, NF-99, NF-95, NF-67, NF-109, MG-160, ONF-64,
Nylon Saree	MG-75/A, MG-179, NF-95, NF-84,	MG-174, MG-197, MG-146, MG-190, M-102, NF-109, NF-111