TATA STEEL INTERNSHIP REPORT

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Sales Data Analysis using Tableau

Guide Name: Mr. Rahul Kumar

Presented by: Suvankar Dash

ACKNOWLEDGEMENT

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In conclusion, I am grateful for the enriching experience and professional growth I have gained through my internship with Tata Steel while continuing my studies at KIIT-DU University. The integration of theoretical knowledge and practical application has been invaluable, and I am confident that the skills and experiences gained will serve as a strong foundation for my future career.

Sincerely,

SUVANKAR DASH

INTRODUCTION

Background:

The present retail market is characterized by intense competition and rapidly changing consumer preferences. This industry dynamic mandates that businesses not only keep pace with technological advancements but also constantly evaluate their operational strategies based on comprehensive data analysis. Effective use of data helps in understanding consumer behavior, optimizing inventory, and tailoring marketing strategies to maximize sales and profitability.

Problem Definition:

Despite possessing extensive sales data, the company has not fully leveraged this information to drive strategic decision-making. The existing reports are static, lack comparative analyses over different periods, and do not provide actionable insights that could be used to enhance business operations and improve financial outcomes.

Objective:

The main objective of this project is to utilize Tableau to develop dynamic visualizations that provide clear insights into sales and profit trends, comparisons across different time frames and categories, and actionable intelligence that can be directly applied to decision-making processes. The aim is to transform raw data into a strategic asset that not only highlights areas of opportunity but also prompts efficient responses to emerging market challenges.

PROCESS

1) Data Collection and Preprocessing:

The first step of the project includes gathering of company sales records over multiple years, including all the detailed information on sales, profits, product categories, customer segments, and geographical data. The dataset used for this project is taken from *Kaggle*. The dataset approximately contains 17,676 entries and a period of over last two years. This dataset has information about the sales from the departmental store, and it contains the following information about the serial number, order date, priority, quantity, sales, discount, unit price, shipping cost, new transportation, customer name, region, state, city, store name, customer segment, product category, product container, product ID, order ID, product name, product description, product base margin, supplier, expected date, ship date, status, reason.

The second step is preprocessing the data. The data is thoroughly analyzed to understand the features that are of importance to the project and getting to know their data types.

2) Model Development:

Model Development typically involves setting up data sources, creating calculated fields, and establishing the right visualizations to model the data accurately. For this project, we would develop models based on the structured questions provided, using Tableau's robust data blending and visualization tools. The models would include:

- **Calculated Fields**: Creating metrics like profit margin, which requires calculations directly within Tableau.
- **Visualization Models**: Designing various types of charts (line, bar, heatmap) that best represent the data dynamics mentioned in each question.

3) Model Evaluation and Selection:

Model Evaluation in Tableau is about assessing the effectiveness and impact of the visualizations:

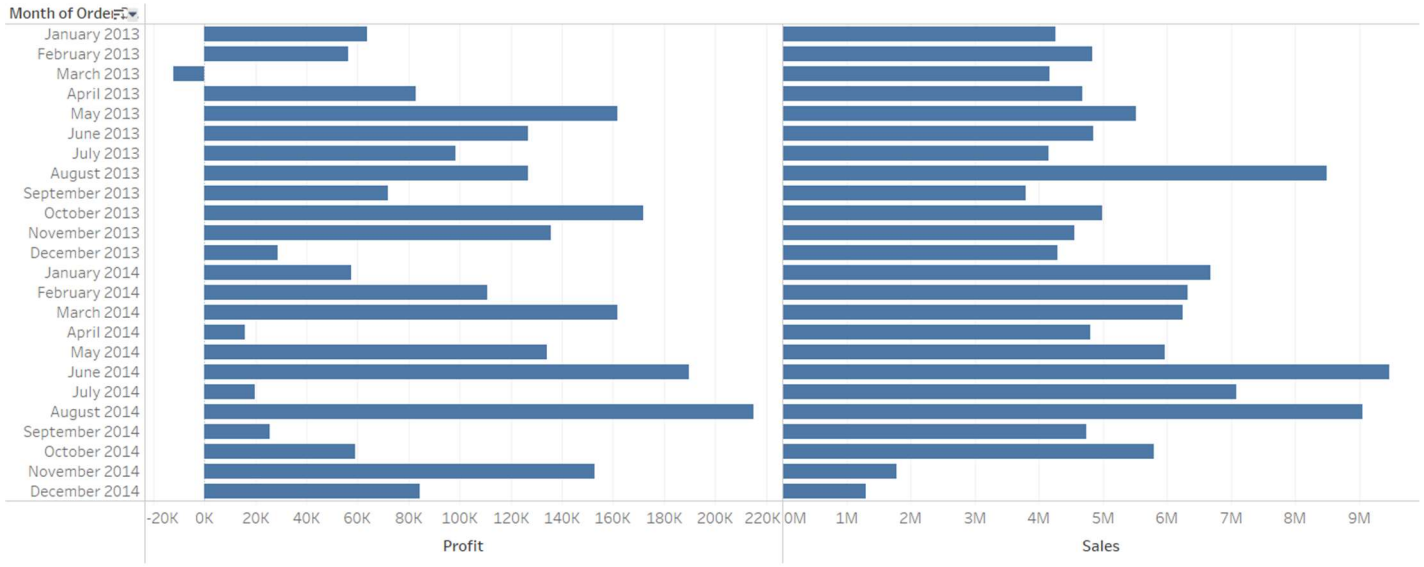
- **User Feedback**: Gathering feedback from end-users, like the CFO or regional managers, on the usability and insightfulness of the dashboards.
- **Performance Metrics**: Ensuring the dashboards perform optimally in terms of load times and responsiveness, especially when handling large datasets or complex calculations.
- **Iteration**: Refining visualizations based on feedback and performance metrics to enhance clarity, reduce clutter, and improve data interaction capabilities.

Each visualization is selected based on its ability to convey the right message and insights effectively, supporting strategic business decisions through a clear, data-driven narrative.

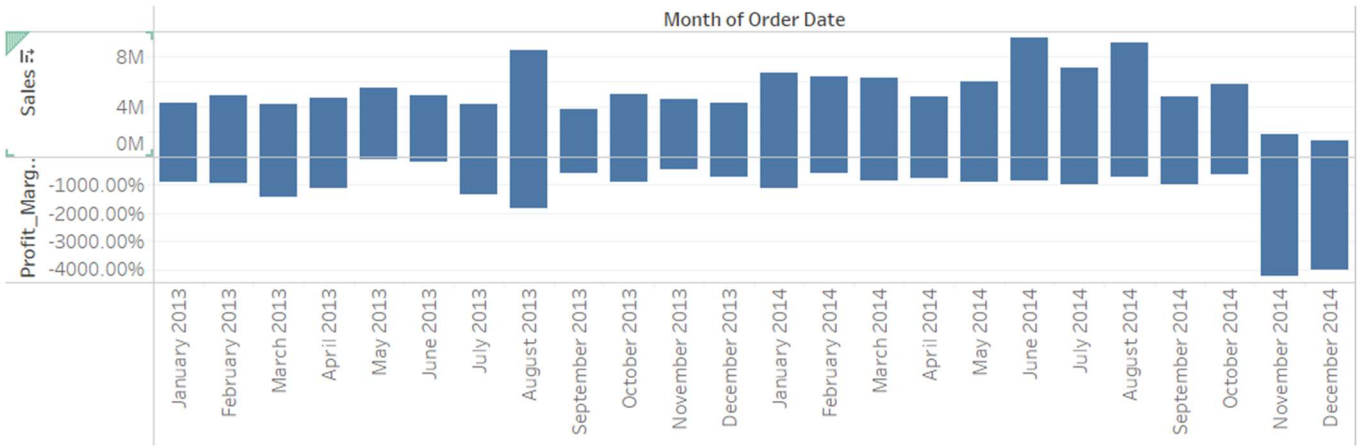
PLOTTINGS

This is an important step in the process of data analysis. The analysis from the data is plotted for better understanding in each step. The results of different models are also plotted to choose the best one for our predicting. Plotting makes it easier to visualize data and thus reach conclusions.

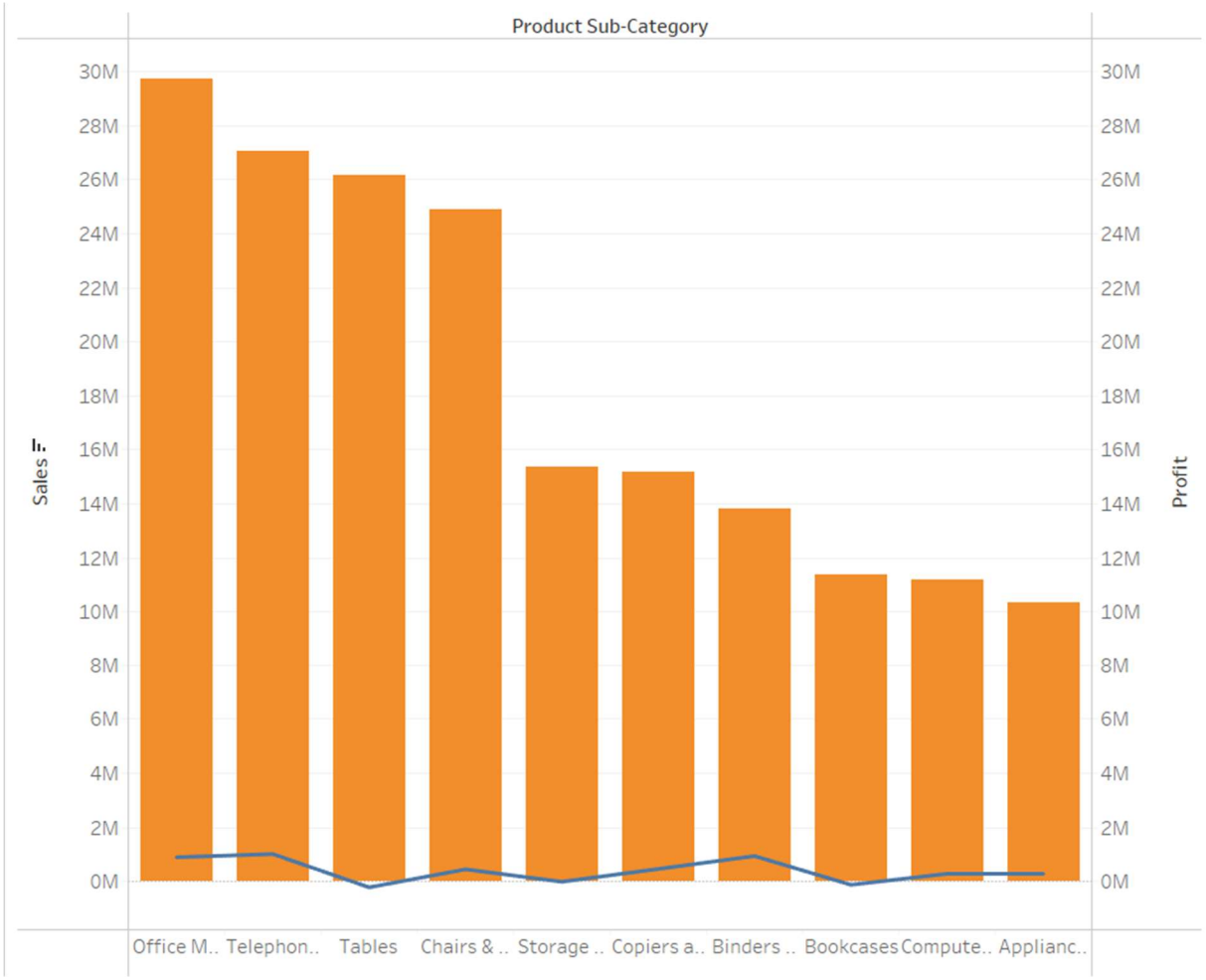
Q1. Monthly Sales and Profits over two years. = The CFO wants to see how sales and profits have changed month-by-month over the last two years. She's particularly interested in comparing this year's data with last year's data directly. So, we create a line chart in Tableau with months on the x-axis and sales and profits on the y-axis. Use different colors or lines to distinguish between the two years for easy comparison.



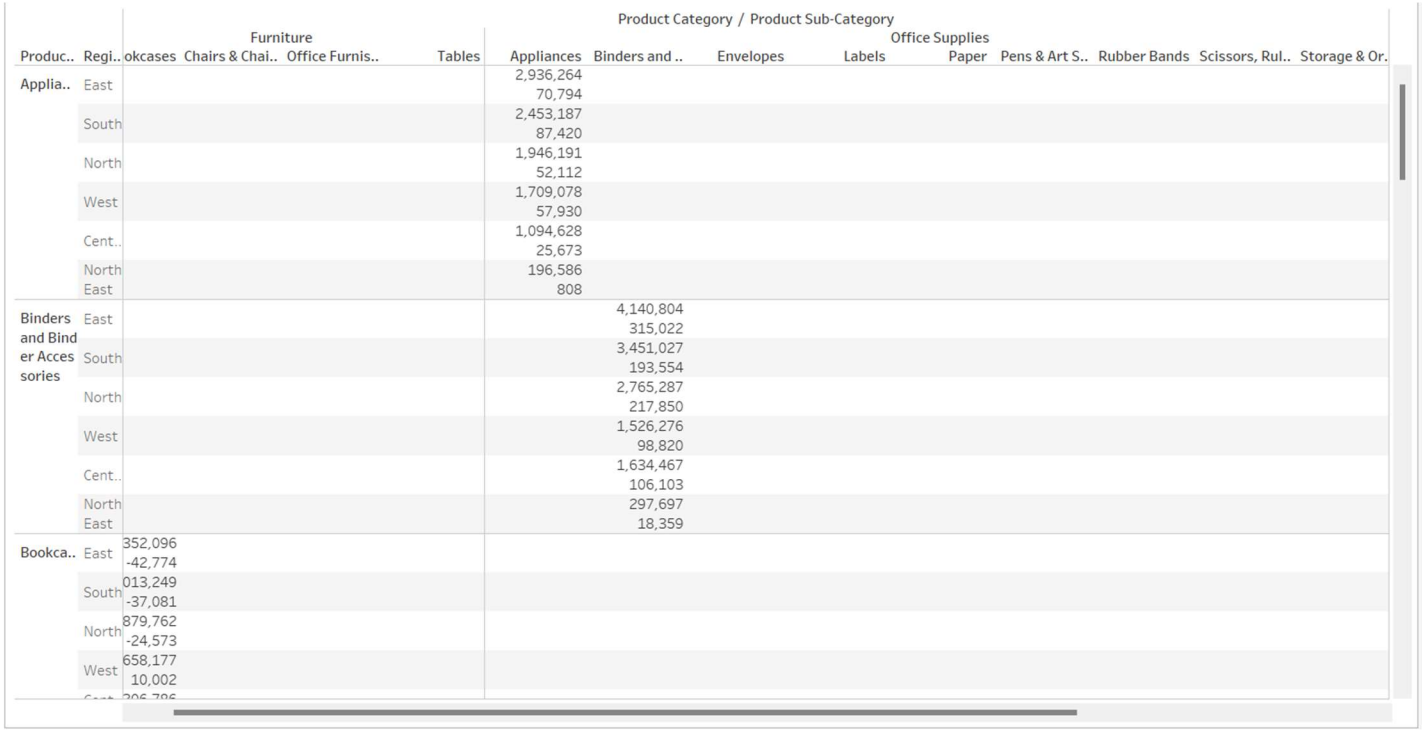
Q2. Showing Profit Margin = Instead of just showing absolute profit numbers, the CFO wants to understand the profit in relation to sales, which gives a better sense of efficiency. Hence, we adjust the chart from Q1 to display profit margin (profit divided by sales). This can be done by creating a calculated field in Tableau for profit margin and using it in the chart.



Q3. Profit and Sales by Product Sub-Category in descending order of sales = Management wants to see which product sub-categories are performing best in terms of sales and profits, all in one chart, sorted by sales. So, we use a bar chart with product sub-categories on the x-axis, and have two bars for each sub-category representing sales and profits. Sort the chart by sales in descending order.



Q4. Detailed Breakdown by Category, Sub-Category, and Region = Regional managers need detailed insights into sales and profits across different dimensions to make informed decisions about products. Hence create a detailed visualization or a series of visualizations that allow for drilling down from category to sub-category and then by region.

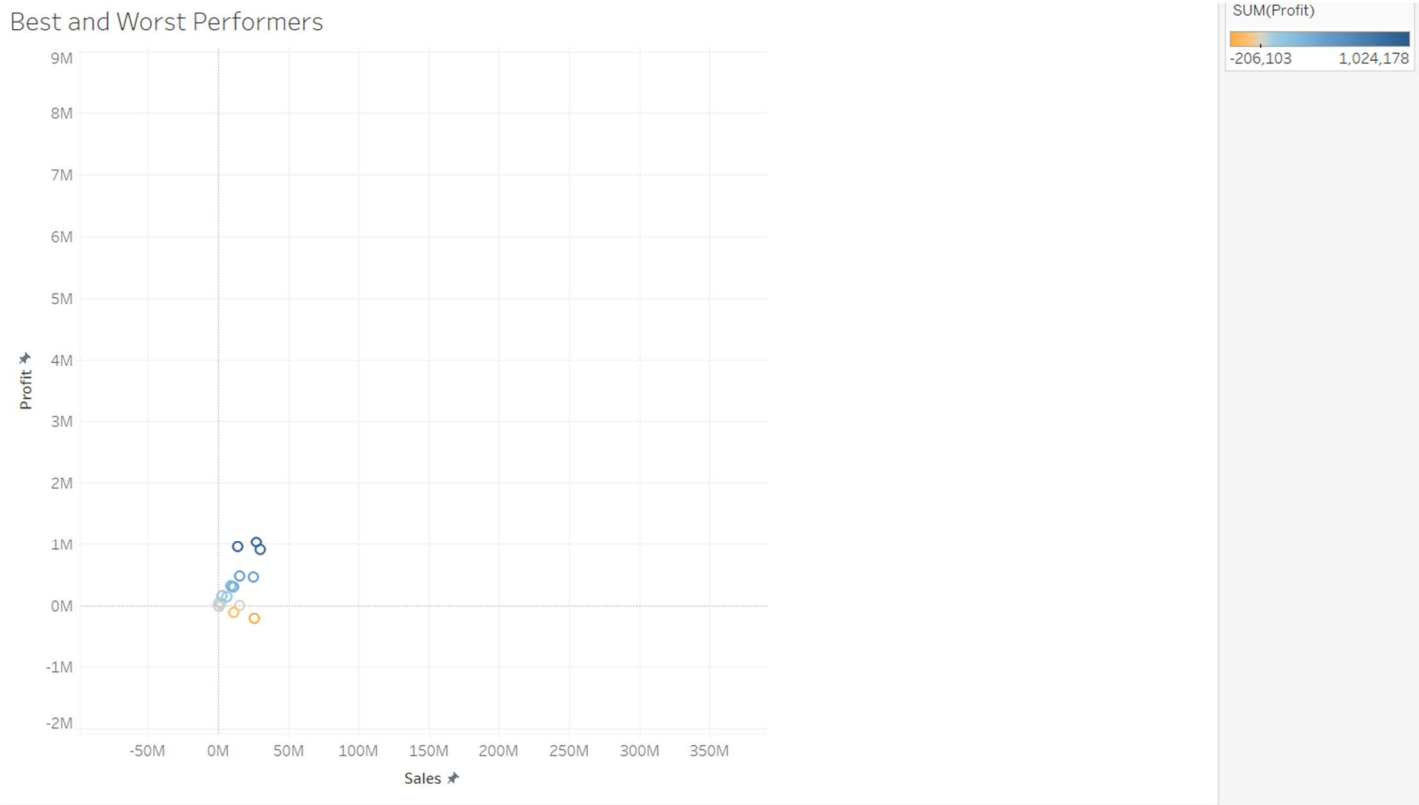


		Product Category / Product Sub-Category														
		Furniture				Office Supplies										
Produc..	Regi..	okcases	Chairs & Chai..	Office Furnis..	Tables	Appliances	Binders and ..	Envelopes	Labels	Paper	Pens & Art S..	Rubber Bands	Scissors, Rul..	Storage & Or.		
Applia..	East					2,936,264 70,794										
	South					2,453,187 87,420										
	North					1,946,191 52,112										
	West					1,709,078 57,930										
	Cent..					1,094,628 25,673										
	North East					196,586 808										
Binders and Binder Accessories	East						4,140,804 315,022									
	South						3,451,027 193,554									
	North						2,765,287 217,850									
	West						1,526,276 98,820									
	Cent..						1,634,467 106,103									
	North East						297,697 18,359									
Bookca..	East	352,096 -42,774														
	South	013,249 -37,081														
	North	879,762 -24,573														
	West	658,177 10,002														

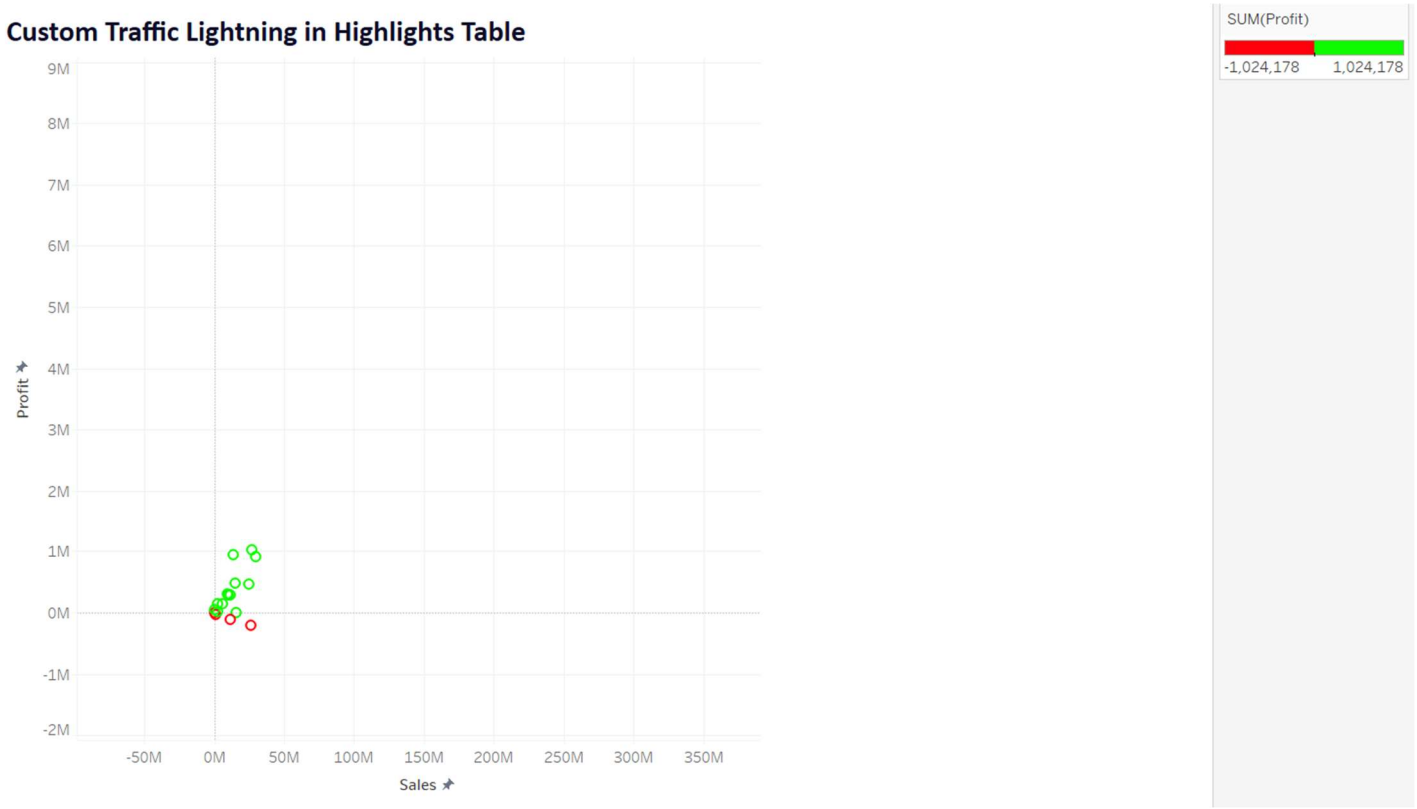
Q5. Crosstab of the data = The Sales Manager needs a straightforward tabular representation of sales and profit data to see exact values rather than graphical summaries. Hence, we create a crosstab (text table) in Tableau that lists product categories and sub-categories with corresponding sales and profit numbers.

Product Cat..	Product Sub-Catego..	Profit	Sales
Furniture	Bookcases	-111,534	11,397,011
	Chairs & Chairmats	459,272	24,915,510
	Office Furnishings	306,708	9,064,656
	Tables	-206,103	26,142,033
Office Supplies	Appliances	294,737	10,335,934
	Binders and Binder ..	949,708	13,815,558
	Envelopes	147,126	2,465,268
	Labels	43,444	577,567
	Paper	139,444	6,197,493
	Pens & Art Supplies	24,983	2,382,302
	Rubber Bands	-955	215,689
	Scissors, Rulers and ..	-25,482	939,174
	Storage & Organizat..	1,213	15,371,233
Technology	Computer Peripherals	296,224	11,168,717
	Copiers and Fax	473,522	15,156,721
	Office Machines	904,783	29,729,859
	Telephones and Com..	1,024,178	27,036,384

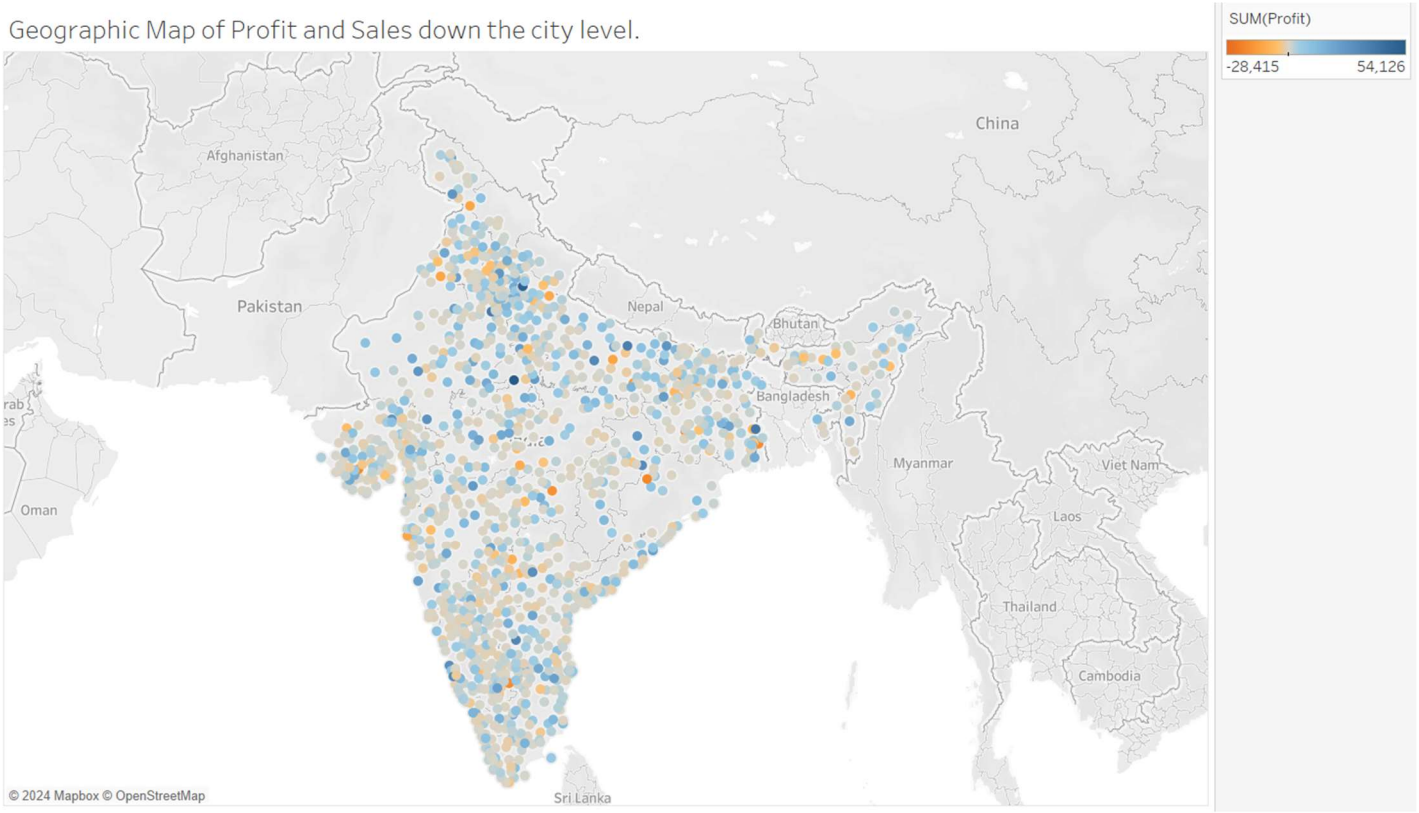
Q6. Highlighting Best and Worst performers by highlighting sales by profit = After reviewing the crosstab, there's a need to quickly identify which products are performing well and which aren't. So, we have used a highlight table that colours the cells based on performance metrics like sales and profits to easily spot high and low performers.



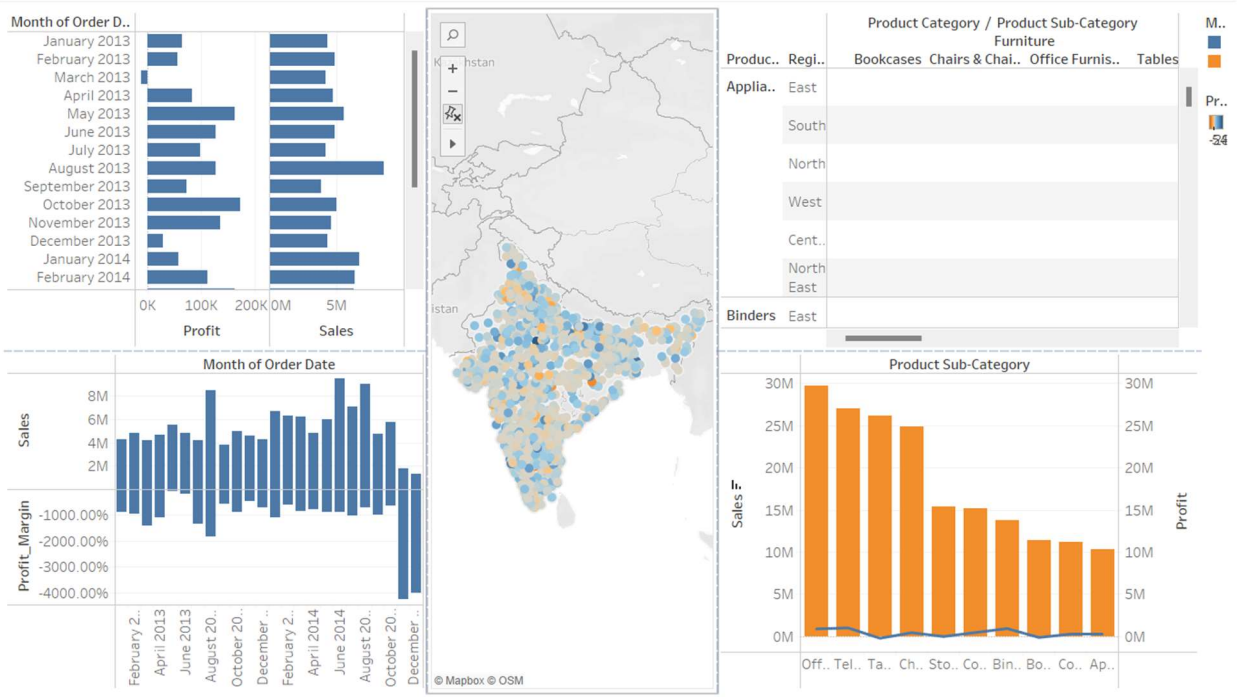
Q7. Custom Traffic Lightning in Highlights Table = Customize the colours in the highlight table to represent different performance thresholds defined by the user. Create calculated fields to define custom thresholds for performance and use these to colour the highlight table.



Q8. Creating a Geographic Map of Profits and Sales down the city level = There's a need for a geographic representation of sales and profit data to help state managers visualize performance across different cities. Create a map view in Tableau where each city is plotted and coloured or sized by sales and profit metrics, with filters to select different product categories.



Q9. Final Sales Dashboard = Combining all the visualizations from previous questions into a single, interactive dashboard that incorporates all the individual charts and tables, ensuring there are interactive elements like filters and actions to allow users to explore the data dynamically.



STUDY PERFORMED

The Tableau project centered around a structured analysis of sales and profit data from Superstore, tailored to address specific inquiries from the CFO and regional managers. The approach was methodical, aiming to dissect various facets of the business performance through targeted studies:

1. **Time-Series Analysis**: The initial study explored sales and profits over a two-year period, identifying trends and cyclic patterns crucial for effective forecasting and strategic planning. This analysis helped in visualizing seasonal impacts and annual growth trajectories, providing a temporal perspective on business health.

2. **Segmentation Analysis**: This deeper dive segmented sales and profits by product categories, sub-categories, and regions. It scrutinized the data at a granular level, revealing performance variances across different segments which were crucial for tactical decision-making in marketing, stock management, and geographic expansion strategies.

3. **Comparative Profit Analysis**: Moving from absolute profit numbers to profit margins, this analysis refined the understanding of real profitability across the product range. It adjusted focus from gross profits to net efficiencies, enabling more nuanced strategies concerning pricing, promotions, and cost management.

4. **Geographic Analysis**: The project also included a geographic study where sales and profits were mapped down to the city level. This visualization was instrumental in identifying regional market strengths and weaknesses, aiding in tailored regional strategies for marketing and distribution.

MODELS AND METRICS USED

The effectiveness and accuracy of the visualizations created in the Tableau project were critically assessed using a comprehensive set of metrics. These metrics were specifically chosen to evaluate the impact and utility of the Tableau dashboards across various dimensions: user engagement, data accuracy, performance, and feedback quality. Below is a detailed expansion of each metric.

User Engagement

User engagement was measured by analysing how users interacted with the dashboards. This included metrics such as:

- **Session Duration**: The time users spent interacting with the dashboards, indicating the relevance and user interest in the content provided.
- **Interaction Rate**: The frequency of interactions per session, such as clicks, filters applied, and tabs explored. High interaction rates often reflect a dashboard's ability to engage users and encourage exploration.
- **Return Visits**: The number of times users returned to use the dashboard, an indicator of its enduring value to the users.

High levels of engagement suggest that the dashboards are well-designed, intuitive, and provide valuable insights that are relevant to the users' needs. These metrics help identify successful elements in dashboard design as well as areas needing improvement.

Data Accuracy

Ensuring data accuracy is paramount, as the reliability of insights depends fundamentally on the precision of the underlying data. Methods to ensure data accuracy included:

- **Data Validation Checks**: Routine checks and audits to confirm data integrity and correctness.
- **Source Verification**: Ensuring all data inputs are consistently drawn from reliable and approved sources.

- **Real-time Monitoring**: Implementing systems to monitor data quality in real-time, quickly identifying and rectifying any inconsistencies or errors.

Data accuracy metrics are crucial as they directly affect the trust stakeholders place in the dashboard's outputs, thereby influencing business decisions.

Performance Metrics

Performance metrics focus on the technical aspects of the Tableau dashboards, particularly concerning their efficiency and responsiveness:

- **Load Time**: Measures the time taken for dashboards to fully load and render, which is critical for user satisfaction, especially with complex visualizations.
- **Query Performance**: The efficiency of data retrieval operations, essential for dashboards that pull data from large databases or perform complex computations.
- **Resource Utilization**: Monitoring resources like CPU and memory usage to ensure the dashboards are optimized for the best performance without overloading the underlying systems.

Optimal performance is essential not only for a good user experience but also for maintaining the operational feasibility of using Tableau dashboards regularly.

Feedback Quality

Feedback from users provides direct insights into the dashboard's usability and effectiveness:

- **Usability Surveys**: Structured surveys to gather user opinions on navigation, interface design, and overall user experience.
- **Focus Groups**: In-depth discussions with a select group of users to gain detailed feedback on their experiences and suggestions for improvement.
- **Incident Reports**: Analysis of user-reported issues, providing direct points of action to enhance the dashboard's functionality.

This qualitative feedback is invaluable as it guides the iterative process of refining and optimizing the dashboards, ensuring they meet the evolving needs of the users.

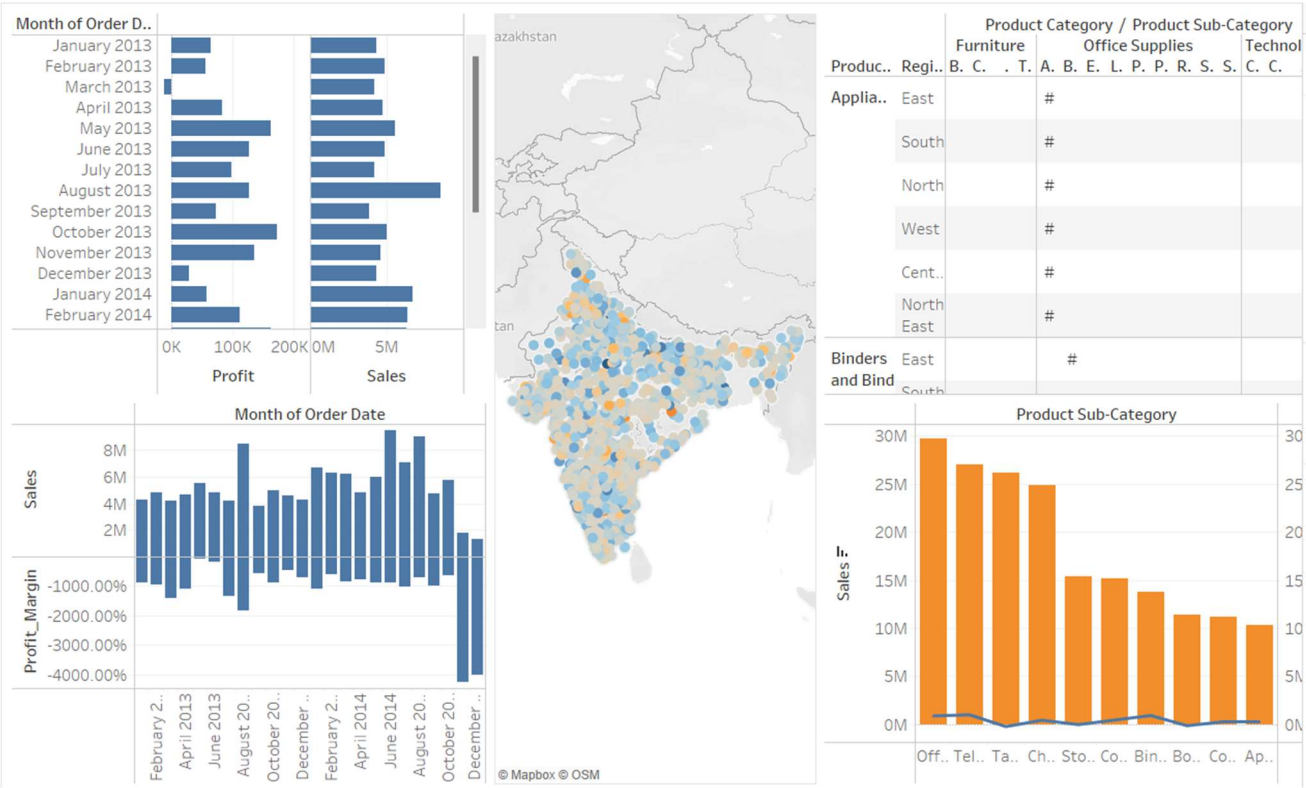
Each of these metrics plays a vital role in assessing the success of the Tableau project, guiding ongoing improvements and ensuring that the dashboards remain effective tools for data-driven decision-making. This robust evaluation framework not only supports the project's immediate goals but also sets a foundation for continuous enhancement, keeping the business agile and well-informed in a competitive landscape.

RESULT

The final dashboard presented in the Tableau workbook serves as a comprehensive visual summary of the sales and profit analysis conducted for Superstore. This visualization tool encapsulates various critical business metrics, providing a clear and interactive overview of the company's financial health and operational efficiency over the past two years. Through detailed charts and graphs, the dashboard illustrates seasonal trends, showcasing months with peak sales and identifying potential troughs that require strategic planning for inventory and staffing. Additionally, it shifts the focus from absolute profit numbers to profit margins, offering a refined view of profitability across different product lines.

The dashboard's comparative year analysis is particularly insightful, enabling the CFO and regional sales managers to quickly discern growth trends and areas in need of improvement. This real-time comparison between the current and previous years' data fosters a proactive approach to business strategy, ensuring timely adjustments that align with the company's financial goals.

By leveraging Tableau’s dynamic visualization capabilities, the dashboard not only aids in routine reporting but also enhances strategic decision-making. Future recommendations for Superstore involve integrating real-time data analysis and exploring predictive analytics to anticipate market trends. This proactive approach will ensure that Superstore remains agile in a competitive retail environment, optimizing operations and maximizing profitability through informed, data-driven decisions.



CONCLUSION

This project effectively utilized Tableau to transform extensive sales data into actionable insights, emphasizing the critical role of data-driven decision-making in the competitive retail landscape. By creating dynamic visualizations, the project enabled the CFO and regional sales managers at Superstore to discern trends, compare performance across various periods and categories, and make informed strategic decisions. The insights gained underscored the potential of using advanced analytical tools to enhance operational strategies and financial outcomes. Moving forward, integrating real-time data analysis could offer more dynamic responses to market changes, and employing predictive analytics would further empower the company to anticipate future trends and better prepare for market dynamics. This approach not only solidifies the role of data in strategic planning but also sets a pathway for continuous improvement and innovation in business practices, ensuring that data collection and analysis evolve to meet the demands of a rapidly changing retail environment.