UNIVERSITI MALAYA

WIE3010 Data Visualization

Group Assignment

Group 13

E-Commerce Bike Store Analysis

	Name	Matric Number
1.	Amir Firdaus Bin Abdul Hadi	17204620
2.	Imran Asyraaf	17202811
3.	Noor Athirah binti Md Fuad	17202875
4.	Nurin Batrisyia Bt Mohd Azmi	17207087
5.	Wan Muhammad Azib bin Wan Abdul Rahim	17207678

Dr. Riyaz Ahamed

Submission date: 25 January 2023

Report Contents

1. Introduction

Online shopping gives consumers more options, more information and easy access to thousands of products, all without leaving their home. In addition to that, it also gives the e-commerce owners and stakeholders access to highly valuable data that can be turned into highly valuable insights. Understanding your customers behavior, preferences and needs optimizes your store performance, hence giving you a competitive edge.

Our dataset is E-commerce Bike Stores Analysis that involves many different brands and models of bikes as well as order, customer, staff and store information. The dataset contains 9 different tables; brands, categories, products, stocks, customers, order_items, orders, staffs and stores. It consists of 3 different stores with 9 different brands and 7 different categories of bike that are sold online from 2016 to 2018. With the available data, we can look into different kinds of analysis that will benefit the customers and stakeholders which are the store owners, store managers and brand owners. Analysis such as product sales analysis, brand popularity analysis, customer analysis and market trend analysis.

The visualization tools used will be SAS Viya, Tableau and PowerBI. These tools allow us to prepare, analyze, collaborate, and provide quick, accurate and reliable analytical insights. Various types of charts and graphs can be made and reported into a dashboard for the end-user to interpret and help in decision making. Although these tools have the similar ability to provide insights, there are pros and cons to each tool that will be discussed further in this report.

2. Business Problem Statements

I. How different kinds of specifications on bicycle's affect the price.
    The aim of this analysis is to determine what is the average price of the product based on their specification or category. Some categories had high demand in high price products due to its specification of that kind of activity. On the other hand, some products had high demand for middle range price for some categories that did not require high specification for their products.

II. Most preferred brand by the customers by its category.

    This business problem is to look at the performance of every brand in every category. The business problem will analyze which brand in each category is most preferred by the customers. By looking at this performance, the company can plan marketing further, and the bike store owners can manage their inventory efficiently.

III. What time of the year contributes to high and low sales.

    This business problem is to look into store sales and time analysis whether there is a pattern in which a certain period of time generates a high amount of sales or generates a low amount of sales. By finding the pattern, store owners can plan well to market their bike stores at certain times of the year to maximize their revenue.

IV. Which region records highest sales of the bicycles and brand preferred.

    Conducting an analysis to identify the regions with the highest sales and ranking of brand sales can be a valuable tool for businesses looking to improve their sales in specific areas. By identifying which regions are most successful for a given brand, companies can develop targeted marketing strategies and allocate resources accordingly. By conducting an analysis to identify the regions with the highest sales and ranking of brand sales, businesses can gain a deeper understanding of their sales performance and develop targeted strategies to improve their sales in specific regions.

V. Market trend in bicycle industry.

Market trend analysis is to see how the bicycle industry started, the growth of the industry itself and the expectation along its journey. This analysis is to identify the customers' preferences of the brands by visualizing the sales and number of orders received. By utilizing this analysis, the companies are able to evaluate whether the changes made bring positive or negative impact towards their revenues.

3. Analysis and Outputs

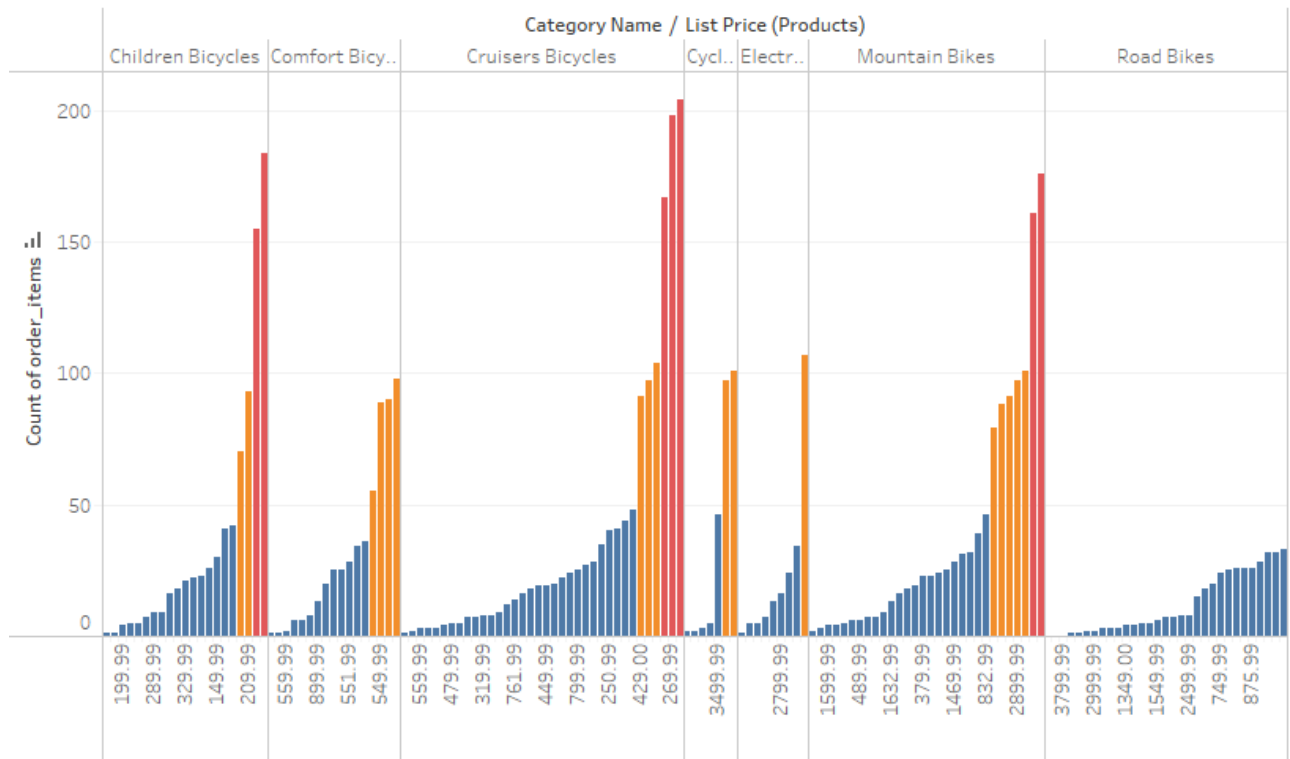## Analysis 1: Category and specification analysis.

<u>Tableau</u>

Number of Order by Categories
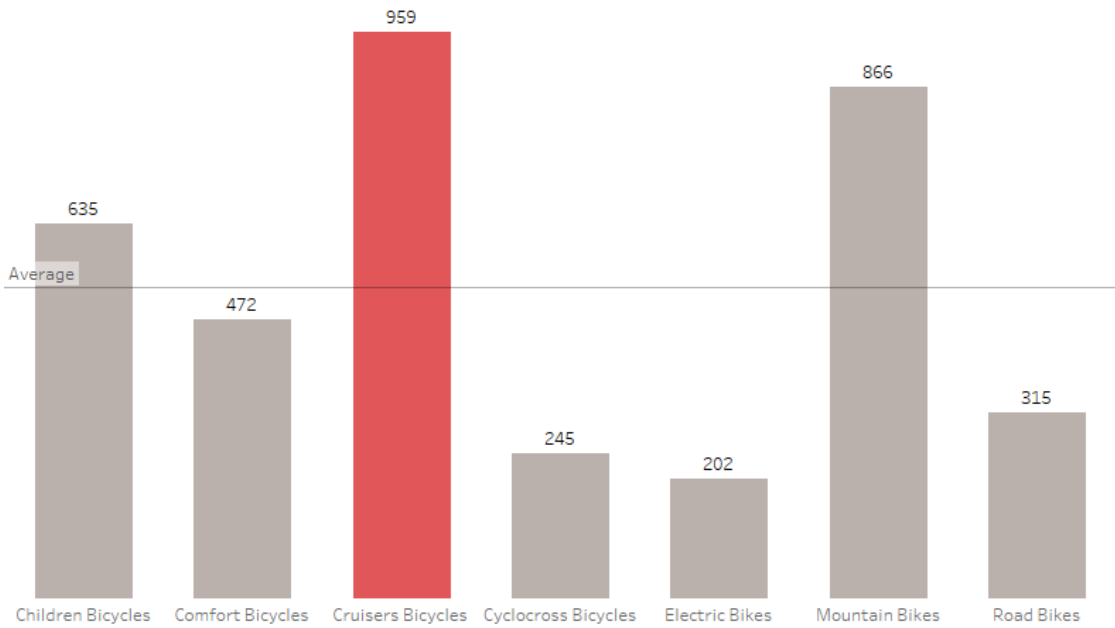
Count of orders for each Category Name. Color shows details about Category Name. The marks are labeled by count of orders.
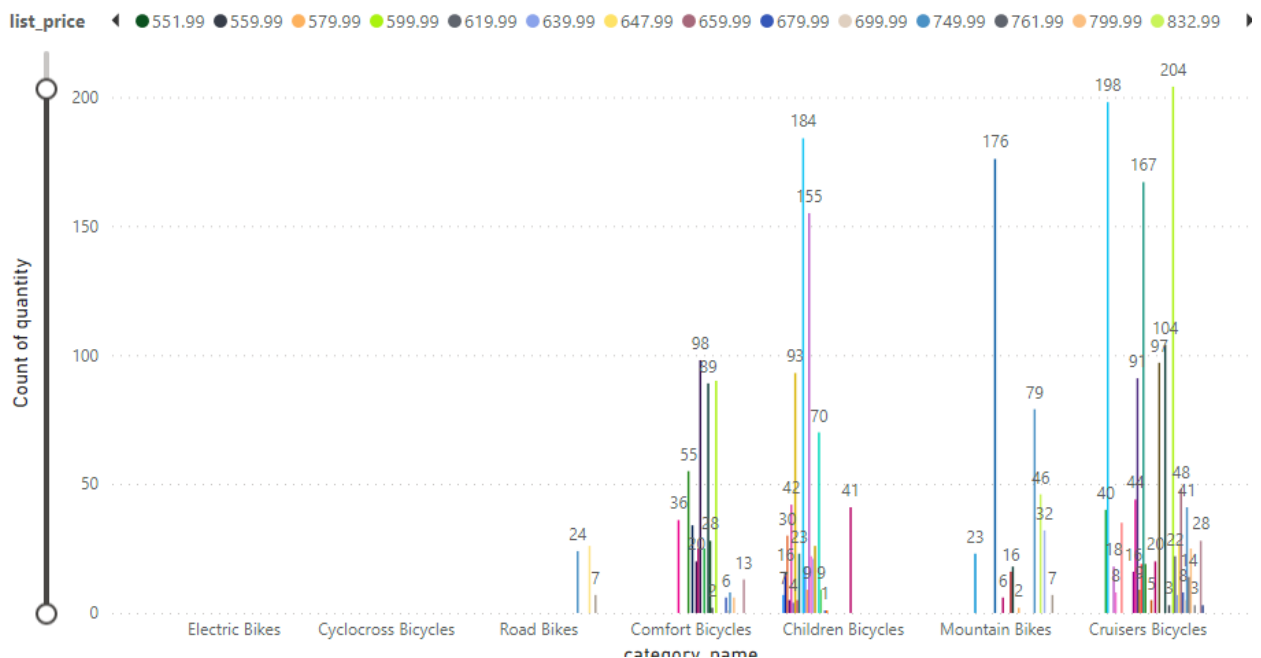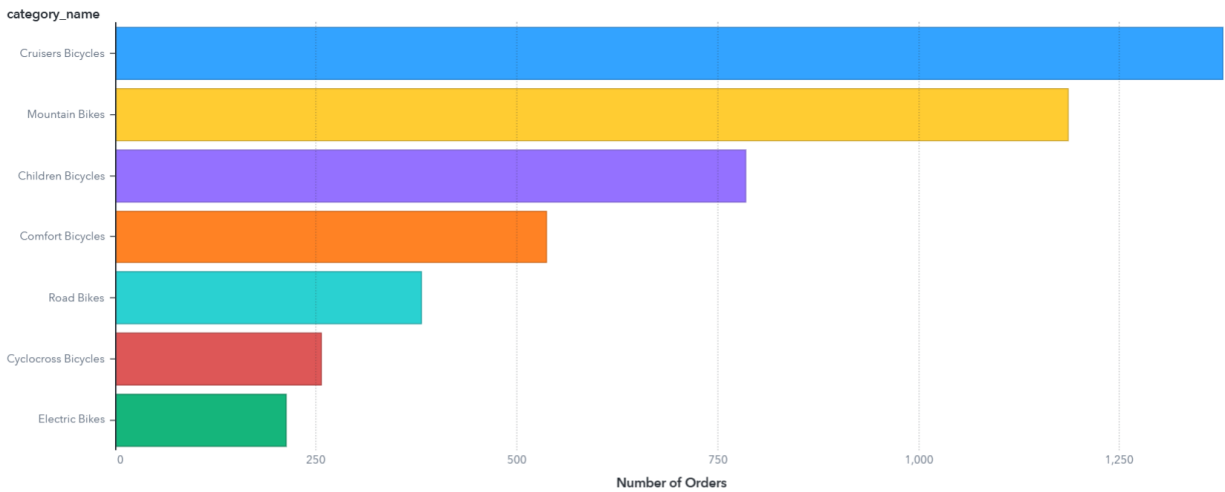
Figure 1 Bar Graph and Pie Chart Using Tableau

PowerBI

Figure 2 Bar Graph and Pie Chart Using Power BI

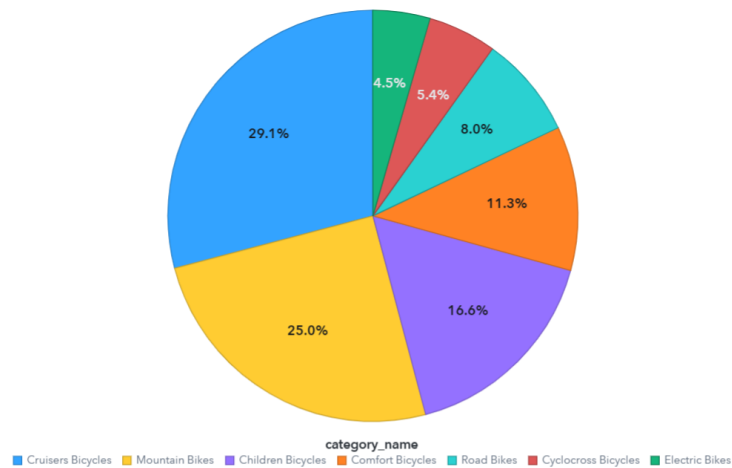Number of Orders of Categories

Percentage of orders by its categories

Figure 3 Bar Graph and Pie Chart Using SAS Viya

Findings

Figure 1,2 and 3 show the number of orders by its category. From this analysis. We could see that cruiser bikes had a high demand compared to other types or categories of bicycles. Here, we could see, cruiser bikes received a total 959 orders with 700 orders coming from Electra brand, 232 orders from Pure Cycles and 216 orders from Sun Bicycles. The second largest orders came from the mountain bike category where it received total 866 orders, various from different brand such as 123 orders from Haro, 97 orders from Heller, 77 orders from Ritchey, 17 orders from Sun Bicycles, 326 orders from Surly and 460 orders from Trek.

From here, we could see the pattern, what types of bicycles are trending now and what kind of product the shops need to focus on promotions and marketing to make more revenue. From analysis, the shops need to focus more on promoting the cruiser bikes and mountain bikes since they have received more demand lately and slow down the sales for electric and cyclocross bikes since they receive less demand.

Advantages & Disadvantages

Throughout this assignment, I found out that Power BI is not beginner friendly. Even for an amateur, Power BI requires a lot of training since the add and drop features in the Power BI requires a lot of understanding to be known before you can visualize the data.For tableau and Sas Viya, it is more beginner and even user friendly for all. The add and drop button tells the user exactly what they need to do as the instruction is clear. From the part of making the relationship of tables until the part to visualize the data, all the features and user interface for Tableau and Sas Viya is much easier than Power BI.
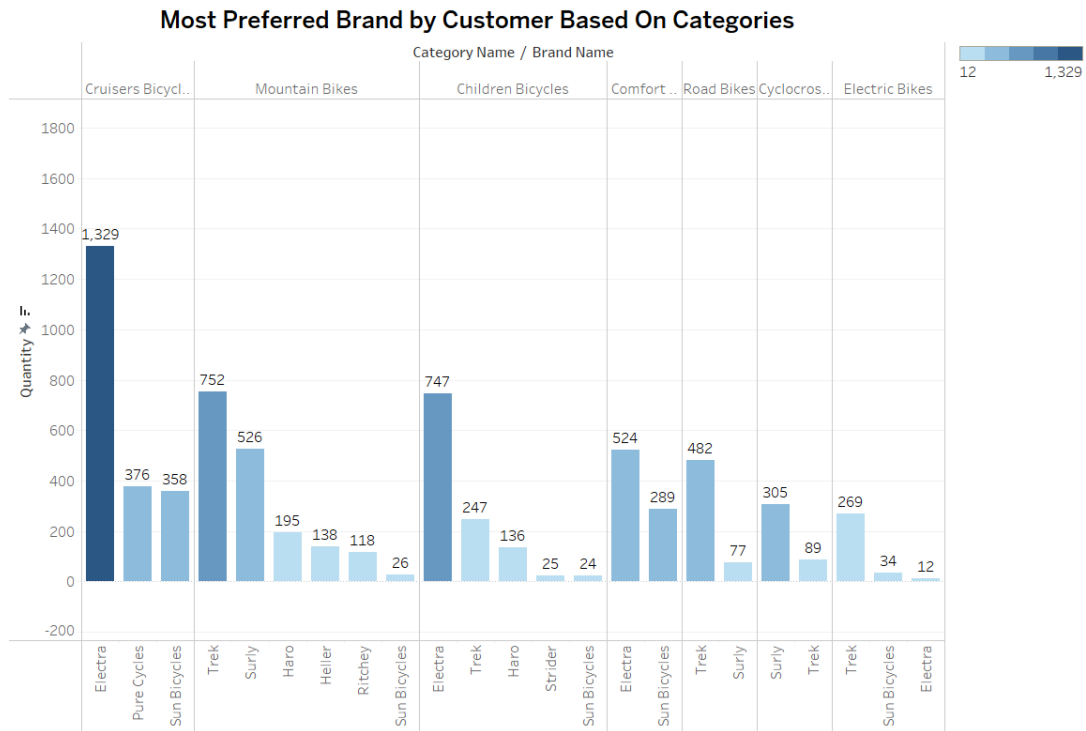
Analysis 2: Brand analysis

Tableau

Most Preferred Brand by Customer Based On Categories

Figure 4 Bar graph using Tableau

PowerBI
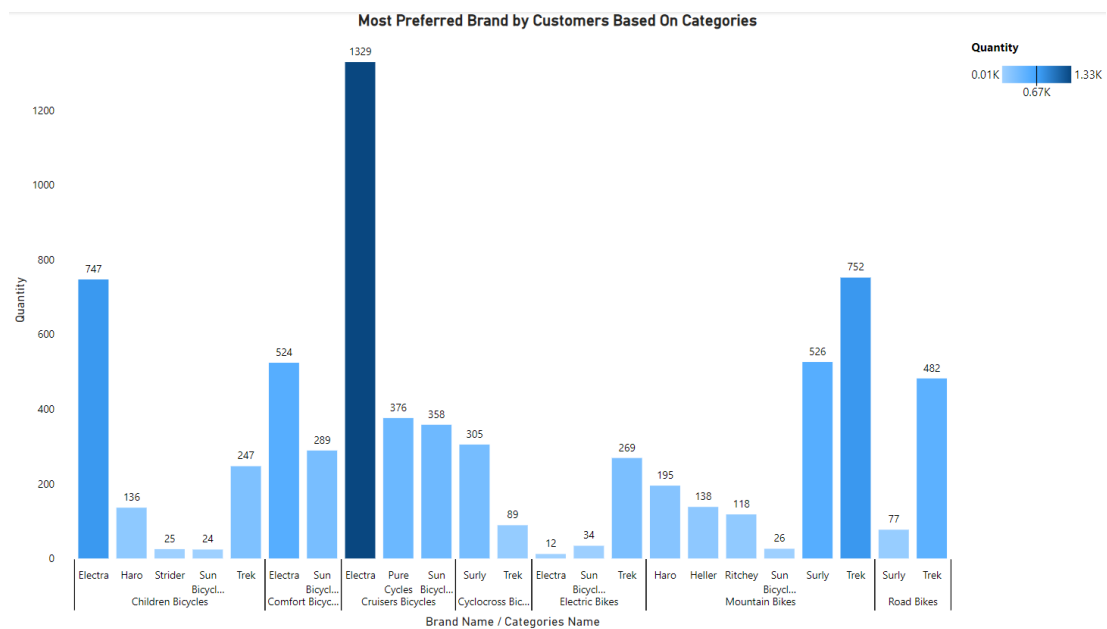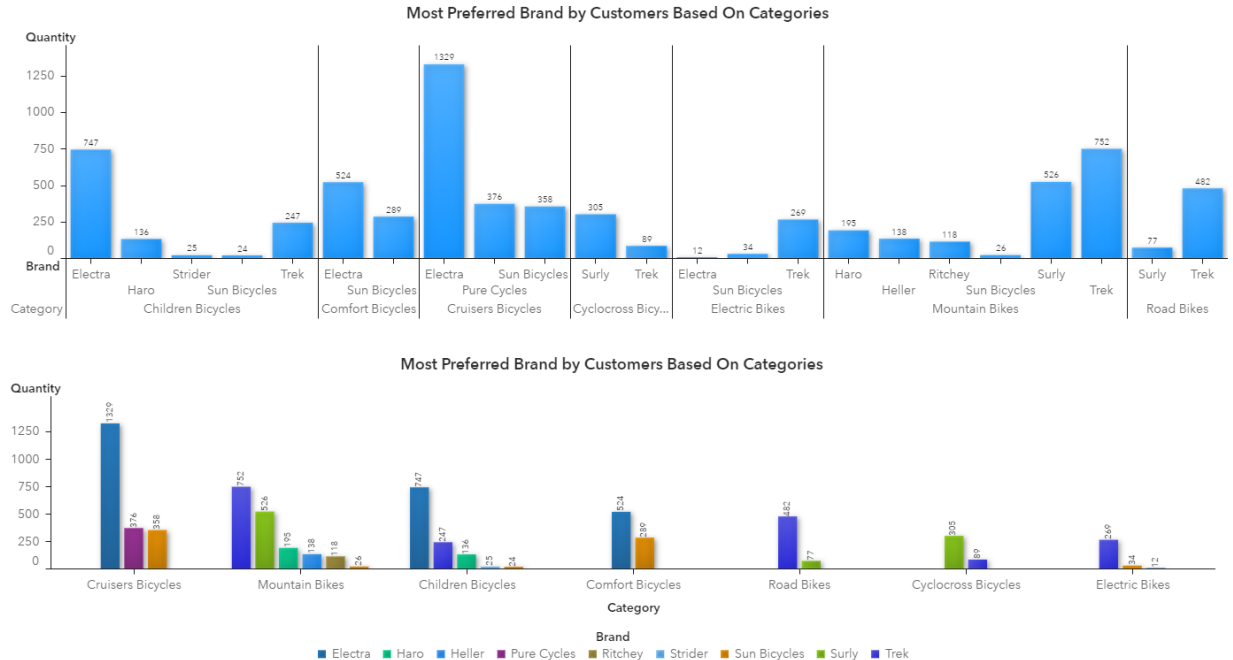

Figure 5 Bar graph using Power BI

Figure 6 Bar graph using SAS Viya

Findings

Figure 4, 5, and 6 shows that Electra, Trek, and Surly are the most preferred brands by the customers. Electra was preferred by customers who wanted to buy cruisers, children, and comfort bicycles but were not preferred for electric bikes. Next, Trek has produced 5 types of bicycles but only 3 types are preferred by customers which are mountain, road, and electric bikes. The Surly brand was preferred for cyclocross bicycles.

Advantages and Disadvantages

The advantage of using Tableau for this analysis is Tableau can sort the graph with two variables which are according to category and quantity. Power BI can sort one variable, which is either category, brand, or quantity. For SAS Viya, it can sort according to category name and quantity if the bar graph is grouped by brand. The advantage of using Power BI for this analysis is you can choose the start, middle and last color for the gradient, but Tableau can only choose the end color of the gradient. For the SAS Viya, it is difficult to do a color gradient. Lastly, the advantage of using SAS Viya is it has a

visual effect on two-dimensional plots which call data skins. However, Power BI and Tableau do not have this visual effect.

Analysis 3: Stores Sales And Time analysis

Tableau

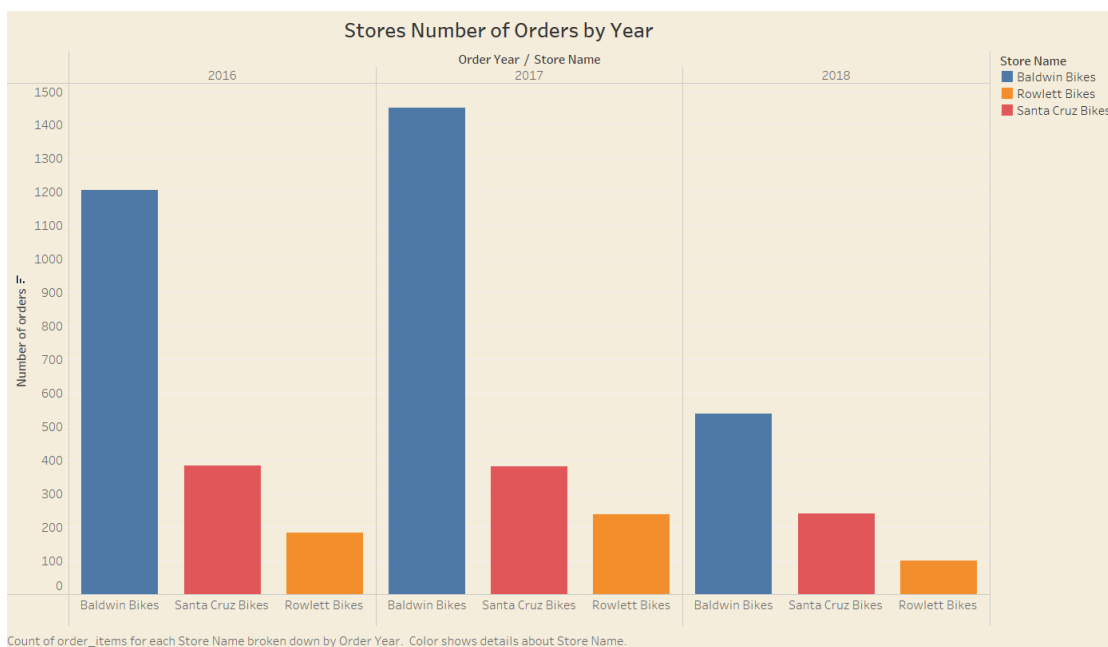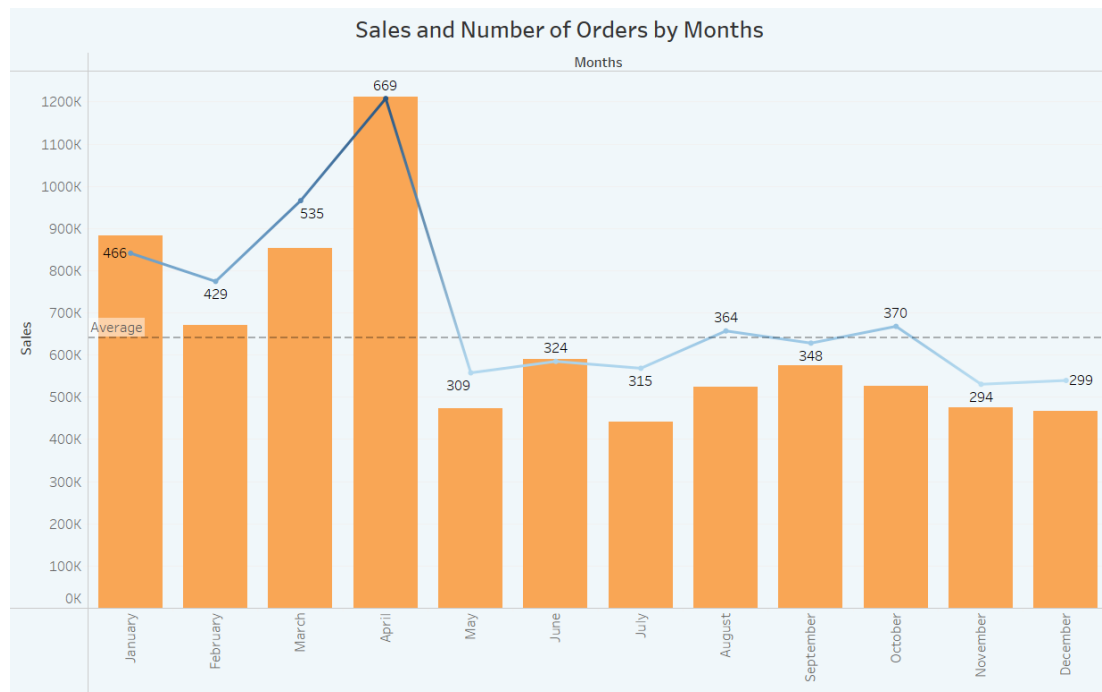
Figure 7: Line and Bar graph usingTableau
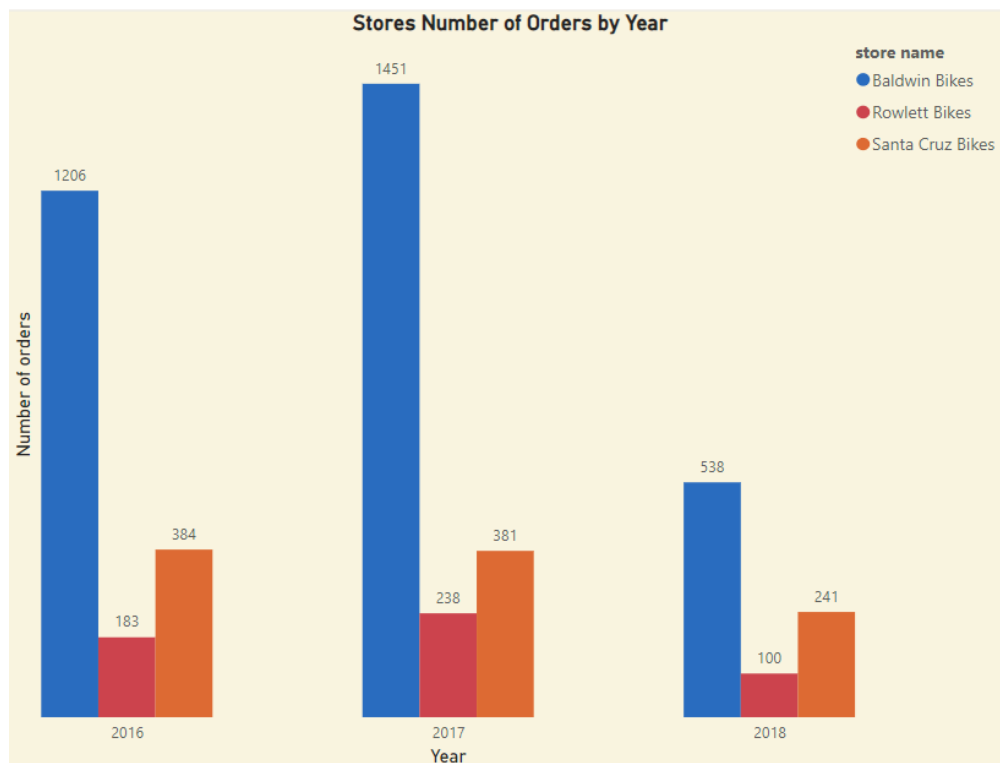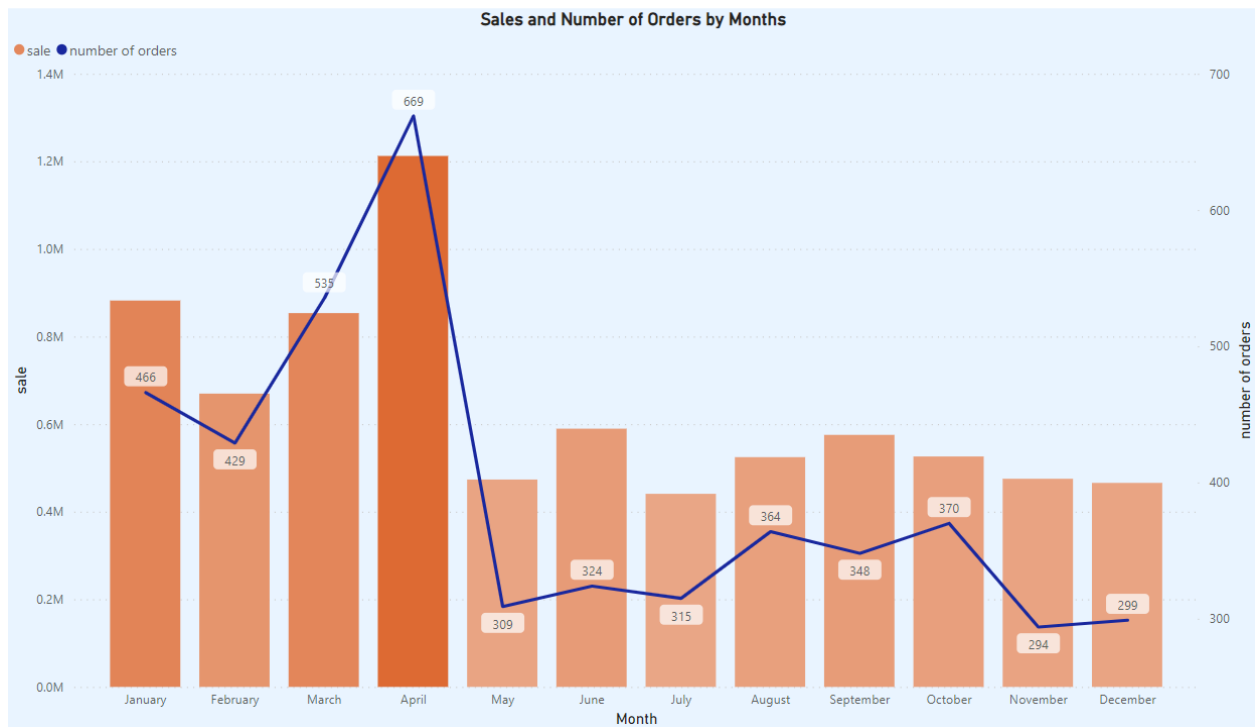
PowerBI

Figure 8: Line and Bar graph using PowerBI

Sales and Number of Orders by Months
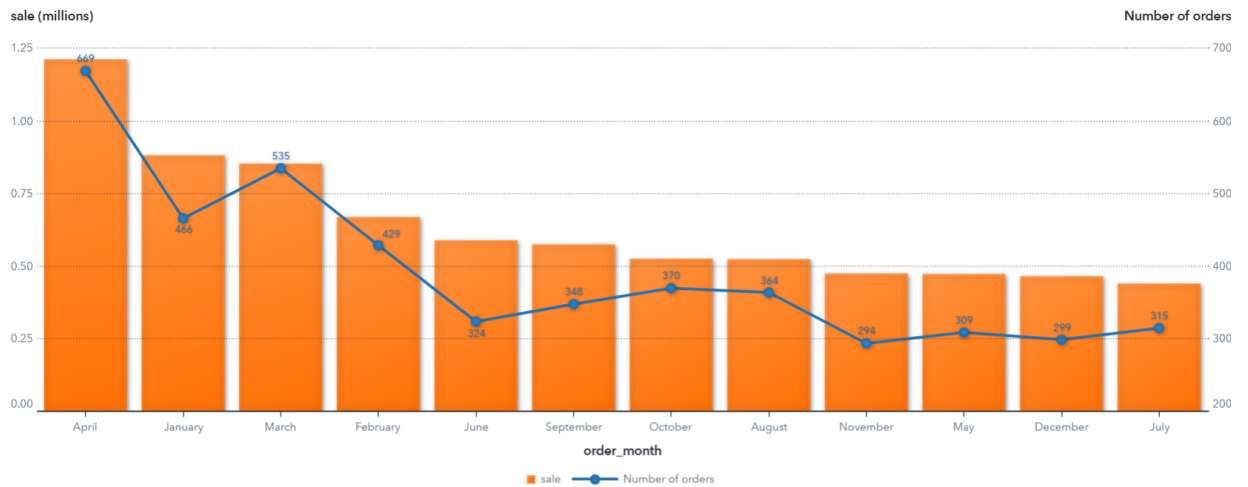
Stores Number of orders by Years
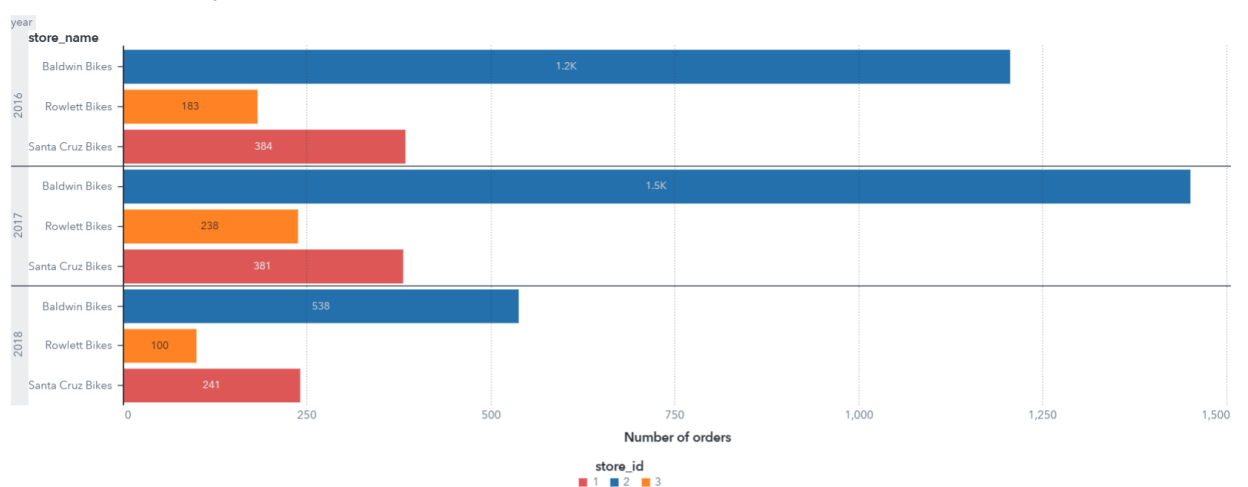
Figure 8: Line and Bar graph using SAS Viya

Findings

From the Sales and Number of Orders by Months chart, we can see that for the first Quarter of the year, it shows a high number of orders and sales for bicycles compared with the rest of the year in the three stores. This means that most people bought bicycles in the early part of the year. And from the first quarter, the month of April brings the most revenue and number of orders. Because this store is in the USA and

affected by the seasonal changes, April being the season of Spring might have an effect on the customer's buying behavior.

From the Stores Number of Orders by Year chart, for 3 years (2016 - 2018), Baldwin Bikes stores has the most popular store to buy bicycles followed by Santa Cruz Bikes and then Rowlett Bikes. Although Santa Cruz Bikes and Rowlett Bikes have almost close to even competitive values, Baldwin Bikes lead the market by a big gap that makes their store worth looking into to increase the orders.

<u>Advantages and Disadvantages</u>

For the Sales and Number of Orders by Months chart, Tableau has the advantage of being able to color gradient the line chart compared to PowerBI and SAS Viya. Tableau also has the functionality to add reference lines easily to show additional information such as the average sales for easy comparisons but PowerBI and SAS Viya does not. Users need to calculate their own new measures in PowerBI and SAS Viya before being able to create a reference line while Tableau is just drag and drop. For the Stores Number of Orders by Year chart, we can easily sort the bar chart by values or manually drag the bar to our preferences with Tableau but PowerBI cannot do so. In that context, SAS Viya automatically sorts the month's bar chart into ascending or descending order and it is not what the user has intended. It is hard to rearrange the bar to user preference just like in Tableau. In terms of color, Tableau is the most attractive followed by PowerBI and then SAS Viya. In terms of customizability, PowerBI and SAS Viya are flexible to custom make a new chart provided that user need to know a bit of scripting.

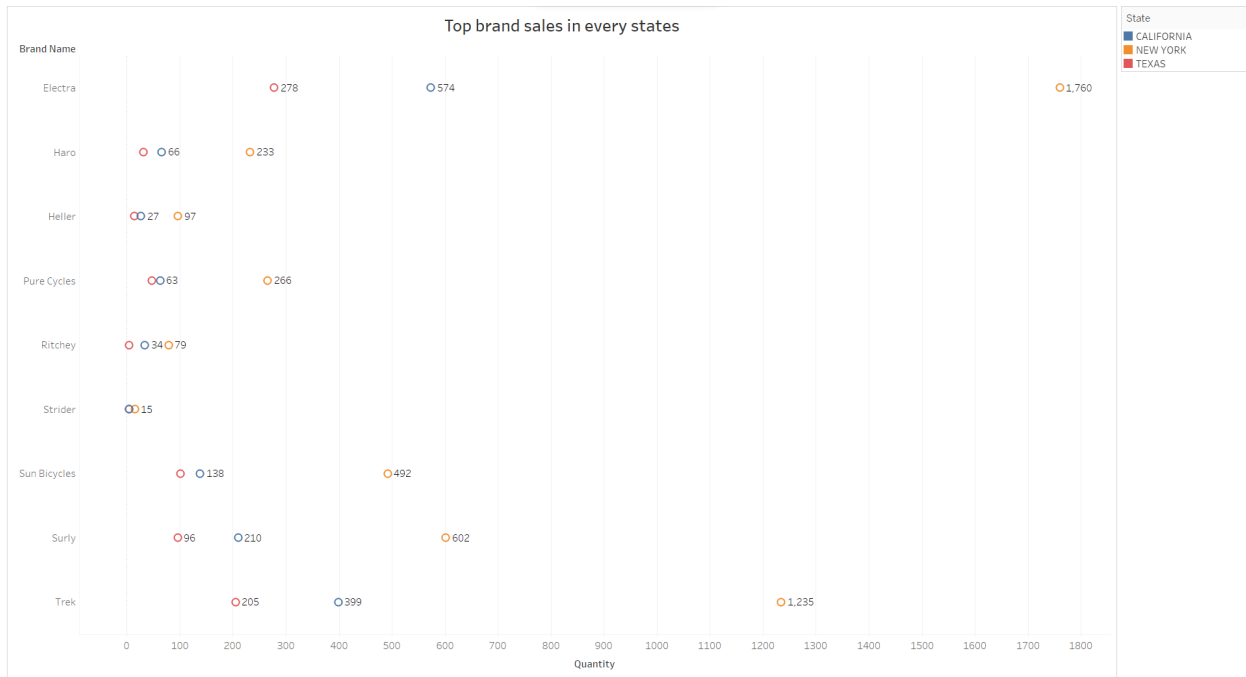## Analysis 4: Location and Sales analysis

<u>Tableau</u>

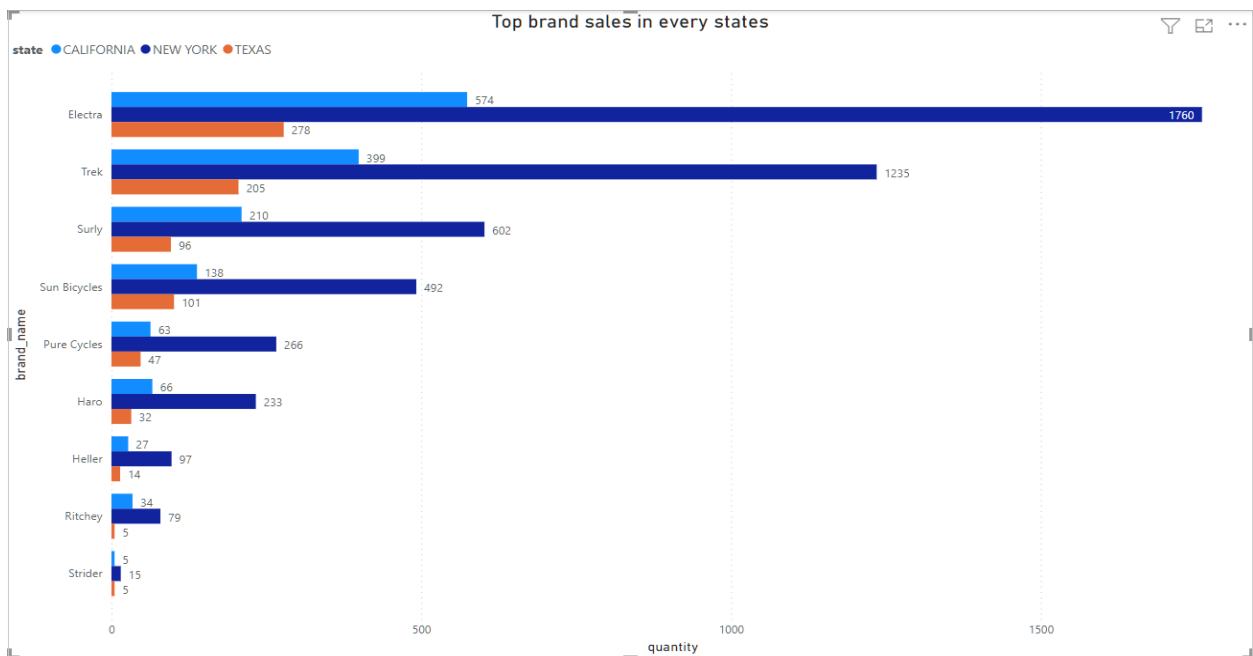Figure 10 : Circle view of top sales of every brand in 3 different states using tableau.

<u>PowerBI</u>

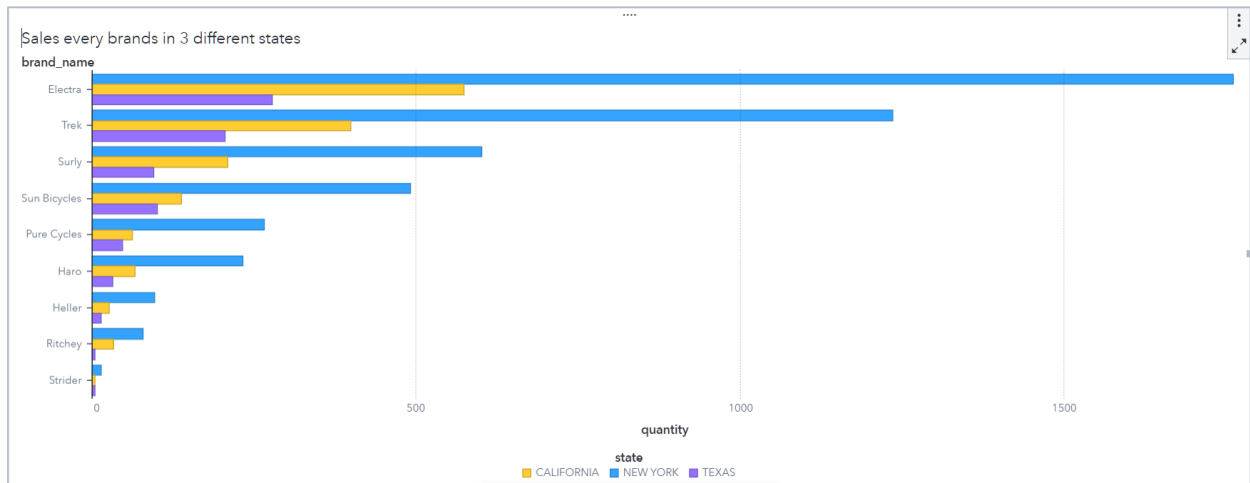Figure 11 : Bar graph of top sales of every brand in 3 different states using power BI.

Figure 12 : Bar graph of top sales of every brand in 3 different states using SAS Viya.

Findings

Based on the figures 10,11 and 12 provided, it appears that the bike brand Electra has had the highest sales in the states of New York, California, and Texas. It's clear from the data that Electra is the top choice for bike enthusiasts in New York, California, and Texas. With a commanding 24.87% of sales in New York alone, it's clear that this brand has a special place in the hearts of consumers. It's no wonder that Electra is able to maintain its dominance in the market, with consumers consistently choosing to ride with this trusted brand. And while Trek may come in a close second, there's no denying that Electra is the true champion in the hearts of bike lovers across these states.

Advantages and Disadvantages

Data visualization and business intelligence tool Tableau has several complex features. Tableau's drag-and-drop interface makes it easier than Power BI and SAS Viya to create and edit visuals without writing code. Tableau's pre-built connections make it easy to connect to and work with diverse types of data.Finally it is easy in Tableau to connect with several tables. For Example in this dataset we need to connect with 9 tables Geographic mapping, scatter plots, heat maps, and more are available in Tableau. It is ideal for data exploration and discovery. Tableau's R and Python interface is another

advantage over competing applications, allowing advanced data manipulation and analysis..Power BI has dynamic visualizations and many data interfaces, but it may not have as many advanced visualization choices as Tableau. SAS Viya is more focused on enterprise-level analytics and governance than Tableau.

Analysis 5: Market trend analysis

Tableau

Sales comparison of brands in year 2016 - 2018
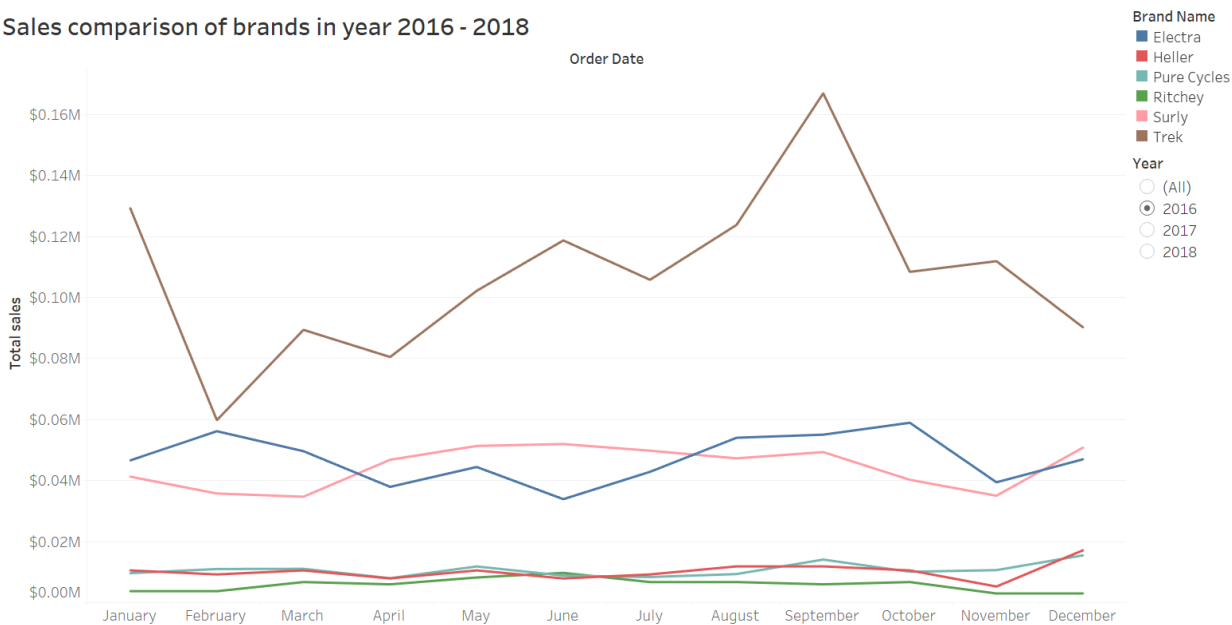
Sales for each brand in 2018 (latest)

Trek $1,249.81K	Surly $121.85K	Sun Bicycles $47.24K	Strider $4.32K	Ritchey $3.11K	Pure Cycles $4.51K	Heller $21.53K	Haro $28.42K	Electra $333.74K

Order count and sales for each brand
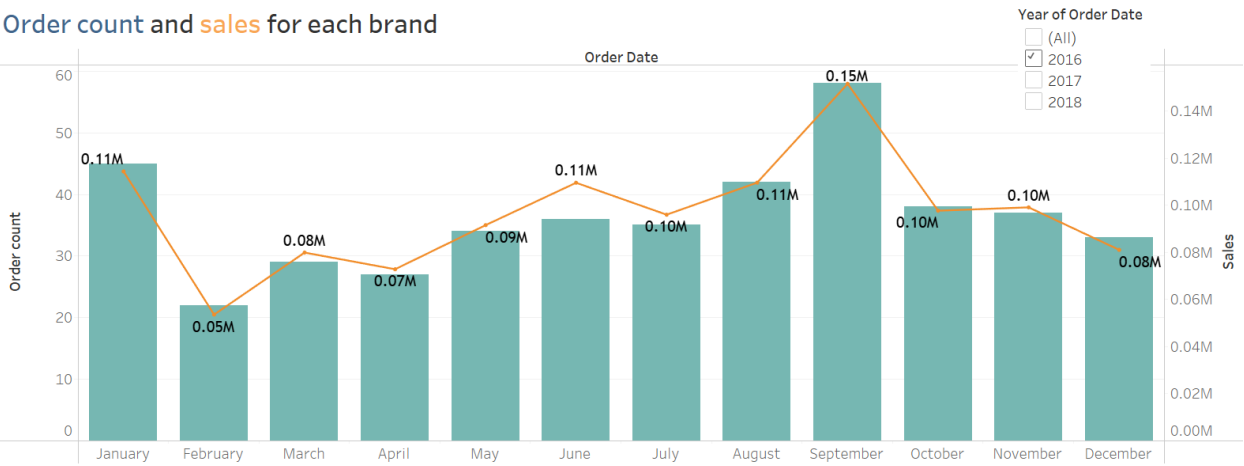
PowerBI

Sum of sales by Month and brand_name
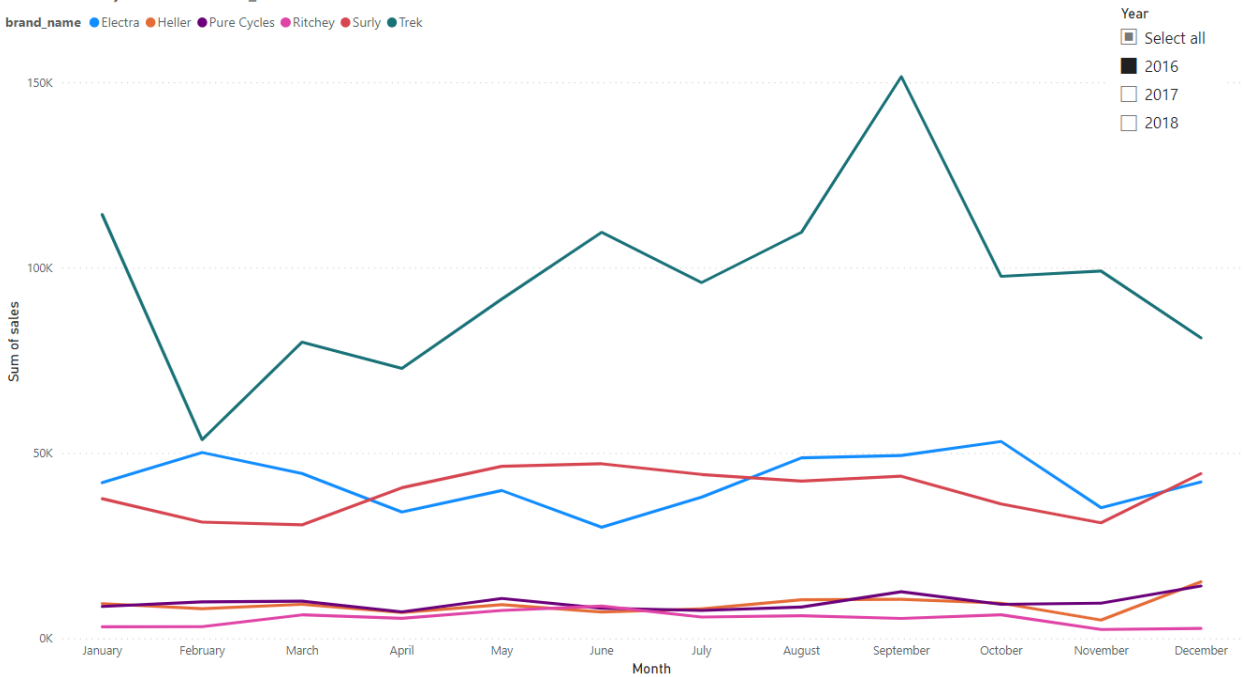
Sum of quantity and Sum of sales by Month

- Sum of quantity
- Sum of sales

Year	
☑	Select all
■	2016
☐	2017
☐	2018

brand_name	
☑	Select all
☐	Electra
☐	Haro
☐	Heller
☐	Pure Cycles
☐	Ritchey
☐	Strider
☐	Sun Bicycles
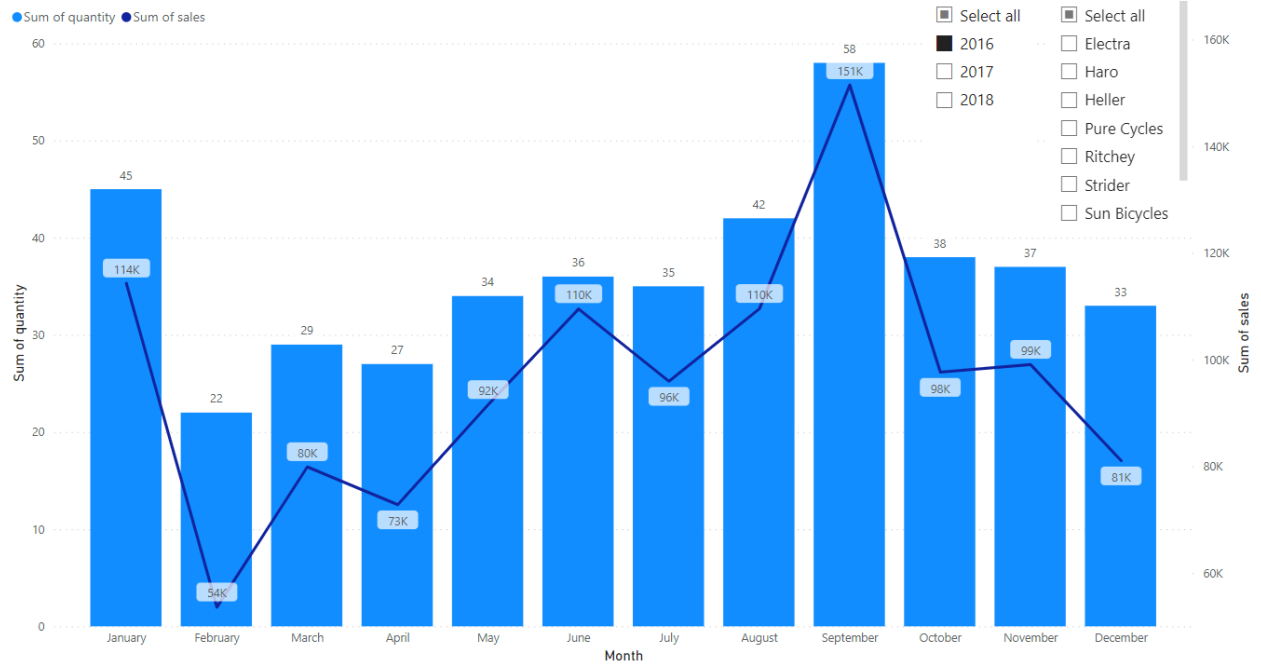
SAS Viya

Brand sales in 2016

brand_name
— Electra — Heller — Pure Cycles — Ritchey — Surly — Trek
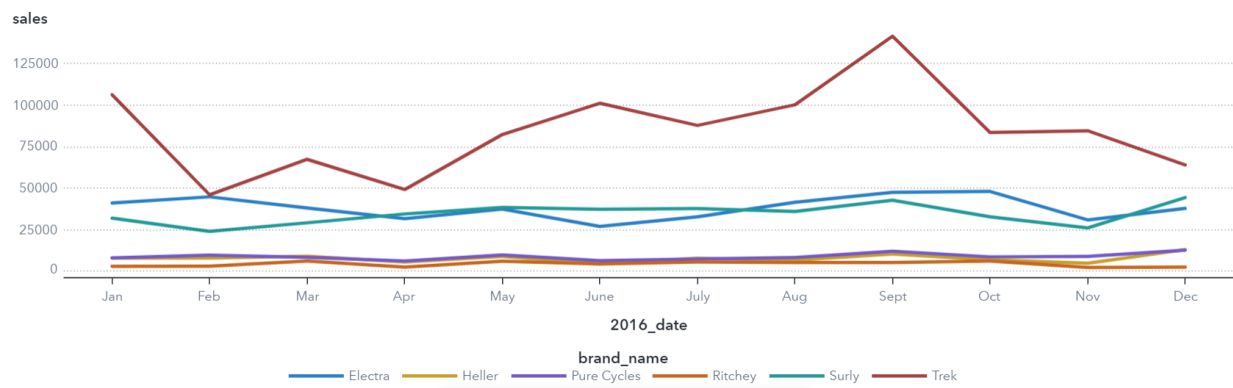
Order count and sales for Trek in 2016
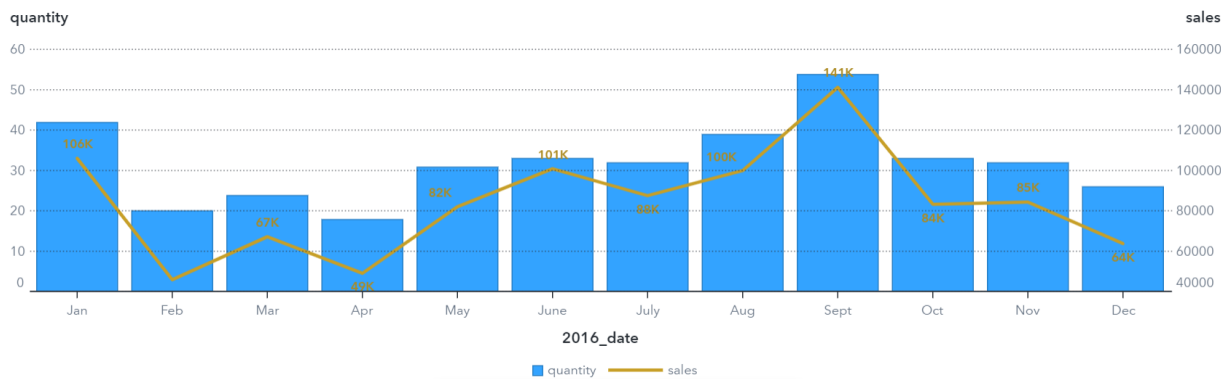
Findings

The analysis shows the sales comparison between brands in 2016. From this visualization, we can see that the Trek brand topped the chart every month and the difference gap is simply obvious compared to other brands. The next most popular brands would be Electra and Surly as they kept going back and forth from second position to third position. In further analysis, Electra brand has the second highest sales in January, February, March, August, September, October and November. Meanwhile, Surly brand occupied the second position in the remaining months. The least popular brand would be Ritchey brand as it has the least sales in every month except June.

As we have analyzed that Trek brand has the highest demand compared to others, Figure shows the number of orders and sales for Trek brand in 2016. The Trek band had the highest demand in September of 58 orders followed by January with 45 orders. Trek received the least orders in February which is 22 followed by April with 27 orders and March with 29 orders.

From these figures, we could discover the market trend in the bicycle industry. For example, Trek has been the most popular brand in 2016. Therefore, the brand itself can focus on how to maintain its high demands while the other brands will be more focusing on how to improve their brands in terms of productivity or marketing.

Advantages and Disadvantages

Tableau is more user-friendly compared to PowerBI and SAS Viya. It is easier to manipulate the data and the charts in tableau. For Power BI, it is much more functional with various types of graphs along with the data that we need to input like y-axis, x-axis, legends,

etc. With this information, they are able to guide us to perform the visualization. For SAS Viya, it can perform data visualization for us like it has analyzed the data and built several possible graphs. From these graphs, we can see how we can visualize our data or how we can improve the graph itself to make it more informative. This function is really helpful if we do not have any prior ideas to perform visualizations.

4. Proposed Solutions

<u>Recommendation 1</u>

From the analysis, companies need to focus on profitable products. Logically, when the company has low profit margins, they will need to sell large volumes of products to generate revenue and profits. Look for products that have a decent profit margin where from the analysis, we could see that some categories of bikes are high in demand where most likely preferred by the customers recently, so they can afford expenses like returns and review samples.

<u>Recommendation 2</u>

Companies for brands that are not the choices of customers must think of ways to attract customers so that the companies can earn profits. Based on the analysis, these companies can learn how their competitors promote their brands to the customers. Therefore, these companies can learn and implement the tactics of their products to attract more customers to buy their products.

Next, companies for brands that are the choices of customers need to maintain their performance so that customers keep buying their products in the future. McKinsey & Company research found that 13 percent of customers that did the survey stated that they were loyal to a single brand, another 87 percent of customers said they shopped around, and another 58 percent had switched to a new brand (Lundin, 2018). Hence, this shows that without continuous good performance in terms of quality of product or customer service can lead to losing customers

Lastly, bike stores owners can minimize the stocks of products that do not get many orders and increase the product stocks that get more orders. It can prevent the bike stores from getting overstocked or out-of-stock. Stockout or out-of-stock is the unavailability of products when customers want to purchase them (Keenan, 2021). Overstock is when the stores have more products than customers buy (Jenkins, 2020). Stockout problems cause bad reviews for the brands and make customers find another bike store. Overstock can lead to poor inventory management because other products cannot come to the stores since there is no more space in inventory.

Recommendation 3

      Focused marketing in the first quarter of the year. From the Sales and Number of Orders by Months chart, the first quarter brings in the most sales. Hence, bike stores managers should capitalize on this and make more effort and active marketing to generate more orders. Marketing such as event sales, offer sales or media advertisement.

      And next is research leading competitors how they manage making high numbers of sales. From the Stores Number of Orders by Year chart, Baldwin Bikes have the best sales performance by far leaving Santa Cruz and Rowlett with less orders. Hence, it is advisable for owners and managers of Santa Cruz and Rowlett Bikes to research and look into Baldwin Bikes and reflect on their own stores on what they are doing differently. From there, strategize appropriate plan and marketing to match their stores' business values.

Recommendation 4

From the analysis, the other bike brands can increase their sales in every region by improving their marketing. Soft selling can be used to help brands market their products by hosting events and rides. Organizing events and group rides that showcase different bike brands can help people experience the bikes firsthand and learn more about their features and benefits. Director of marketing at Electra, Fowley, said the difference their brand can make to other customers is their marketing strategy for bike components, which all companies can get from the same supplier (Vosper, 2012). On the other hand, all brands can sponsor local bike races or teams. Sponsoring local bike races or teams can help increase the visibility of different bike brands in the region. They can supply their bicycles or bicycle components, so this helps the brand gain trust from the customer.

<u>Recommendation 5</u>

From the analysis, the companies can either maintain their brands' popularity or to develop their products to cater to their customers' needs. If there are changes made, then they can make an analysis in the next year to see if the changes had any positive impact on their revenues or sales. Besides, from this analysis, the companies are able to discover their customers' preference and the corresponding stores can focus on promoting the preferred brand or focus on how to make the least preferred brand to be more attractive to their customers. Lastly, the sales may not only be affected by the quality of product but the marketing of the products. When it comes to sales, the marketing strategy also plays a significant role in winning more customers.

5. Conclusion

To summarize, we found that:
- Cruiser bikes had a high demand compared to other types or categories of bicycles.
- The Trek brand topped the chart every month and the difference gap is simply obvious compared to other brands in 2016.
- Electra, Trek, and Surly are the most preferred brands by the customers overall.
- Bike brand Electra has had the highest sales in the states of New York, California, and Texas.
- First quarter of the year shows a high number of orders and sales for bicycles in all stores.
- Baldwin Bikes stores is the most popular store to buy bicycles followed by Santa Cruz Bikes and then Rowlett Bikes.

And in terms of visualization tools, we preferred Tableau compared to PowerBI and SAS Viya due to the reasons that Tableau is the most beginner friendly with intuitive drag and drop features making it easier for users to quickly create sophisticated visualizations without needing extensive technical knowledge. Tableau's data blending capabilities are more robust, allowing users to easily combine and analyze data from multiple sources. Last but not least, Tableau provides more advanced color customization options and more aesthetic formatting options, allowing for more polished and professional-looking visualizations. It allows users to easily apply color to data points based on specific field values or to create custom color rules. Tableau's color options are more advanced, with more color schemes, more customization options, and better support for colorblind accessibility.

6. References

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