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ASSIGNMENT 1

MCSD1013 – 01

BUSINESS INTELLIGENCE AND ANALYTICS

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Title: Assignment 1 (Dashboard improvement)

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1.0 Executive Summary

1.1 Introduction

In today's fast-paced and data-driven business environment, it is essential for companies to have access to accurate and up-to-date information about their operations. One effective way to do this is by creating dashboards that allow managers to quickly and easily visualize key performance indicators and trends. In this project, we will be creating dashboards for product sales, sales analysis, and customer segmentation to help our company better understand its performance and identify opportunities for improvement.

Having these dashboards will provide a number of benefits for our company. For example, the product sales dashboard will allow us to see which products are performing well and which ones may need more attention. The sales analysis dashboard will give us insights into overall sales trends and help us identify opportunities for growth. And the customer segmentation dashboard will help us better understand the needs and preferences of our different customer segments, which will allow us to tailor our marketing and sales efforts to their specific needs.

2.0 Dashboard

2.1 Customer segmentation dashboard

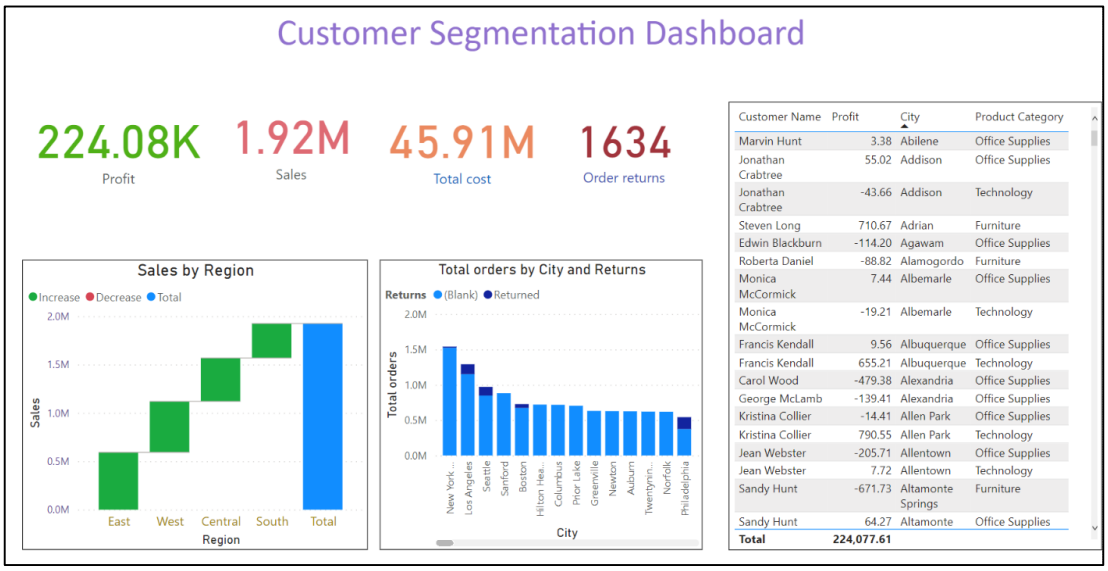

Figure 1 Customer Segmentation Dashboard

A customer segmentation dashboard is a visualization tool that is used to display key metrics and data related to customer segments. Customer segmentation is the process of dividing a customer base into smaller groups based on common characteristics, such as demographics, purchasing habits, or geographic location. The main function of a customer segmentation dashboard is to provide a comprehensive view of the customer base, broken down by customer segment. This can help businesses to understand the specific needs and preferences of different customer segments, and to tailor their marketing, sales, and customer service efforts accordingly. A customer segmentation dashboard can be used to track and analyze customer data over time, identify trends or patterns in customer behavior, and identify areas for improvement in the customer experience. It can also be used to track the performance of different customer segments or to identify opportunities for upselling or cross-selling to existing customers.

2.2 Sales analysis dashboard

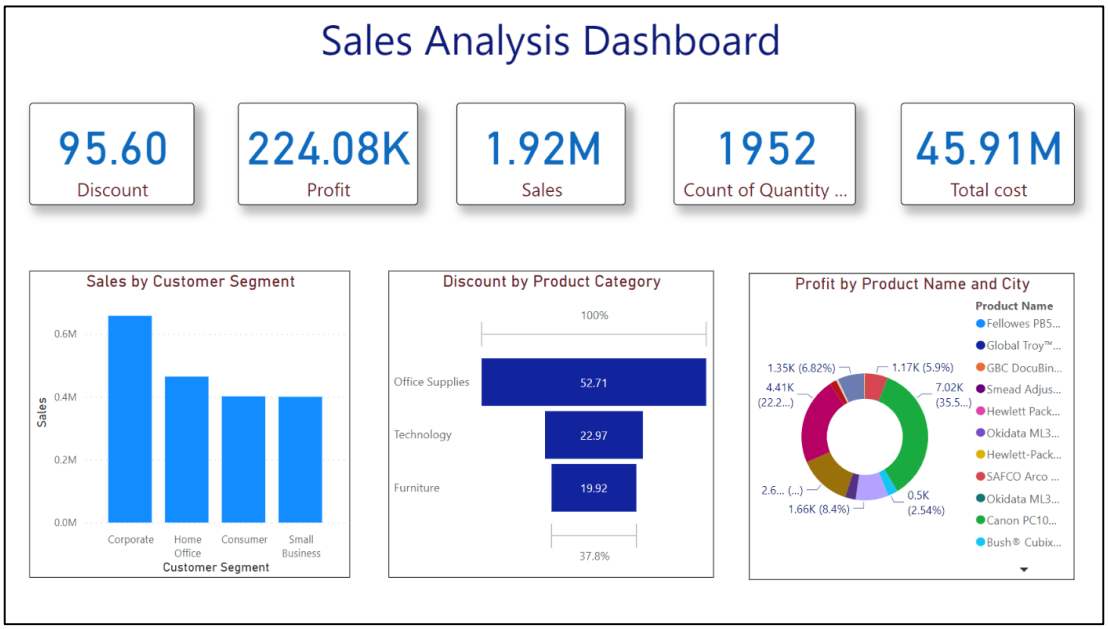

Figure 2 Sales analysis dashboard

The function of a sales analysis dashboard is to provide a comprehensive overview of the performance of a company's sales activities. It typically includes metrics such as sales revenue, sales volume, average transaction value, and conversion rate, as well as key drivers of sales such as product or customer segments. A sales analysis dashboard can help companies understand how their sales are performing, identify trends and patterns, and make informed decisions about how to optimize their sales efforts. In this dashboard, the value of discount, sales, profit, order quantity and total cost are placed at the top of the dashboard as a card which generally used as an overview for specific value and parameter. At the bottom, we can observe sales, by different customer segment, discount by product category and profit by product name and city.

2.3 Product sales dashboard

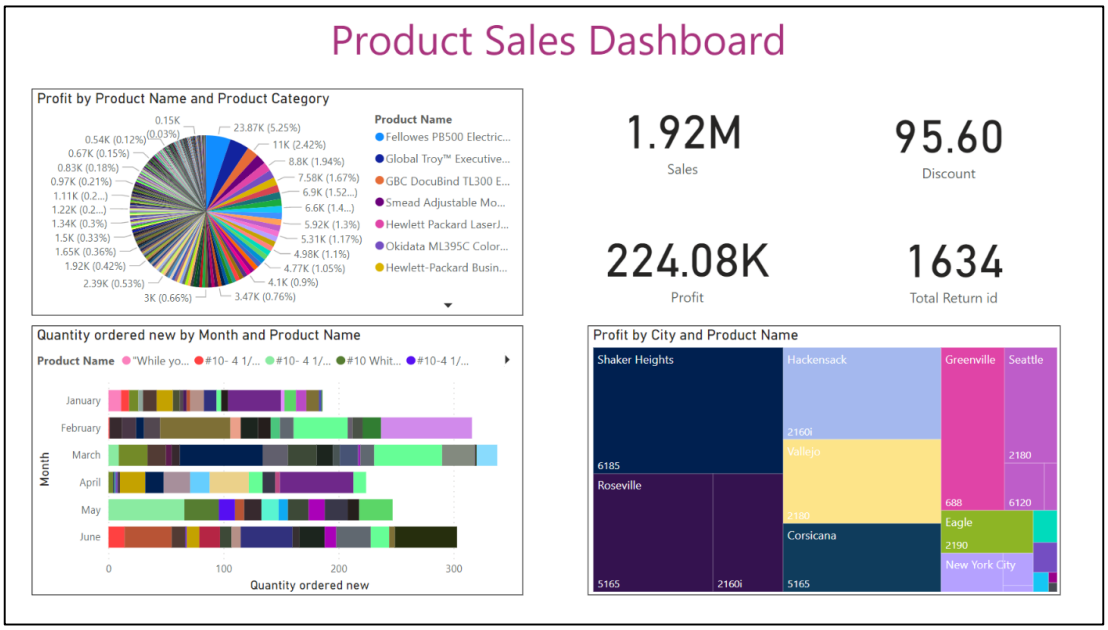

Figure 3 Product Sales Dashboard

A product sales dashboard is used to reflect product sales and profitability for the past period. Displaying information, such as trends and key indicators, enables managers to understand real product sales information to guide decision-making and achieve the purpose of data-driven decision-making. Sales and profit totals in this dashboard provide an overall view to give viewers a general perception of sales. The pie chart of profit by product name and product category shows the profit share of each product. Based on the profit pie chart, management can understand which products are the most profitable and which are barely profitable and thus adjust the product mix. Similarly, the treemap of profit by city and product name shows profits by city and product dimension, allowing us to understand the sales and profits of various products between different cities. Aggregating by region gives management insight into product preferences across cities, how sales strategies are being executed across cities and a host of other issues. At last, the stacked bar chart of quantity ordered new by month and product name represents the order volume of each product summarized by month. This chart reflects the order trend from January to June and can be broken down for each product. In summary, the product sales dashboard reflects the basic situation of product sales and provides the data basis for sales decisions, i.e. data-driven decisions

3.0 Issue

3.1 Wrong Chart Implementation

Using the correct type of chart is important because it helps to clearly and effectively communicate the data and insights being presented. Using the wrong type of chart can lead to confusion or misinterpretation of the data, which can lead to incorrect decisions or actions being taken. It is important to choose the appropriate chart type based on the nature of the data and the message being conveyed, in order to effectively communicate the information to the viewer.

In customer segmentation dashboard for instance, waterfall chart as shown in Figure 4. Is used to show how an initial value is affected by a series of intermediate positive or negative values, resulting in a final value. This type of chart is often used to show the breakdown of a whole into its component parts, or to show the contributions of different factors to an overall change. In the context of a customer segmentation dashboard, a waterfall chart would not be an appropriate visualization because the focus of the dashboard is on understanding and analyzing the characteristics and performance of different customer segments, rather than on showing the breakdown of a whole into its component parts or the contributions of different factors to an overall change. A more suitable chart type for this purpose might be a bar chart or a pie chart, depending on the specific data and insights being presented.

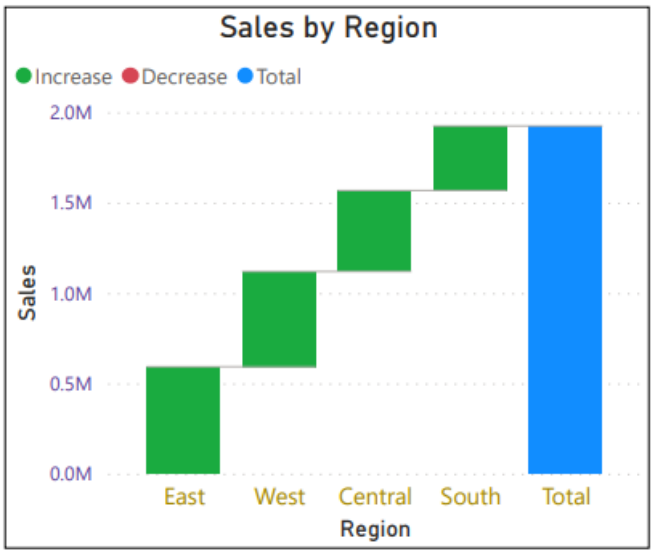

Figure 4 Waterfall chart from customer segmentation dashboard

This case also happened in product sales dashboard, using a Treemap for a product sales dashboard may not be the most effective visualization choice. While Treemaps can effectively represent the relative sizes of different categories, they can be difficult to compare and may not accurately display smaller categories. Figure 5. illustrate Treemap from product sales dashboard. It may be more effective to use a different visualization method, such as a bar chart or pie chart, to effectively communicate the sales data for each product.

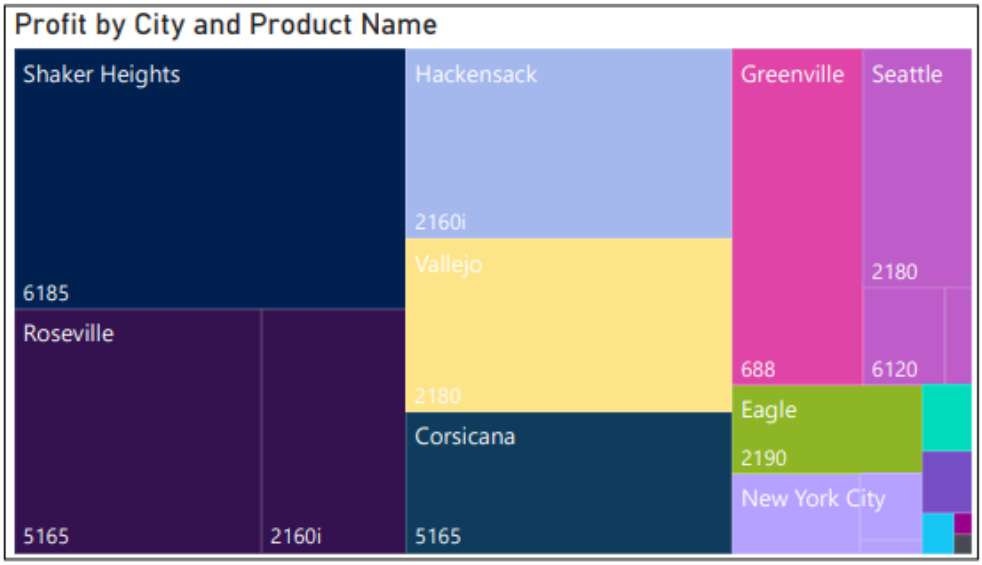

Figure 5 Treemap from product sales dashboard

3.2 Lack of cue

3.3 Unnecessary volume of data

Too much data is displayed in charts. Showing too much data is a problem that many producers often face. This problem is because the producer does not understand the problem from the user's point of view but tries to show as much information as possible on the dashboard. This manner will cause viewers to get lost instead of giving them more helpful information. Take the pie chart in product sales dashboard as an example which is shown in Figure 6 below, it shows so many categories that it is impossible to see how many categories there are and the percentage of each category. The same is true for the other two charts in this dashboard

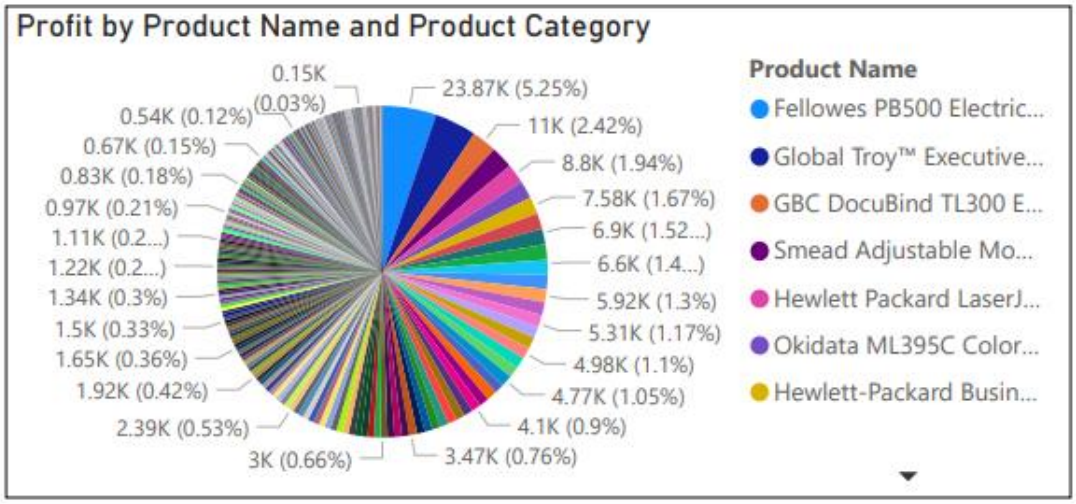

Figure 6 Pie chart from product sales dashboard

3.4 indistinguishable colour scheme

The use of color scheme in a dashboard is important because it helps the user to quickly and easily understand the data being presented. By using a consistent color scheme throughout the dashboard, the user is able to easily identify different data points and trends. Additionally, using contrasting colors can help to highlight important data points and draw the user's attention to specific areas of the dashboard.

It is also important to use colors that are easy on the eyes and do not strain the user's vision, as this can make it difficult for the user to effectively interpret the data.

As can be seen from the product sales dashboard, as demonstrated in Figure 7. The stacked bar chart and treemap use colour to distinguish different products. However, it can be seen that some of the products adjacent to each other in the figure use colours that are similar. Such a colour scheme makes it impossible to understand data well in charts and even causes visual errors.

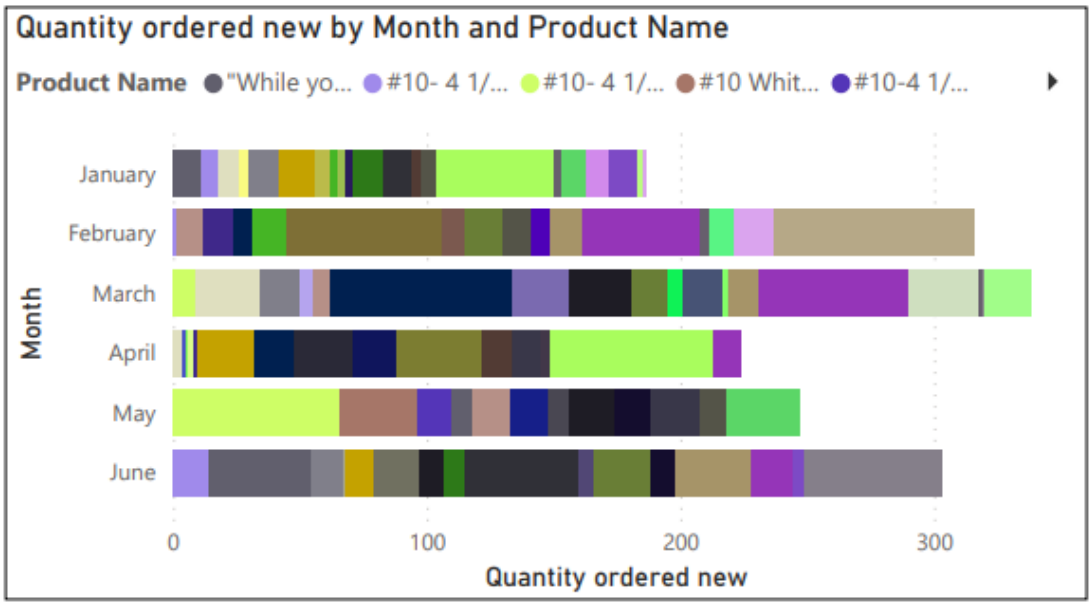

Figure 7 Stacked bar chart from product sales dashboard

3.5 Emphasis on title

The title not only serves as an emphasis but also explains the purpose of the chart. Therefore, the title should be eye-catching and semantically clear. Obviously, titles in all dashboard are not highlighted enough, and the headings are even unnoticeable in the summary data area.

3.6 Visualization Hierarchy

Visualization hierarchy helps the viewer understand the data more effectively by guiding their eyes to the most important information first. It allows the viewer to quickly grasp the main points being made by the data and then delve deeper if necessary. The aggregated data area has no visual focus, resulting in the viewer not catching the point the producer is trying to make at first glance. A visualization without hierarchy will easily make the viewer get lost in a sea of data. The author can guide the viewer's eyes through the visual hierarchy for the purpose of narration, making it easier for the viewer to understand what the data is saying.

This issue can be seen in all of the dashboard, for example in customer segmentation dashboard, looking at the chart, we can say the waterfall chart is to relatively compare the sales among the region. The next one is to compare the total the total order by city. Last one is table showing profit, city and product category of specific customer. All this item seems to lead to nowhere near customer segmentation. We can compare sales of different region, order of different city and profit of specific customer, but this has no relation to customer segmentation.

3.7 Return Order

In Customer Segmentation dashboard, the returned orders cannot be connected to main orders. We found that the number of returned orders was not associated with the main order, which comes from a separate table. In other words, this data does not reflect the actual return order situation. It does not change with the main order screening changes. Another issue with return order table is that the order id in the return table seems to have no connection with the order table. It is found that only 15 orders out of 1962 orders are intersected in both tables. While return parameter is important and although the frequency of return is very insignificant which is 0.8% we found that there's a relationship between the returns table and orders table and thus, we created a new column with the Related function and this function will return the related value in returns table to our main orders table.

3.8 Negative space

Excessive negative space. As can be seen from the original product sales dashboard, the summary data in the upper right corner is displayed within four rectangles. However, the white space between rectangles is much larger than the negative spaces between other charts, which makes people feel unbalanced in the overall design. This can also be seen in other dashboard.

4.0 Improvement

As for goal of enhancing how the current dashboards are presented. We will use the Microsoft Power Bi Application to develop a new customer segmentation dashboard, sales analysis dashboard and product analysis dashboard.

4.1 Customer segmentation Dashboard

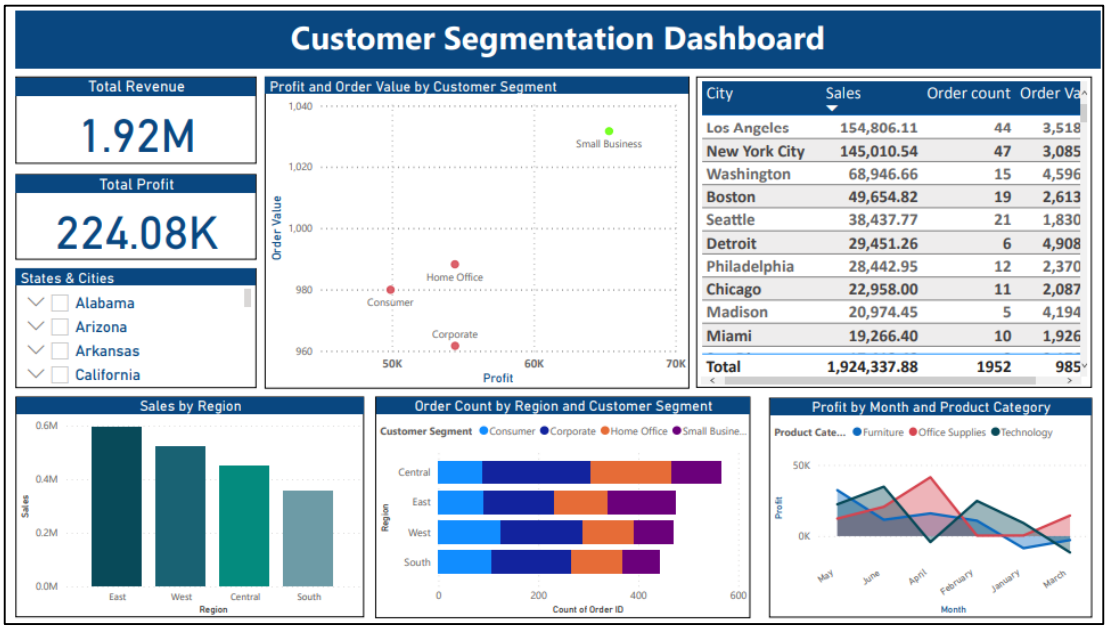

Figure 8 Revised customer segmentation dashboard

Looking back to the objective of customer segmentation dashboard, we need to ensure that we are able to achieve this objective within the dashboard. To do that, we have to ensure we are able to answer general question such as the performance of customer segment or the current value of the customer segment. Having this question answered, we can understand specific customer segment and prepare an optimized marketing or sales tactic. By looking at Figure 8. It shows the new customer segmentation dashboard.

4.1.1 Cards

Cards are the most crucial element that show and track numbers, we put down the cards for overall statistic on the most left upper part of the dashboard. The cards consist of total sales, total profit which function to provide quick number for specific parameter. These number is adjustable based on filter selected which provide flexibility. One of the example to show flexibility in the dashboard is usage of slicer for states and cities just below the card item. The slicer provides the ability to filter the data based on slicer's parameter which will take effect on whole dashboard.

4.1.2 Scatter Chart

The scatter plot with profit and order value by customer segment is a useful visual tool for analyzing the performance of our different customer segments. By examining the data on this chart, we can identify which customer segments tend to have higher profits and higher order values, and which segments may be less profitable. This information can help us make informed decisions about how to best target our marketing efforts and improve our business operations. Additionally, the scatter plot allows us to identify any potential correlations or trends between profit and order value, which can be useful for identifying opportunities for growth and optimization.

4.1.3 Table

The table in this dashboard displays data on city, sales, order count, and order value. The city column provides information on the geographic location of the data points, while the sales, order count, and order value columns provide data on key performance metrics. The main function of this table is to provide a clear and concise view of the data, allowing users to easily compare and analyze different data points across cities. The table can be used to highlight trends or patterns in the data, and can be paired with other visualization techniques such as charts or graphs to provide additional context and insights. By analyzing the data in this table, users can gain a deeper understanding of the performance and characteristics of different cities, and can make informed decisions about how to optimize sales and operations in those locations.

4.1.4 Area Chart

The main function of this area chart is to provide insights into the overall profitability of the business and to identify trends or patterns in the data over time. By showing the movement of profit over time, this chart allows users to see how the profit has changed and to identify opportunities for improving sales and operations. This chart may also be useful for comparing data points over time and for providing a visual representation of the trends and patterns in the data. In this chart, we used the legend to specify the product categories, red colour for office supplies as office supplies gives the most profit out of three categories. The red colour make the category stands out for presentation.

4.1.5 Stacked bar chart

The "Performance of Customer Segment" chart is a stacked bar chart that shows the profit of different customer segments and their order counts by region. The y-axis of the chart represents the customer segment’s region, while the x-axis

represents the customer segment's order counts. And the legends demonstrate the four customer segments. Each bar in the chart represents the total order counts for a specific customer segment, and in different regions. At the same time, the card represents the profit contributions from different customer segments. This chart allows users to see the overall performance of each customer segment, as well as the specific region that are driving that performance. This chart enables us to relatively compare the size and performance of different customer segment. The main function of this chart is to provide insights into the profitability of different customer segments and to identify opportunities for optimizing sales and operations in those segments.

4.1.6 Stacked Column Chart

The stacked column chart with sales as the y-axis and region as the x-axis is a useful visual tool for understanding the sales performance of our business in different regions. By examining the data on this chart, we can identify which regions tend to have higher or lower sales, and we can identify any trends or patterns in the data. This information can help us make informed decisions about how to best allocate our resources and target our marketing efforts in each region. Additionally, the column chart allows us to easily compare the sales performance of different regions and identify any disparities or inequalities in our business.

4.1.7 Slicer

The slicer by State and City, is a useful visual element had to be in our customer segmentation dashboard, it acts as a canvas visual filter where it enables a user to sort and filter with a city of interest. To see the customer performance or analysis in specific province.

4.2 Sales analysis dashboard

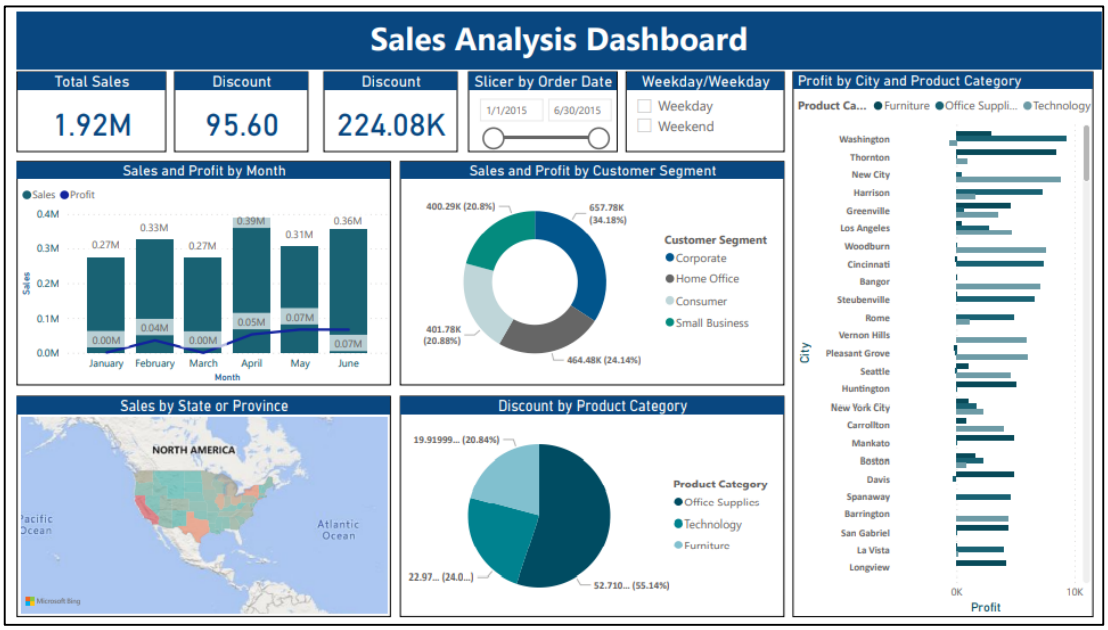

Figure 9 Revised Sales analysis dashboard

Referring to the newly created design shown in Figure9, it represents sales analysis dashboard. A variety of information is available through the new interface, including analyses of sales, profit, quantity, category only to achieve a complete sales analysis throughout the period.

Additionally, information on the company's products, customer types, and location and region are all provided. The sales analytics dashboard presents sales analytics insights based on several client segments, including corporate, small business, home office, and consumer customers. This dashboard also displays the discount percentages that are currently being provided depending on the product categories like furniture, office supplies, and technology. The latter displays the amount of goods sold and the yield at each location inside the active area. Not to mention, we use a visual slicer display to help decision makers more readily and efficiently analyses analysis data by order month and date. We employed as many as seven different types of items that will help in improving our dashboard.

4.2.1 Card

We created three different cars that seek to show a number, such as the amount of sales, profit and discounts given. A Power BI card is a sort of visualization that is excellent for displaying such figures. Type of visual cards is used in card visualization, a participative technique for gathering data that enables groups to exchange and brainstorm ideas.

4.2.2 Slicer

When we want to observe the dashboard's overall visual display, the slicer is a good option. For quicker access, place frequently used or significant filters on the report canvas. Make it simpler to view the current condition of the filters without opening another list. Use the data table's hidden and unused columns as filters. To provide more thorough date filtering in this modification, we used two types of portable slicers. The first one is by order date in days within the given period in the dataset between 1/1/2015 to 30/6/2015, The second one is by Weekend and Weekday, we came to this after creating two columns, one for Day of Week for each order date by using the WEEKDAY function built in Power BI, and the second column is Weekday/Weekend by using the IF Condition function. We should utilize the slicer tool since our goal is to have a stronger impact on the selective filtering of the data in the visualization during the period.

4.2.3 Clustered bar chart

Next, we employ a clustered bar chart, which shows values or measurements with bars that are proportional to the data. Product category data are shown in this clustered bar chart broken down by city. Bar charts with clusters are useful for graphically illustrating (visualizing) our data. In addition to statistical indications, it is utilized. Multiple data series are shown in clustered horizontal columns in clustered bar charts. The horizontal bars are organized by city because each data series has the

same axis name. Multiple series are directly compared within a particular category using clustered bars. The beginning of the chart is Washington have the high profit by city and product category.

4.2.4 Line and stacked column chart

A combo chart that combines a Line chart and a Column chart in one image is called a stacked Line and Column chart. We can quickly compare two sets of metrics, namely total sales and total profit by month, using this visual. This sort of chart's key advantage is that it can have one or two Y-axes.

A dual axis chart that combines a column and line chart is what is known as a column and line chart. When comparing values that have multiple units of measurement, dual axis charts can be helpful. The sales result information is observed to be higher than the month of March, just as the chart on this dashboard shows that the increase in profit started to increase in the month of April and has since continued to rise.

4.2.5 Donut chart

In that it depicts how the parts relate to the whole, a donut chart is comparable to a pie chart. The middle is now empty and can include a label or icon, which is the only distinction.

Nonetheless, more than one data series may be present in a doughnut chart. A ring is added to a donut chart for each data series you plot. The Centre of the graphic shows the first series of data. We show information about sales and profitability based on customers in our donut chart display. Starting with 34.18 percent of corporate clients, moving on to 24.14 percent of home office customers, 20.8 percent of consumer customers, and 20.8 percent of small business customers.

4.2.6 Filled Map

Next, a filled map-type visual is used. Rather than displaying data points as points on a map, a filled map displays data points as geospatial areas. Continents, countries, regions, states, cities, and counties are all examples of regions. However, using filled maps is not as easy and uncomplicated as using map charts.

Filled maps are used to examine data variations or patterns across the locations that are shown. We represent a geographic area as sales information using a populated map. It is divided based on the shaded or colored decision.

4.2.7 Pie Chart

The pie chart type is the last but certainly not least of the charts in our sales analysis dashboard. All versions of Power BI provide built-in chart visualizations called pie charts. Depending on the value of each data label, each set of categorical data is displayed in a pie form in a circular pie chart.

Pie charts can be used to indicate percentages at specific moments in time as well as to display general percentages. Pie charts do not depict changes over time, in contrast to bar graphs and line graphs. a display of information regarding discounts based on product categories, for instance. As much as 55.14% of the second office supply category is visible, followed by 24.02% of the technology category and 20.84% of the kind of furniture product category.

4.3 Product Sales Dashboard

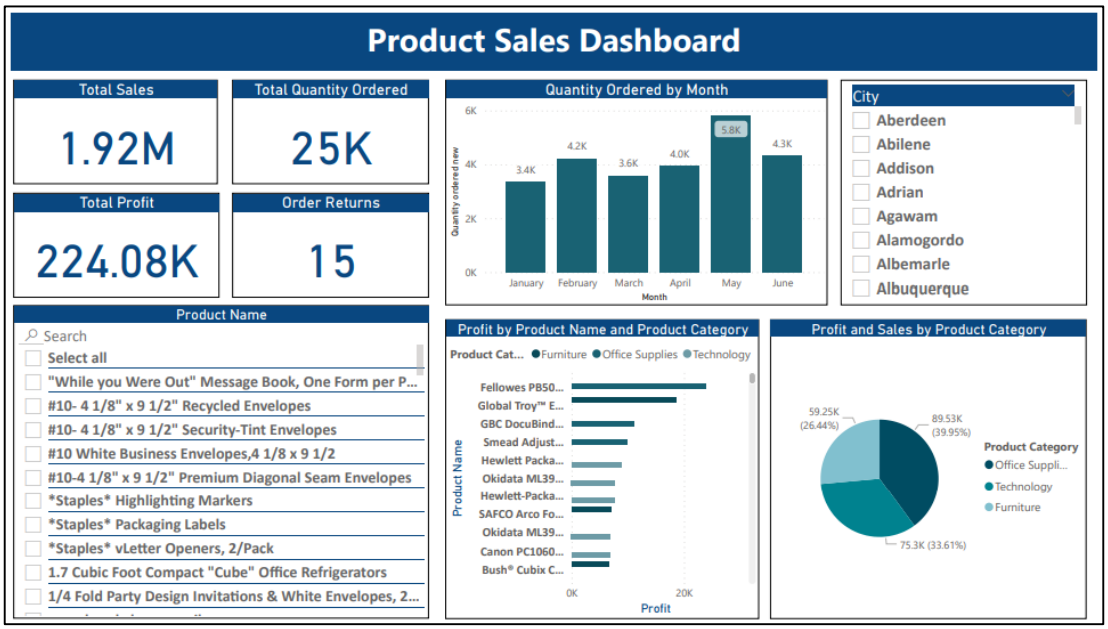

Figure 10 Revised product sales dashboard

First, we adjusted the spacing between components in the new dashboard. As we can see from the summary data area in Figure 10, all components are bordered, and the negative space is unified, making the overall layout more aesthetically pleasing without being crowded or sparse.

4.3.1 Cards

For product sales dashboard, at the top left we created four different cards associated with products performance and statistical records they have achieved. Sales and Profit were essential in order to describe the performance of the products. As well as total quantity ordered and returned orders to describe the products. We found that only 15 return orders could be connected to the main order table, accounting for 0.8% of the total orders.

4.3.2 Slicers

We added two slicers to solve the problem of displaying too much data in one chart. The City Slicer and Product Slicer allow users to filter by cities and products of interest, thereby reducing the amount of data displayed in the chart simultaneously and allowing for a more focused chart representation. Fixed the pie chart to show the profit share by product category to avoid interference.

4.3.3 Line and Stacked Column Chart

Line and stacked column chart can show the number of quantity ordered of the products name by months from January to June. By looking at this visualization, it's very easy to notice the interesting products by the customers and see the trending period of the products.

4.3.4 Clustered Bar Chart

Next, we replaced the Treemap with a Bar Chart in the new dashboard because it is easier to make comparison. Treemap tastes confusing because it is difficult to extract useful information from it. The Bar Chart which shows profits with bars of product names and their categories. The horizontal bars are organized by product names as shown in this clustered bar chart listed as a descending manner by the profit, and broken down by product categories with different colors described as a legend. In addition to statistical indications, the quantities ordered and the remaining cards show more specific information about these products separately

4.3.5 Pie chart

Lastly, we used a pie chart to shows the sales and profits of different product categories type, with the legend as product category and the profit as values, while we added the sales data as a tooltip.

In response to the visual hierarchy, the style of summary data area has been changed to highlight the importance so that the viewer's attention will fall on this area during the initial viewing. Guides viewers to explore the dashboard in order from overall to partial.

The overall layout of the dashboard has been adjusted, resulting in a more aesthetically pleasing instrument panel and a more balanced placement of components. People have a special obsession with symmetry, and asymmetry most of the time means unattractive. We Filled the background colour for the title area to make the title stand out and changed the colour of the title text to a more eye-catching white. Viewers' attention is first drawn to the title when viewing the chart so that they are informed of the intended theme of the chart before viewing the data.

Changed the colour scheme. Using more contrasting colours in the new colour scheme makes it easier for viewers to distinguish between different data areas.

5.0 Dashboard output

In this topic, we will delve into the insights that can be gleaned from our dashboard, using a method of storytelling to present the data. The dashboard we have created serves as a powerful tool for understanding the performance of our business, and through the use of visualization and analysis, we can make informed decisions on how to move forward. By carefully examining the data presented in the dashboard, we can gain a deeper understanding of our customers, our products, and our overall operations.

5.1 Customer segmentation

To present or read this dashboard, we first need to know the objective. The objective of this dashboard is to spot group of customers to tailor marketing effort or sales effort. Usually this is done to make the effort more resource effective. With the objective in mind, scatter plot in the top row shows that the profit and order value by small business is the highest. While consumer, home office and corporate is relatively in a same group in term of value. Let's take note that small business gives more profit and have higher order value.

In perspective of region, the column chart shows that the sales from east region is the highest, followed by west, central and south. Additionally, if we click on small business in the scatter plot above, we can see that the sales from small business in east is the highest. This shows the weight that small business contributes to the majority of sales in east.

The bar chart at the bottom shows the order count by region and product category. If we click on the small business again, we see a very small number of order count. Different case can be observed for corporate order count which we ca see significant number especially in office supplies category. This happen because corporate customer segment's sales per order is lower or we could say, corporate customer segment buys cheap product but in bulk.

Now looking at its time series data, we can see significant drop in profit from technology and rise in profit from office supplies product. The reason is not clear enough as there is no significant event from other parameter. However, there is subtle increase in total cost for technology product and huge decrease in total cost for office supplies. However, technically there is no actual calculation from the table for the profit.

As a conclusion for this dashboard, small business has higher order value. The best course of action we could do is to focus on retaining and if possible, growing this customer group. This can be achieved through targeted marketing efforts, offering

personalized promotions or incentives, and providing excellent customer service. On the other hand, we need to take advantage of high volume of order from corporate even though we do not receive much profit from them, we could utilize their trust to turn them into higher value customer. This can involve upselling or cross-selling products or services, or finding ways to improve their customer experience in order to increase their loyalty to the company.

5.2 Sales analysis

Analyzing how well a firm's products are selling, particularly in comparison to how the company anticipates them to sell a product, is the task of sales analysis. Managers can assess the success of their sales teams using sales analysis. Setting role-specific goals for the successful sale of a product or other item is an example of a typical sales analytics task. For instance, the account management team can be given sales productivity objectives while the sales director is given revenue targets. A document that lists a company's sales operations is referred to as a sales report or a sales analysis report. These reports often contain data for a given time period on sales revenue, earnings, leads, customer accounts, and discounts.

A crucial component of managing a successful firm is sales analysis. We can choose which products to concentrate on, where to sell, and how to effectively reach clients using sales data. To the dashboard above, which shows numerous visual representations that might assist management in making decisions. A graphic that shows the percentage of segments using a donut chart that works well for a total of fewer than ten entities. There is no denying that small business sales are the lowest, but the insight results displayed on the dashboard show that small business is higher benefit the company, as seen from the display of the donut chart. Despite being in the small business customer segment, the amount of profit generated from other customers is the highest. The chart can display office supplies that have very high sales and the type of customer who buys is from the small business customer group, in addition to a display that uses a clustered bar chart and chooses the y-axis as the city and the x-axis

as the profit and the product category as the legend. This information is also relevant to some cities.

The four primary forms of data analysis in data analysis and data science are descriptive, diagnostic, predictive, and prescriptive. Understanding business performance in terms of sales is very important in this sales analysis. It gives information on past, present, and potential business performance and may be used to forecast trends, find development possibilities, and create strategic action plans for the business. As an illustration of a line stack column chart, we've included a y-axis column for sales data, a y-axis line for profit data, and an x-axis for the date. The management may decide to concentrate on a particular product category and/or consumer segment as a result of this understanding to some extent. You can also observe the growth of monthly sales in the graph, including whether it increases or decreases from month to month.

Conclusion a crucial component of managing a successful firm is sales analysis. There are several technologies available for sales analytics that can help small firms develop and expand. We can choose which products to concentrate on, where to sell, and how to effectively reach clients using sales data. We utilize the Power BI application as a tool to develop sales analysis insights, similar to this dashboard. Customized solutions for potential customers are the major objective of sales, along with generating income for the company. Sales analysis helps us find the most profitable consumers by enabling us to better understand customers, the items they enjoy, and why. Once we recognize these clients, we can work to keep them interested in our company, which will tangentially boost revenue.

5.3 Product Sales

This dashboard is in the form of a summary data area to give the viewer a general idea of product sales at first, including total profit and total sales. The audience is then guided to explore by product category, name, and regional dimension. The end result is that users have a complete picture of product sales.

The bar chart of quantity ordered by month shows the number of orders every month from January to July. The x-axis represents the month, and the y-axis is the number of orders. So from this chart, it is possible to compare the differences in volume per month and show the trend of orders by month. Trends are more meaningful to management than quantities.

The profit share of product categories shows that office supplies provide nearly 40% of the profits. Technology and furniture generated 33% and 26% of profits, respectively. This indicates that the profit composition of the product is relatively balanced.

The use of bar charts instead of treemap makes comparison easier. With the use of the slicer, it can achieve the goal of comparing any category and product.