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Data Translation Challenge
Technical Report
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Sales Revenue Analysis

You will need to understand and analyze the data in the AdventureWorks2017DW database. (**This is the data warehouse**, not the database you have used for other efforts).

Key points to remember:

- The sales data is found in two tables that may need to be joined for some analysis and separate for others.
- Internet sales (FactInternetSales) are direct, online sales
- Reseller sales (FactResellerSales) are through reseller network

The data warehouse also contains important information that will be relevant for your analysis, including the following:

- Customer data that provides interesting demographic data
- Product data that can be segregated into categories and subcategories
- Promotion data that may give insights to success of promotions
- Geography data to analyze data by region
- Territory data that can be joined with sales data to look at sales group performance.

Your objectives:

In each of the following objectives you need to provide the minimum in a clear, concise, and professional manner. Feel free to expand on the objectives if you see something interesting in the data, but make sure you are able to explain your reasoning and your findings. The first three are rather prescriptive and you'll need to follow the requests. The last two are open to interpretation, as long as you meet the intent of the objective.

1. Provide a detailed list of Internet sales with the following columns for the financial analyst team to review (Category, Model, CustomerKey, Region, IncomeGroup, CalendarYear, FiscalYear, Month, OrderNumber, Quantity, and Amount). Income group should categorize the people based on "Low" being less than 40,000, "High" being greater than 60,000, and the rest will be "Moderate".
2. Provide a similar analysis for Reseller sales with the following columns (Category, Model, CalendarYear, FiscalYear, Month, OrderNumber, Quantity, Amount).
3. Show the total sales (overall) by year rolled up by the Territory group and country. A special request is that the United Kingdom is no longer part of Europe and management wants to see their totals as a separate Territory group. You cannot modify the data, so you will need to address this request in your query.
4. Provide an analysis of sales performance by Promotion. It would be interesting to see how different types of promotions drive sales (quantity and revenue), especially by product category or region. The comparison between Internet and Reseller sales is probably interesting too. Don't attempt to do everything, but show some good analysis related to Promotion.
5. Our customers are always a big discussion topic with management and the sales team. The Customer table has a wealth of data categories that could be joined with Internet sales and all the extra data that brings along. This request will likely separate the high-performing analysts from the rest.

Technical Tools Used:

- SSMS
- Azure Data Studio
- Docker
- Power BI

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Query no.	01_internet_sales	02_reseller_sales	03_country_sales	04_promotion_analysis	05_customer_analysis
1	Internet Sales (Category, Model, CustomerKey, Region, IncomeGroup, CalendarYear, FiscalYear, Month, OrderNumber, Quantity, and Amount)	Reseller Sales (Category, Model, CalendarYear, FiscalYear, Month, OrderNumber, Quantity, Amount.)	Overall Total Sales by year (Territory group and country) **Request to add UK as its own SalesTerritoryGroup.	Internet promotions.	Customer age group.
2				Reseller Promotions	Customer demographics (Education, MaritalStatus, and Income by Gender).
3				Reseller Sales by Promotion Hierarchy. (Category, Type, Name)	Customer group income level.
4				Internet Sales by Promotion Hierarchy. (Category, Type, Name)	Customer Geographics (AvgIncome, NumOfCustomer, NumOfOrder, and Revenue per customer).
5				Geographic contribution to Reseller Sales under promotions by rank.	Count of CustomerOrders by ProductCategory, ranked by Sales.
6				Geographic contribution to Internet Sales under promotions by rank.	
7				Sales Trend & Forecast by month under promotions from Resellers.	
8				Sales Trend & Forecast by month under promotions from Internet.	

Abstract

In determining what drives Sales Revenue, five different analyses were conducted. Both the Internet and Reseller were considered for promotional sales, as well as no discount sales. While the overall total sales were more focused on countries and regions, much of it was focused on analyzing yearly sales for which country had generated higher internet or resellers sales. Furthermore, promotional offers did not help grow revenue as much as they did for client demographics where customer education and average income have no bearing on the number of purchases placed. This report intends to demonstrate that promotions did not increase sales quantity or revenue more than no discounts did.

Background

Since the Executive board entrusted me with analyzing Sales Revenue from the AdventureWorksDW2017 database; I hypothesized that promotion is a key factor that would drive sales quantity and revenue. For me to draw an accurate conclusion, I have spent the last couple of weeks manipulating data in SQL Server in order to gather evidence on my report. After cleaning the data, I used Power BI to create data visualizations to help me better understand the results and measure the impact on the business so that I could visually communicate the insight to the organization.

Implementation

The first objective, I created a query that list Internet Sales with the following columns; Category, Model, CustomerKey, Region, IncomeGroup, CalendarYear, FiscalYear, Month, OrderNumber, Quantity, and Amount. Then, I used the CASE statement to select one alternative based on the condition from the available options, in this case, where the IncomeGroup are categorized based on “Low” being less than \$40,000 and “High” being greater than \$60,000, and the rest is “Moderate”.

With the second objective, I created a similar query to the first one with the following columns; ProductCategory, ModelName, ResellerKey, SalesRegion, CalendarYear, FiscalYear, SalesMonth, SalesOrderNumber, OrderQuantity, SalesAmount, RevenueGroup and ResellerSize. Similarly, I used the CASE statement again to categorize RevenueGroup from “Low”, “Middle”, “High” and “VeryHigh”. As well as the ResellerSize, from “Small”, “Mid”, “Large” and “VeryLarge”.

As for the third objective, I created a query to analyze the overall sales by year rolled up by the SalesTerritory group and SalesTerritoryCountry including the Yearly Internet Sales and Yearly Reseller Sales. Also, I was not able to modify the data to include United Kingdom as its own SalesTerritoryGroup without permission. However, I did include the following query to be able to update the table and add it.

```

UPDATE dbo.DimSalesTerritory
SET
    SalesTerritoryGroup = 'United Kingdom',
    SalesTerritoryCountry = 'United Kingdom',
    SalesTerritoryRegion = 'United Kingdom'
WHERE SalesTerritoryKey = 10;

```

Initially, I looked at both Reseller and Internet Sales for objective four in which I created several queries to analyze them separately. In the promotion analysis, I created the query Internet Promotions first to show which EnglishPromotionCategory generated the most PromotionSalesRevenue including EnglishPromotionName and EnglishPromotionType. While the second query was created for Reseller Promotions to analyze the same strategy as the Internet Sales Promotion. Another query was created for Reseller Sales by Promotion Hierarchy and Internet Sales by Promotion Hierarchy to analyze if the promotion sales for both Internet and Resellers made an impact to drive sales quantity and revenue compared to having no discounted sales. Then another query was made on Geographic contribution to Reseller and Internet Sales under Promotions to analyze which country generated the most sales with the promotion. Finally, the last query was made to analyze an overview of the sales trend by month under promotion for both Internet and Resellers.

For the last objective, I created a query based on customer demographics such as age, gender, education, geographics, household income and income level. The first query was made to analyze customer age group where I used a CASE statement to categorize AgeGroup from “Thirties”, “Forties”, “Fifties”, “Senior” and “Twenties”. The second query is created for customer demographics on Education, Marital Status and Income by Gender. For the third query, I used the CASE statement again to categorize Group Income Level from “Low”, “High”, to “Moderate”. The fourth query is created for customer geographics based on Average income, Number of Customers, Order and Revenue Per Customer. Finally, the last query is created to count the number of Customer Orders by Product Category.

Results

Surprisingly, after reviewing my hypothesis, promotions did not drive much sales quantity or revenue as shown in the 04_promotion_analysis, Query no. 3 and 4.

```

54  -- Results for Internet Sales by Promotion Hierarchy (Category, Type and Name).
55  SELECT p.EnglishPromotionCategory,
56    p.EnglishPromotionType,
57    p.EnglishPromotionName,
58    SUM(isales.UnitPrice * isales.OrderQuantity) Sales,
59    SUM(DiscountPct * isales.UnitPrice * isales.OrderQuantity) AS Discount,
60    SUM(isales.UnitPrice * isales.OrderQuantity) - SUM(isales.TotalProductCost) AS 'Profit',
61    SUM((isales.UnitPrice * isales.OrderQuantity)/100) AS 'Promotion %',
62    RANK() OVER(ORDER BY SUM(isales.UnitPrice * isales.OrderQuantity) DESC) AS 'Rank'
63
64
65  FROM dbo.FactInternetSales AS isales
66  INNER JOIN dbo.DimProduct dp
67    ON dp.ProductKey = isales.ProductKey
68  INNER JOIN dbo.DimPromotion AS p
69    ON p.PromotionKey = isales.PromotionKey
70
71 GROUP BY p.EnglishPromotionCategory, p.EnglishPromotionType, p.EnglishPromotionName;
72
73

```

Results Messages

	EnglishP...	EnglishPromot...	Engli...	Sales	Discount	Profit	Promot...	Rank
1	No Discount	No Discount	No Disco...	27307607.0825	0	11205876.0276	273075.9249	1
2	Reseller	Volume Discount	Volume D...	2005230.2282	40104.604563...	857661.7961	20052.2858	2
3	Reseller	New Product	Touring-...	30992.91	6198.5820000...	11727.7173	309.9291	3
4	Reseller	New Product	Touring-...	14847.00	2227.0499999...	5618.104	148.47	4

Query 3 shows Internet Sales by Promotion, and No Discount generated the most with over 27 million in revenue while the discounted promotions only generated over 2 million in revenue. (Graph results shown in Figure 5.)

```

36  -- Results for Reseller Sales by Promotion Hierarchy (Category, Type and Name).
37  SELECT p.EnglishPromotionCategory,
38    p.EnglishPromotionType,
39    p.EnglishPromotionName,
40    SUM(rsales.UnitPrice * rsales.OrderQuantity) Sales,
41    SUM(DiscountPct * rsales.UnitPrice * rsales.OrderQuantity) AS Discount,
42    SUM(rsales.UnitPrice * rsales.OrderQuantity) - SUM(rsales.TotalProductCost) AS 'Profit',
43    SUM((rsales.UnitPrice * rsales.OrderQuantity)/100) AS 'Promotion %',
44    RANK() OVER(ORDER BY SUM(rsales.UnitPrice * rsales.OrderQuantity) DESC) AS 'Rank'
45
46  FROM dbo.FactResellerSales AS rsales
47  INNER JOIN dbo.DimProduct dp
48    ON dp.ProductKey = rsales.ProductKey
49  INNER JOIN dbo.DimPromotion AS p
50    ON p.PromotionKey = rsales.PromotionKey
51
52 GROUP BY p.EnglishPromotionCategory, p.EnglishPromotionType, p.EnglishPromotionName;
53

```

Results Messages

	EnglishPromotionCategory	EnglishPromotionType	EnglishPromotionName	Sales	Discount	Profit	Promotion %	Rank
1	No Discount	No Discount	No Discount	75027907.9559	0	2295995.9928	750276.7606	1
2	Reseller	Volume Discount	Volume Discount 11 to 14	2950226.2061	59004.52412199983	-4643.7684	29502.2084	2
3	Reseller	Volume Discount	Volume Discount 15 to 24	1092256.1346	54612.806730000026	-54648.1572	10922.5383	3
4	Reseller	New Product	Touring-1000 Promotion	726664.536	145332.9072000003	-402572.1438	7266.6323	4
5	Reseller	New Product	Touring-3000 Promotion	521463.7575	78219.56362499986	-198851.5753	5214.6128	5
6	Reseller	Discontinued Product	Mountain-100 Clearance Sa...	386042.61	135114.9135000002	-482398.8564	3860.4199	6
7	Reseller	Volume Discount	Volume Discount 25 to 40	137942.8159	13794.281589999997	-7304.3042	1379.4262	7
8	Reseller	Excess Inventory	Road-650 Overstock	71408.688	21422.6064	-76550.1184	714.084	8
9	Reseller	Discontinued Product	Mountain-500 Silver Clear...	43165.236	17266.094399999958	-74574.0018	431.6425	9
10	Reseller	Seasonal Discount	Sport Helmet Discount-2003	10706.94	1606.040999999995	1808.256	107.0655	10
11	Reseller	Seasonal Discount	Sport Helmet Discount-2002	8276.4732	827.6473199999999	1448.3988	82.7601	11
12	Reseller	Volume Discount	Volume Discount 41 to 60	2043.5175	306.527625	280.7696	20.4351	12

Interestingly, Query 4 shows Reseller Sales by Promotion, and No Discount generated over 75 million in revenue while the discounted promotions only generated over 2 million in revenue with negative profits.

(Graph results shown in Figure 4.)

There are questions significant to analyzing whether overall promotional sales are generating enough revenue. However, based on some of my analysis, there are significant growth in promotion sales over the course of a year as shown in Figure 1 and 2 for both Reseller and Internet Sales. For Resellers, monthly trend in promotional sales was the lowest in February at \$1.7 million and the highest in December at \$3.2. While Internet Sales, lowest was in June at \$2.9 to the highest at \$9.7 in May.

This new discovery gives us a lot of information on the products and promotions that worked and didn't work in boosting revenue for the company. Short-term promotions with big discounts were not the only lucrative promotions, as 20 of the 35-month promotions with discounts ranging from 2% to 5% created more monthly revenue with promotions than without promotions. We can now predict which products and campaigns will be successful in the future.

In terms of customer analysis, I wanted to get a general idea of the total number of customers and orders for each State and Province in our database in addition to the average income in those states. Below we can see that California, Washington, England, British Columbia, and New South Wales clearly shows the most customers with > 1000 and orders of > 5000. This should be taken into consideration for experiment and future promotional sales.

```
--  
59  
60  -- Customer Geographics based on Average income, Number of customers, Orders and Revenue per customer.  
61  SELECT g.StateProvinceName,  
62      g.EnglishCountryRegionName,  
63      AVG(c.YearlyIncome) AS AvgIncome, --FORMAT(AVG(c.YearlyIncome), 'C2') AS AvgIncome  
64      COUNT(DISTINCT isales.CustomerKey) AS NumOfCustomers,  
65      COUNT(isales.SalesOrderNumber) AS NumberOfOrders,  
66      SUM(isales.SalesAmount) / COUNT(DISTINCT isales.CustomerKey) AS AvgRevenuePerCustomer  
67  
68  FROM dbo.FactInternetSales AS isales  
69  INNER JOIN dbo.DimCustomer AS c  
70    ON isales.CustomerKey = c.CustomerKey  
71  INNER JOIN dbo.DimGeography AS g  
72    ON g.GeographyKey = c.GeographyKey  
73  
74  GROUP BY g.StateProvinceName,  
75      g.EnglishCountryRegionName  
76  
77  ORDER BY NumOfCustomers DESC,  
78      NumberOfOrders DESC,  
79      AvgRevenuePerCustomer DESC;  
80
```

	Results Messages					
	StateProvinceName	EnglishCountryRegionName	AvgIncome	NumOfCustomers	NumberOfOrders	AvgRevenuePerCustomer
1	California	United States	68261.757	4444	12248	1285.8365
2	Washington	United States	61276.8398	2263	6101	1090.2555
3	England	United Kingdom	56139.5887	1913	6906	1772.9807
4	British Columbia	Canada	60150.3164	1559	7584	1254.2271
5	New South Wales	Australia	66734.0297	1559	5839	2523.724
6	Oregon	United States	60083.4492	1073	2876	1091.3248
7	Victoria	Australia	65037.3915	894	3343	2550.2304
8	Queensland	Australia	66369.2731	793	2903	2507.459

Conclusion

After reviewing my hypothesis, I was surprised that overall promotions did not drive much total sales quantity or revenue. It is recommended to evaluate promotion sales for both Internet and Resellers to drive revenue. The primary goal of sales promotion is to increase product sales by increasing demand since discounted product would have to sell a greater quantity to generate more revenue. Thus, if another promotion is to be implemented then pricing experiment should be considered to claim lost profits from recent sales and promotions that were unsuccessful. US, UK, Canada and Australia are the top four countries with the highest Sales in total which would be a good geographic location to conduct the experiment. Overall, there are some valuable insights that can be derived from the data to be used for the organization.

Figures & Tables

Figure 1. Resellers Sales Trend by Month under Promotions.

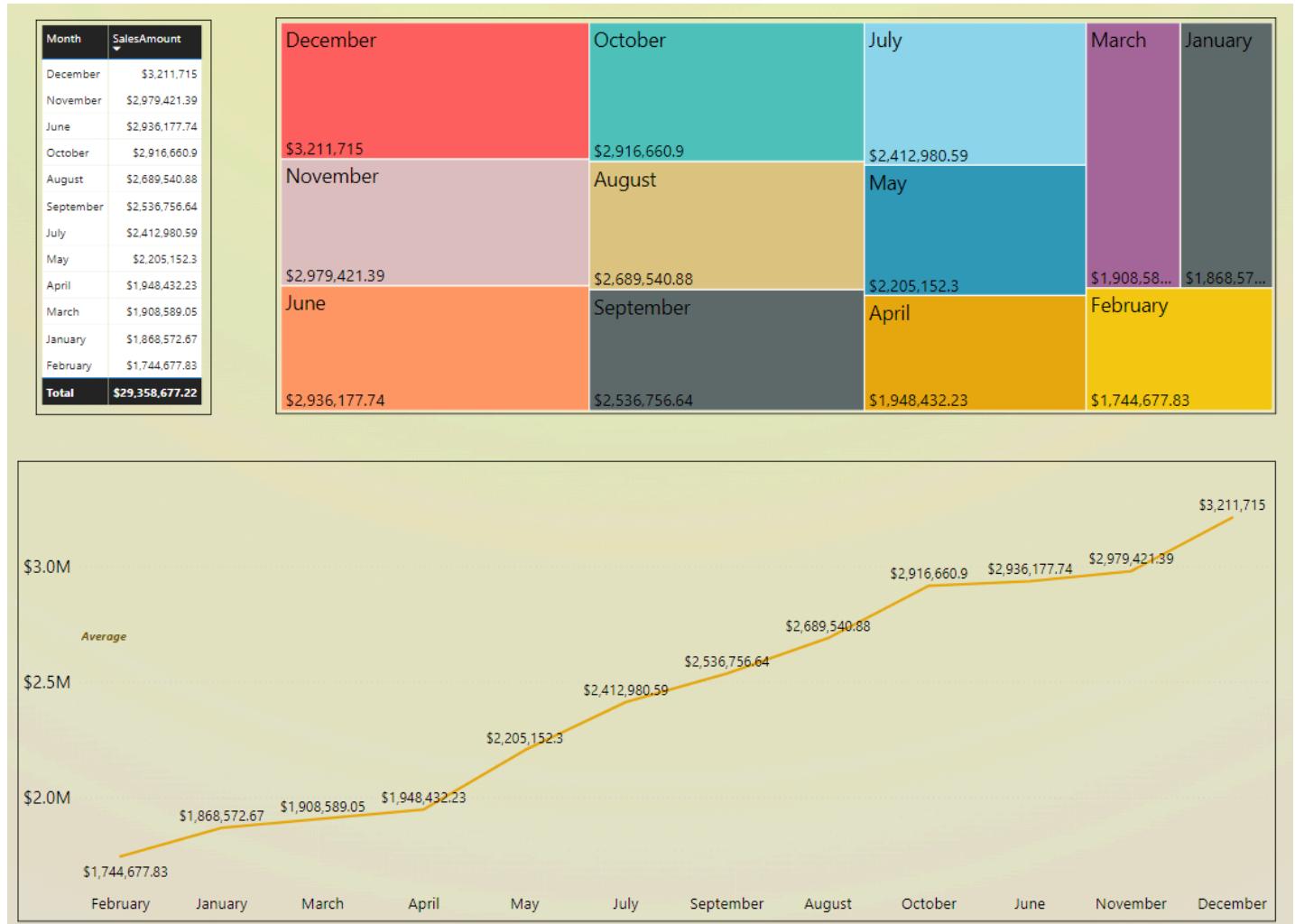


Figure 2. Internet Sales by Month under Promotions.

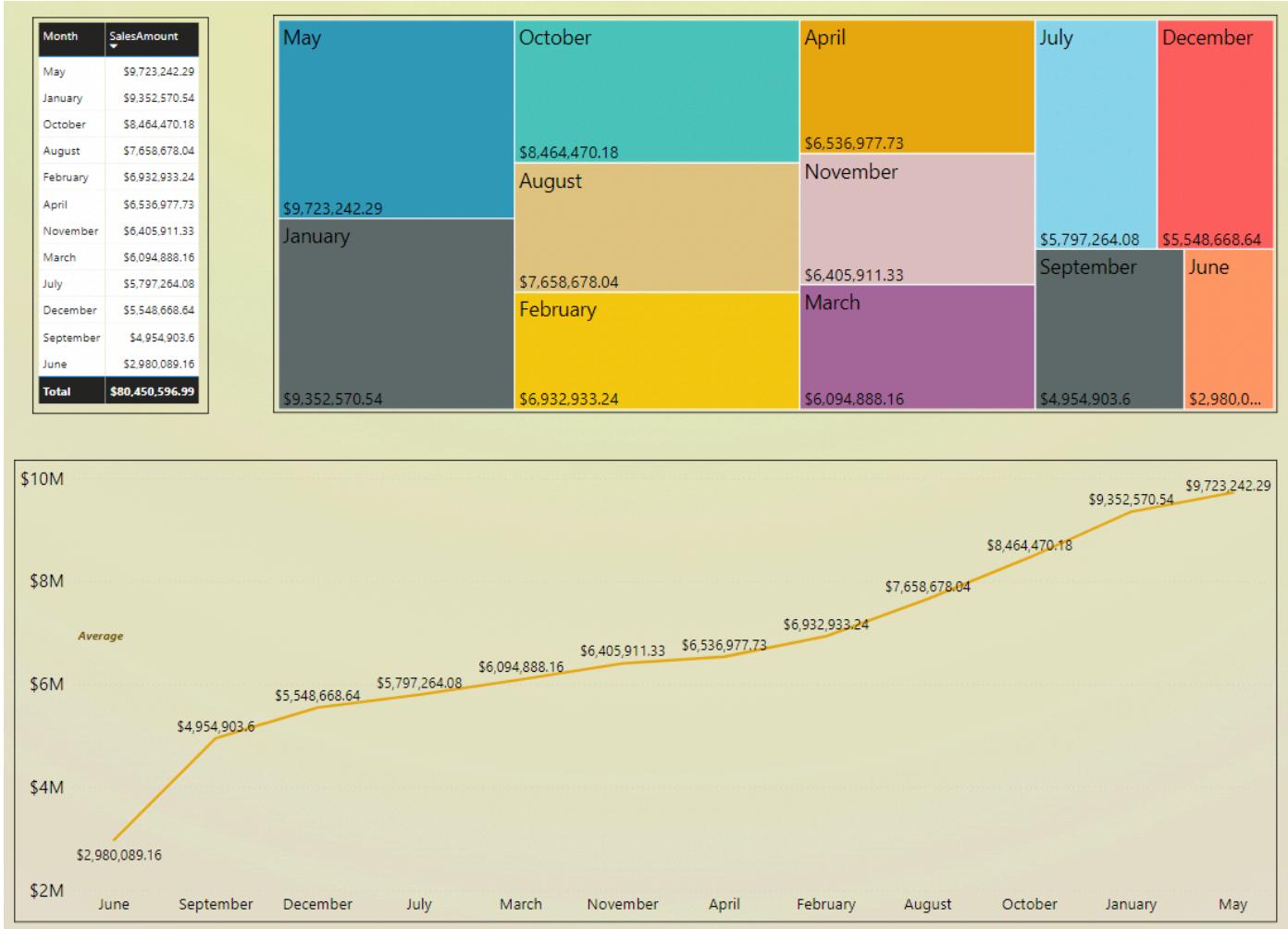


Figure 3. Total Sales by Territory.

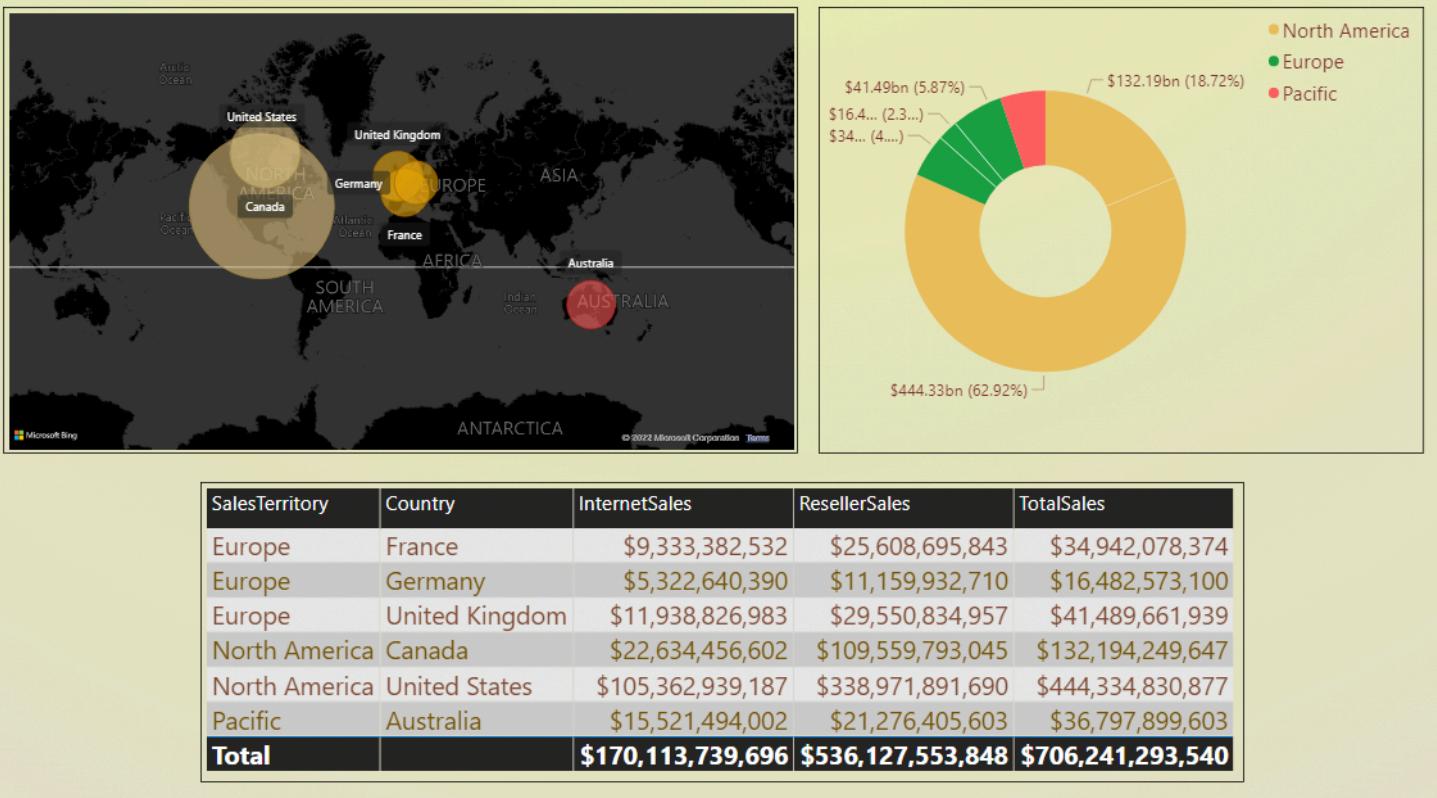


Figure 4. Top Reseller Sales by Promotion.

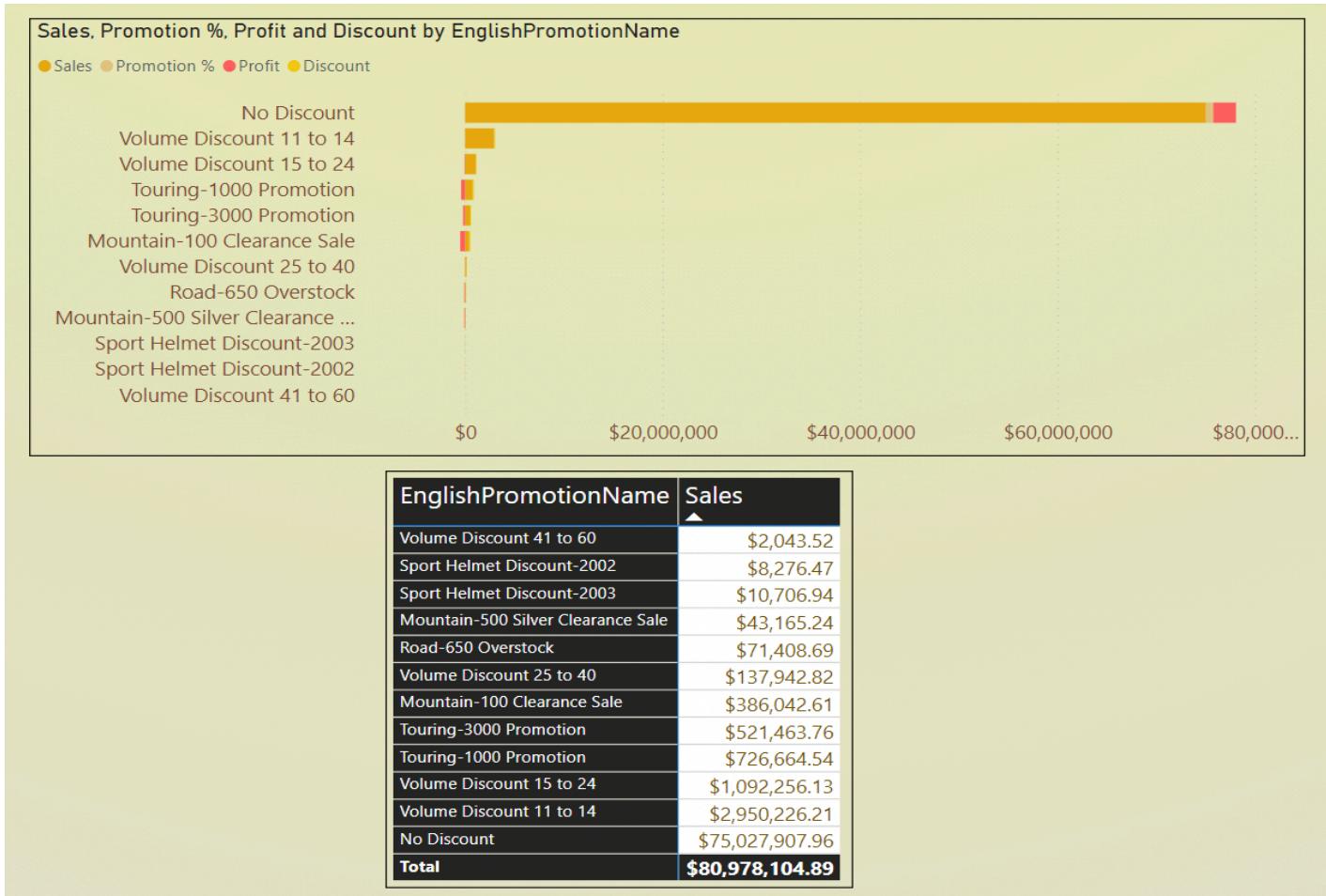


Figure 5. Top Internet Sales by Promotion.

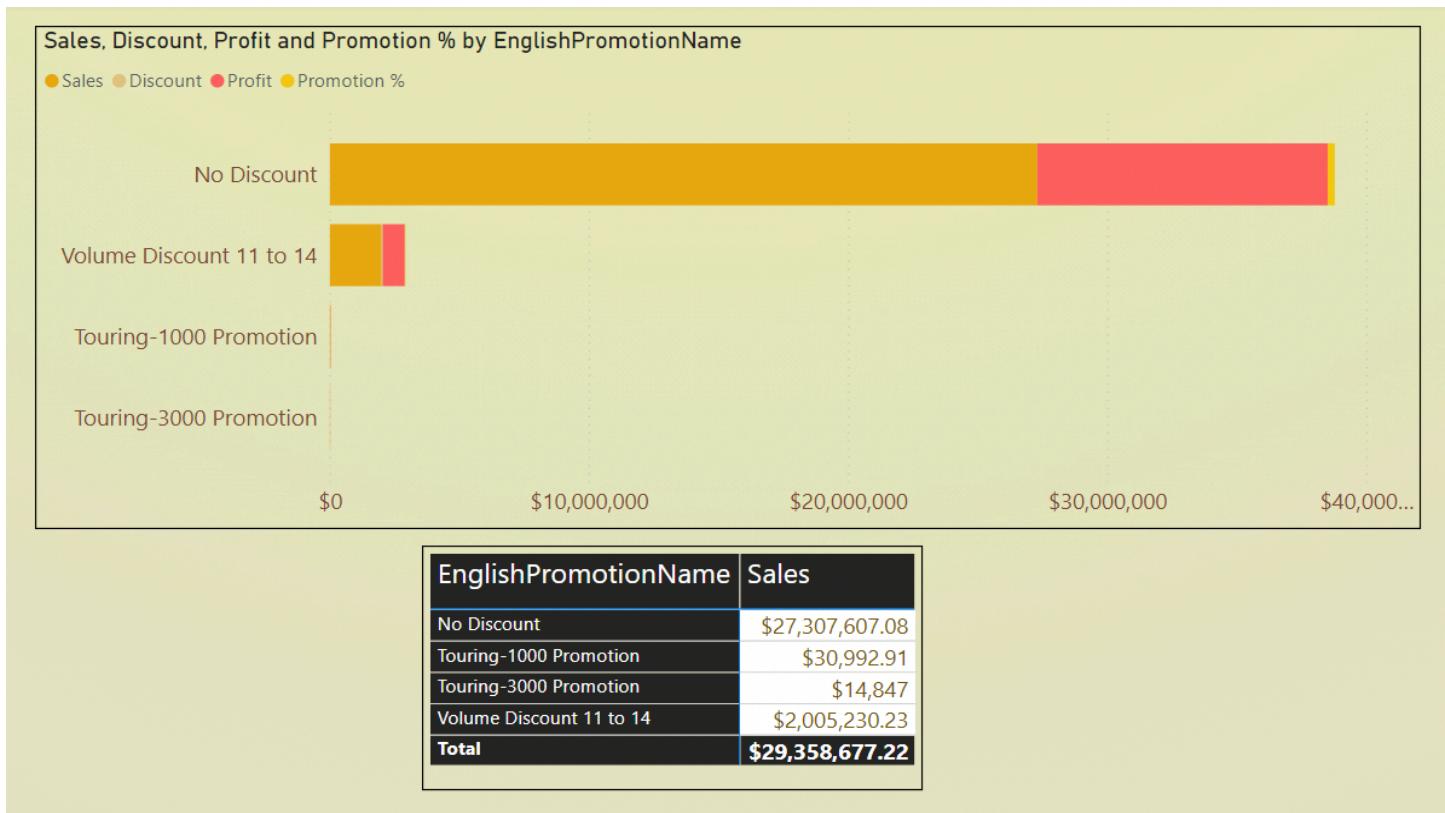
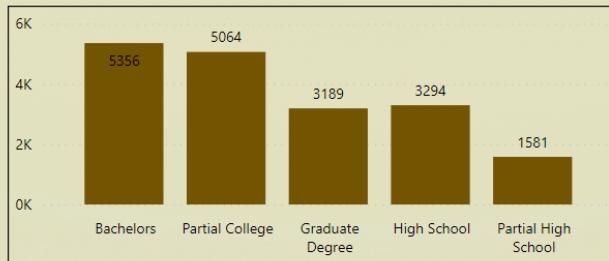


Figure 7. Customer Demographics (Income, Marital Status, Education)

EducationLevel	Gender	MaritalStatus	AvgIncome	NumOfCustomers	NumOfOrders	OrdersPerCustomer	AvgRevenuePerCustomer
Bachelors	F	M	\$63,898.41	1473	5079	3	\$1,787.79
Bachelors	F	S	\$68,165.56	1155	3914	3	\$2,114.96
Bachelors	M	M	\$64,106.82	1634	5542	3	\$1,686.56
Bachelors	M	S	\$68,464.95	1094	3609	3	\$1,890.41
Graduate Degree	F	M	\$64,607.26	906	3030	3	\$1,641.14
Graduate Degree	F	S	\$67,118.14	705	2370	3	\$1,890.52
Graduate Degree	M	M	\$66,577.56	1020	3404	3	\$1,503.7
Graduate Degree	M	S	\$70,400.22	558	1799	3	\$1,984.05
High School	F	M	\$58,222.04	781	2441	3	\$1,135
High School	F	S	\$45,040.4	814	2599	3	\$1,576.62
High School	M	M	\$59,300.32	886	2787	3	\$1,402.41
High School	M	S	\$46,586.44	813	2493	3	\$1,507.61
Partial College	F	M	\$63,911.21	1285	4257	3	\$1,481.98
Partial College	F	S	\$53,102.68	1257	4061	3	\$1,591.04
Partial College	M	M	\$63,194.71	1377	4689	3	\$1,436.07
Partial College	M	S	\$48,727.88	1145	3616	3	\$1,608.55
Partial High School	F	M	\$56,604.36	300	963	3	\$1,186.48
Partial High School	F	S	\$34,067.54	457	1303	2	\$1,067.19
Partial High School	M	M	\$55,235.89	349	1081	3	\$1,716.92
Partial High School	M	S	\$33,365.17	475	1361	2	\$804.24
Total			\$1,150,697.56	18484	60398	58	\$30,473.24



Education Level sorted by NumOfCustomer and NumberOfOrders.