RETAIL ANALYTICS

A report submitted for the course of

Application Development_ Data Analytics Explore

III B.Tech II Semester

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DATA SCIENCE

CERTIFICATE

This is to certify that this bonafide record of the application development entitled **"Retail Analytics"** submitted by **Ms. D Akshaya (2111CS030004), Ms. V. Harsha Sri (2111CS030035), Ms. E. Harshitha Goud (2111CS030038), Mr. Mohammad. Nouman (2111CS030072)** of III-year II-sem to the Malla Reddy University, Hyderabad. This bonafide record of work carried out by us under the guidance of our supervision. The contents of this report, in full or in parts, have not been submitted to any other Organization for the award of any Degree.

Internal Guide

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ABSTRACT

Retail analytics is a dynamic field that leverages data-driven insights to enhance decision making processes within the retail industry. This project involves collecting, processing, and analyzing vast amounts of data generated by various retail activities to derive valuable information for strategic planning and operational improvements. Retail Analytics is customer behavior analysis. Retail Analytics involves systems to gather data on customer preferences, shopping patterns, and demographics. By understanding these factors, retailers can personalize marketing strategies, optimize product placements, and tailor inventory management to meet customer demands more effectively. Retailers employ predictive analytics to forecast demand, reduce excess inventory, and prevent stockouts. This proactive approach not only enhances customer satisfaction by ensuring product availability but also minimizes costs associated with overstocking. Retailers are combining data from various touchpoints, such as e-commerce platforms, mobile apps, and physical stores. This holistic approach provides a comprehensive view of customer interactions, allowing retailers to create seamless and consistent experiences across all channels.

In this project, retail industry offering unparalleled insights into customer behaviour, inventory management, pricing strategies, and the overall retail landscape. By harnessing the power of data, retailers can adapt to changing market dynamics, stay competitive, and ultimately enhance the overall shopping experience for consumers.

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LIST OF DATA SETS

The dataset used for this project is in page number 5 – Table1

LIST OF ABBREVIATIONS

BI	:	Business Intelligence
ROI	:	Return on Investment
ATV	:	Average Transaction Value
POS	:	Point of Sale
KPI	:	Key Performance Indicator

CHAPTER-1
INTRODUCTION

Retail analytics is the process of tracking business data, such as inventory levels, consumer behaviour, sales numbers, and more, to make more informed, strategic decisions. This includes providing insights to understand and optimize the retail business's supply chain, consumer behaviour, sales trends, operational processes, and overall performance. With today's high customer expectations for retail, companies must meet those rising needs with personalized omnichannel offers, efficient processes, and quick adjustments to upcoming trends—all of which require retail analytics.

Retailers need to be able to accurately target and anticipate customer needs in order to offer the right products at the right price at the right time—and they need analytics to do that. Analytics can help retailers make the right marketing decisions, improve their business processes, and deliver better overall customer experiences by uncovering areas for improvement and optimization.

Retailers used to rely mostly on their instincts and hunches, honed through years of experience, to make decisions about which items to sell, which locations will likely draw the most demand, how much inventory to carry, and when to adjust prices. And while retailers are often proud of their acumen, instincts no longer are enough, especially in an industry with narrow profit margins. Consumers are too fickle and market conditions are too numerous for humans to accurately account for all those variables. Data analytics software can help make decision-making more precise and profitable for retailers by augmenting—and, in some cases, correcting—those well-educated hunches.

Simply put, retail analytics takes the guesswork out of many types of decisions. Experienced employees are often a font of wisdom, but as the baby boomer generation ages out of the workforce, less experienced employees will have fewer insights to share. And even the most experienced and savvy retail executives must wade through a plethora of internal and external data points on factors that include labor strikes, merchandise trends, and weather forecasts. Analytics helps retailers synthesize such data and take steps to anticipate future events.Retail is a highly competitive business complicated by the relative novelty of online commerce, and retail profit margins have always been thin, leaving little room for error. Even slight adjustments in product selection and inventory management can greatly reduce stockouts

or, at the other end of the same spectrum, the need for steep discounts. Those adjustments, in turn, can have an enormous impact on the bottom line. For example, Fashion Retailers can use data analytics to decide which styles and sizes to order for different locations and in what quantities, based on demographic and purchasing trends at each location.

Retail analytics, an indispensable tool in the modern business landscape, encompasses a multifaceted approach to data analysis tailored specifically to the retail sector. At its core, retail analytics leverages advanced statistical techniques and machine learning algorithms to extract actionable insights from vast volumes of data generated across various retail touchpoints, including sales transactions, customer interactions, inventory levels, and marketing campaigns. One of its fundamental components involves sales forecasting, where historical sales data is analysed to predict future demand patterns, enabling retailers to optimize inventory levels, minimize stockouts, and maximize revenue. Customer segmentation is another pivotal aspect, whereby demographic, behavioural, and psychographic attributes are utilized to categorize customers into distinct groups, facilitating targeted marketing strategies, personalized promotions, and enhanced customer experiences. Moreover, retail analytics empowers retailers to optimize pricing strategies by analysing competitor pricing, market trends, and customer willingness to pay, thus striking a delicate balance between profitability and competitiveness.

Additionally, it plays a pivotal role in improving operational efficiency through the analysis of supply chain dynamics, workforce management, and store performance metrics, ultimately driving cost savings and operational excellence. Furthermore, with the proliferation of digital channels and the advent of omnichannel retailing, retail analytics has become indispensable in tracking and analysing customer journeys across multiple touchpoints, enabling seamless integration and optimization of online and offline shopping experiences. As data continues to burgeon in volume and complexity, the application of advanced analytics techniques such as predictive modelling, machine learning, and artificial intelligence will further revolutionize the retail landscape, empowering retailers to stay agile, responsive, and competitive in an ever-evolving market environment. In essence, retail analytics serves as the linchpin for informed decision-making, strategic planning, and sustainable growth in the dynamic and hypercompetitive retail industry.

There are several areas of the retail business that can benefit from analytics. First, retail analytics can be used to provide a comprehensive view of the business and assess the efficiency

of business processes. For example, a retailer can use predictive analysis to adjust inventory based on customer purchasing trends and reduce waste and associated costs. Secondly, retail analytics can greatly improve marketing tactics. It can help target customers by determining the ideal customer based on data gathered on current and past customers' location, age, preferences, purchasing patterns, and other key factors. Personalized marketing in the retail industry is becoming more commonplace and requires a deep understanding of individual customer preferences. With retail analytics, companies can develop strategies focused on specific customers and therefore increase success for such marketing tactics. Finally, retail analytics can be used to predict consumer needs and business improvements to gain a competitive advantage. Analysing sales data can help retailers identify emerging trends and anticipate customer needs.

In conclusion, retail analytics stands as the cornerstone of success in the contemporary retail ecosystem, offering retailers a powerful toolkit to decipher the complexities of consumer behaviour, market dynamics, and operational efficiency. By harnessing the power of data analytics, retailers can unlock valuable insights that drive revenue growth, enhance customer satisfaction, and optimize business operations. As technology continues to evolve and data becomes increasingly abundant, the significance of retail analytics will only intensify, serving as a catalyst for innovation and differentiation in an increasingly competitive landscape. Embracing retail analytics isn't just a strategic choice; it's a necessity for retailers looking to thrive and adapt in the fast-paced world of modern commerce.

CHAPTER - 2

REVIEW OF RELEVENT LITERATURE

Sales Analytics: The literature on sales analytics emphasizes the importance of data-driven decision-making in the sales domain. Key studies focus on the development and application of various analytical techniques to enhance sales performance. The role of data visualization, including the use of dashboards like the one shown in the image, is particularly highlighted for its ability to present complex data in an accessible manner. Industry reports often showcase best practices in dashboard design, emphasizing the need for clear, actionable insights that can be gleaned at a glance.

Predictive Sales Modelling: Predictive modelling in sales is a rapidly evolving field, with literature covering a range of statistical and machine learning techniques. Time series analysis, regression models, and advanced algorithms are frequently discussed in academic papers as methods for forecasting future sales trends. These models are critical for businesses looking to anticipate market demands and adjust their strategies accordingly.

Customer Relationship Management (CRM): CRM systems are a central topic in sales-related literature, with numerous studies examining their impact on managing customer data and enhancing customer engagement. Research often explores how CRM integration with sales analytics can lead to improved customer insights and, consequently, more effective sales strategies.

Sales Performance and Territory Management: Literature on sales performance often intersects with discussions on territory management. Studies in this area analyse how sales data can inform the allocation of resources across different sales territories, with the goal of maximizing coverage and efficiency. Performance metrics are scrutinized to understand their impact on sales outcomes and team productivity.

Consumer Behaviour: Understanding consumer behaviour is crucial for sales success, and the literature reflects this through extensive research on the factors influencing purchasing decisions. This body of work is essential for interpreting sales trends and tailoring marketing efforts to meet consumer needs and preferences.

E-commerce and Online Sales: For businesses with an online presence, literature on e-commerce and online sales is particularly relevant. Studies explore the digital transformation of retail, the growth of online sales channels, and the unique analytics challenges and opportunities these present.

CHAPTER – 3
METHODOLOGY

Retail analytics methodology utilizing Power BI involves several key steps to extract actionable insights from data. Firstly, it begins with data collection from various sources such as sales transactions, customer demographics, and inventory records. This raw data is then cleaned and transformed to ensure accuracy and consistency. Next, relevant metrics and insights are identified based on the retail objectives, which could include sales performance, customer segmentation, and inventory turnover. These metrics are visualized through interactive dashboards and reports using Power BI's robust visualization capabilities, allowing stakeholders to gain a comprehensive understanding of the retail operations. Additionally, advanced analytics techniques such as predictive modelling and clustering can be applied to uncover patterns and trends within the data. Continuous monitoring and analysis of these metrics enable retailers to make informed decisions, optimize processes, and enhance the overall performance of their business.

We have used some of the important visuals from Power Bi such as Slicer, Card, Pie chart, Donut chart, Pie chart, Slicer with title, Clustered column chart, Table, Multi row card, Stacked column chart, clustered column chart and Filled Map visuals to visualize and extract the insights which will help the company to increase the company's performance.

The dataset used for visualization is mentioned below:

Table 1:

ORDER_NUMBER	QUANTITY_ORDERED	PRICE_EACH	ORDERLINE_NUMBER	SALES	ORDER_DATE	STATUS	QTR_ID	MONTH_ID	DEAL_SIZE	PRODUCT_LINE	MSRP($)	PRODUCT_CODE	ADDRESS_LINE
10107	30	95.7	2	2871	2-24-2022	Shipped	1	2	Small	Motorcycles	95	S10_1678	897 Long Airport Ave
10121	34	81.35	5	2765.9	05-07-2022	Shipped	2	5	Small	Motorcycles	95	S10_1678	59 rue de l'Abbaye
10134	41	94.74	2	3884.34	07-01-2022	Shipped	3	7	Medium	Motorcycles	95	S10_1678	27 rue du Colonel Pie
10145	45	83.26	6	3746.7	8-25-2022	Shipped	3	8	Medium	Motorcycles	95	S10_1678	78934 Hillside Dr.
10159	49	100	14	5205.27	10-10-2022	Shipped	4	10	Medium	Motorcycles	95	S10_1678	7734 Strong St.
10168	36	96.66	1	3479.76	10-28-2022	Shipped	4	10	Medium	Motorcycles	95	S10_1678	9408 Furth Circle
10180	29	86.13	9	2497.77	11-11-2022	Shipped	4	11	Small	Motorcycles	95	S10_1678	184, chausse de Tour
10201	22	98.57	2	2168.54	12-01-2022	Shipped	4	12	Small	Motorcycles	95	S10_1678	5557 North Pendale
10211	41	100	14	4708.44	1-15-2023	Shipped	1	1	Medium	Motorcycles	95	S10_1678	25, rue Lauriston
10223	37	100	1	3965.66	2-20-2023	Shipped	1	2	Medium	Motorcycles	95	S10_1678	636 St Kilda Road
10237	23	100	7	2333.12	04-05-2023	Shipped	2	4	Small	Motorcycles	95	S10_1678	2678 Kingston Rd.
10251	28	100	2	3188.64	5-18-2023	Shipped	2	5	Medium	Motorcycles	95	S10_1678	7476 Moss Rd.
10263	34	100	2	3676.76	6-28-2023	Shipped	2	6	Medium	Motorcycles	95	S10_1678	25593 South Bay Ln.
10275	45	92.83	1	4177.35	7-23-2023	Shipped	3	7	Medium	Motorcycles	95	S10_1678	67, rue des Cinquant
10285	36	100	6	4099.68	8-27-2023	Shipped	3	8	Medium	Motorcycles	95	S10_1678	39323 Spinnaker Dr.
10299	23	100	9	2597.39	9-30-2023	Shipped	3	9	Small	Motorcycles	95	S10_1678	Keskuskatu 45
10309	41	100	5	4394.38	10-15-2023	Shipped	4	10	Medium	Motorcycles	95	S10_1678	Erling Skakkes gate 7
10318	46	94.74	1	4358.04	11-02-2023	Shipped	4	11	Medium	Motorcycles	95	S10_1678	7586 Pompton St.
10329	42	100	1	4396.14	11-15-2023	Shipped	4	11	Medium	Motorcycles	95	S10_1678	897 Long Airport Ave
10341	41	100	9	7737.93	11-24-2023	Shipped	4	11	Large	Motorcycles	95	S10_1678	Geislweg 14
10361	20	72.55	13	1451	12-17-2023	Shipped	4	12	Small	Motorcycles	95	S10_1678	Monitor Money Build
10375	21	34.91	12	733.11	02-03-2021	Shipped	1	2	Small	Motorcycles	95	S10_1678	67, rue des Cinquant
10388	42	76.36	4	3207.12	03-03-2021	Shipped	1	3	Medium	Motorcycles	95	S10_1678	1785 First Street
10417	66	100	2	7516.08	5-13-2021	Disputed	2	5	Large	Motorcycles	95	S10_1678	C/ Moralzarzal, 86
10103	26	100	11	5404.62	1-29-2022	Shipped	1	1	Medium	Classic Cars	214	S10_1949	Erling Skakkes gate 7
10126	38	100	11	7329.06	5-28-2022	Shipped	2	5	Large	Classic Cars	214	S10_1949	C/ Araquil, 67
10140	37	100	11	7374.1	7-24-2022	Shipped	3	7	Large	Classic Cars	214	S10_1949	9408 Furth Circle
10150	45	100	8	10993.5	9-19-2022	Shipped	3	9	Large	Classic Cars	214	S10_1949	Bronz Sok., Bronz Ap
10163	21	100	1	4860.24	10-20-2022	Shipped	4	10	Medium	Classic Cars	214	S10_1949	5905 Pompton St.
10174	34	100	4	8014.82	11-06-2022	Shipped	4	11	Large	Classic Cars	214	S10_1949	31 Duncan St. West E

These are the brief information's on the visuals we have used:

1. Slicer

Figure 1:

In Power BI, employing slicers with titles is a strategic move that significantly enhances the user experience and the overall effectiveness of your reports. By including titles, you provide clear context and guidance to users, ensuring they understand the purpose of each slicer and which field it filters. This clarity not only reduces confusion but also improves usability, as users can quickly identify and interact with the slicers relevant to their analysis. Moreover, incorporating titles adds a professional touch to your reports, contributing to a polished and cohesive presentation. Consistency in including titles across your reports promotes uniformity in design and usability, making it easier for users to navigate different reports within your organization. Additionally, titles improve accessibility by providing clear labels that can be easily interpreted by users with disabilities. In essence, leveraging slicers with titles in Power BI enhances communication, usability, presentation quality, consistency, and accessibility, ultimately leading to more effective data analysis and decision-making.

The Slicer with Dropdown feature offers a streamlined approach to data filtering, optimizing user interaction and report aesthetics. By incorporating this feature, you provide users with a compact and efficient method for selecting filter values from a dropdown menu. This not only conserves valuable report space but also enhances the overall user experience by reducing clutter and simplifying navigation. The dropdown functionality enables users to effortlessly explore and analyze data by selecting specific filter values with ease. Furthermore, by adopting Slice with

Dropdown, you ensure consistency in filter presentation across your reports, promoting a cohesive and intuitive user interface. Overall, integrating Slice with Dropdown in Power BI reports enhances usability, maximizes space efficiency, and contributes to a more engaging and visually appealing data analysis experience.

2. Card

Figure 2:

Cards play a pivotal role in Power BI reports, offering concise and focused data summaries that are crucial for decision-making. These compact visual elements distill complex information into easily digestible snippets, providing users with quick insights at a glance. Whether displaying key performance indicators (KPIs), metrics, or trends, cards offer a versatile way to highlight important data points and track progress towards organizational goals. Their flexibility allows for customization, enabling users to showcase various measures, such as sales revenue, customer satisfaction scores, or inventory levels. Moreover, cards can be enhanced with conditional formatting to draw attention to significant changes or outliers, further aiding in data interpretation. In essence, cards serve as effective tools for presenting critical information efficiently, empowering users to make informed decisions based on the latest data trends and performance metrics.

3. Pie Chart

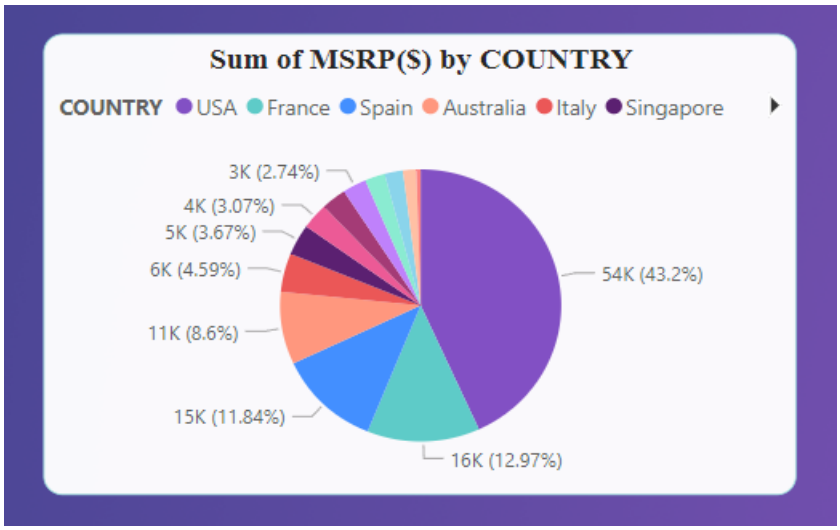


Figure 3:

Pie charts hold significance in Power BI reports as they provide a visually intuitive way to represent proportions and distributions within a dataset. Their circular design allows users to easily grasp the relative sizes of different categories or segments, making it effortless to identify patterns, trends, or outliers. Pie charts excel at showcasing parts-to-whole relationships, enabling users to understand the contribution of each category to the total in a single glance. Whether visualizing market share, expense breakdowns, or survey responses, pie charts offer a compelling visual narrative that simplifies complex data into easily understandable insights. Furthermore, interactive features in Power BI allow users to drill down into specific segments for deeper analysis or filter other visuals based on pie chart selections, enhancing the overall interactivity and usability of the report. However, it's essential to use pie charts judiciously and consider alternative visualizations when dealing with large datasets or when precise comparisons are necessary. Despite their limitations, pie charts remain a valuable tool in Power BI for effectively communicating proportions and distributions within datasets.

4. Donut Chart

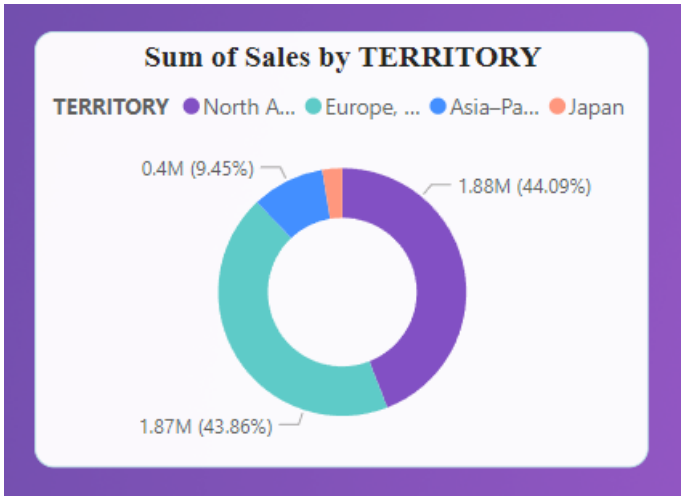


Figure 4:

Donut charts serve as valuable assets in Power BI reports, offering a visually engaging and efficient means of representing data distributions and proportions. Similar to pie charts, donut charts provide a clear depiction of parts-to-whole relationships, enabling users to discern the relative sizes of different categories or segments effortlessly. What sets donut charts apart is their unique circular design, which includes a central blank space that can be utilized to display additional information, such as a total value or supplementary metrics, further enriching the visualization. This additional layer of context enhances the chart's comprehensiveness and aids in conveying insights effectively. Donut charts are particularly useful for displaying categorical data with multiple segments, such as budget allocations, sales by region, or product sales distribution. Moreover, Power BI's interactive capabilities enable users to interact with donut charts dynamically, facilitating drill-downs into specific segments for deeper exploration or filtering other visuals based on selected categories. While it's essential to use donut charts judiciously and consider the limitations inherent to all visualizations, their versatility and visual appeal make them a valuable asset in Power BI for conveying data distributions and proportions with clarity and impact.

5. Clustered Column Chart

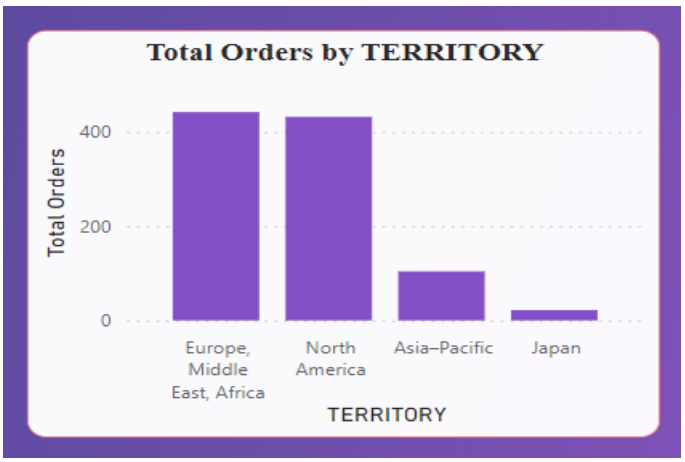
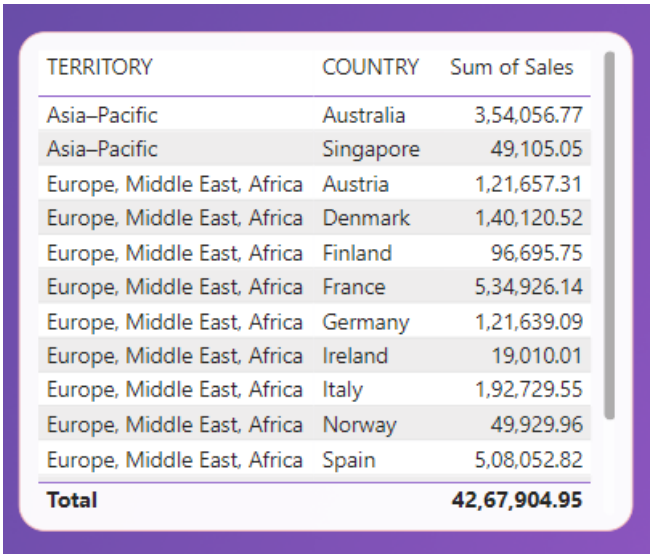


Figure 5:

Clustered column charts are fundamental tools in Power BI for visualizing and comparing data across multiple categories or groups. These charts display data using vertical bars grouped together based on distinct categories, allowing users to identify patterns, trends, and variations easily. One of the key benefits of clustered column charts is their ability to provide a comprehensive overview of data relationships within a single visual, making them ideal for presenting complex datasets or comparing multiple metrics side by side. Whether analyzing sales performance across different product categories, tracking monthly revenue by region, or comparing year-over-year growth, clustered column charts offer a clear and intuitive representation of data that facilitates informed decision-making. Additionally, Power BI's customization options enable users to enhance clustered column charts with additional features such as data labels, trendlines, or drill-down capabilities, further enriching the analytical experience. Overall, clustered column charts play a crucial role in Power BI reports by enabling users to gain actionable insights from data quickly and efficiently, making them indispensable tools for data analysis and visualization.

6. Table



TERRITORY	COUNTRY	Sum of Sales
Asia–Pacific	Australia	3,54,056.77
Asia–Pacific	Singapore	49,105.05
Europe, Middle East, Africa	Austria	1,21,657.31
Europe, Middle East, Africa	Denmark	1,40,120.52
Europe, Middle East, Africa	Finland	96,695.75
Europe, Middle East, Africa	France	5,34,926.14
Europe, Middle East, Africa	Germany	1,21,639.09
Europe, Middle East, Africa	Ireland	19,010.01
Europe, Middle East, Africa	Italy	1,92,729.55
Europe, Middle East, Africa	Norway	49,929.96
Europe, Middle East, Africa	Spain	5,08,052.82
Total		**42,67,904.95**

Figure 6:

Tables are indispensable components in Power BI reports, providing a structured and detailed presentation of data that allows for thorough analysis and comparison. Unlike visualizations like charts or graphs, tables offer a granular view of the underlying data, making them ideal for examining individual records, values, and relationships. Tables excel at presenting large datasets or complex information with multiple dimensions, providing users with a comprehensive overview of the data set's attributes. Additionally, tables in Power BI are highly customizable, allowing users to tailor the appearance and organization of the data to suit their specific needs. Whether displaying raw data, summary statistics, or calculated measures, tables offer flexibility and versatility in presenting information, making them valuable tools for data exploration and interpretation. Moreover, tables can be enriched with interactive features such as sorting, filtering, and conditional formatting, enabling users to interact with the data dynamically and uncover meaningful insights efficiently. In summary, tables play a vital role in Power BI reports by providing a detailed, organized, and interactive representation of data that supports informed decision-making and data-driven analysis.

7. Multi Row Card

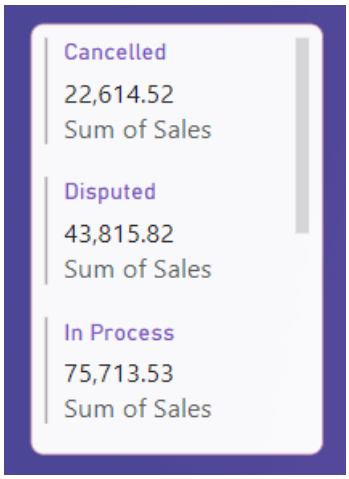


Figure 7:

Multi-row cards are essential elements in Power BI reports, offering a versatile and compact way to display detailed information from multiple fields or records. Unlike traditional single-row cards, multi-row cards can present data in a tabular format, accommodating more content within a confined space. This makes them particularly useful for showcasing various attributes or metrics related to a specific entity or category, such as customer details, product specifications, or financial performance indicators. Multi-row cards allow users to efficiently compare and analyze data across different dimensions without the need for extensive scrolling or navigation. Moreover, they offer flexibility in customization, enabling users to adjust the layout, formatting, and content displayed within the card to meet specific reporting requirements. Additionally, multi-row cards can be enhanced with interactive features like sorting, filtering, and conditional formatting, enhancing the user experience and facilitating data exploration. In summary, multi-row cards are invaluable components in Power BI reports, providing a concise and comprehensive view of data that supports informed decision-making and analysis across various business domains.

8. Stacked Column Chart

Figure 8:

Stacked column charts are pivotal components in Power BI reports, offering a visually impactful way to illustrate the composition and trends within categorical data sets. By stacking data series on top of one another, these charts enable users to discern both the total magnitude of each category and the relative contribution of individual components within it. This dual-layered representation facilitates a deeper understanding of the data's distribution and allows for quick identification of patterns, trends, and outliers. Stacked column charts are particularly effective in showcasing cumulative totals over time or comparing the distribution of multiple metrics across different categories. Moreover, Power BI's interactive features enhance the utility of stacked column charts, enabling users to drill down into specific data points, filter out unwanted categories, or dynamically adjust the chart's appearance based on their analytical needs. Whether analyzing sales by product category, tracking expenditure by department, or monitoring performance over time, stacked column charts provide a visually compelling and informative means of conveying complex data relationships, making them indispensable tools for data analysis and visualization in Power BI reports.

9. Line And Clustered Column Chart

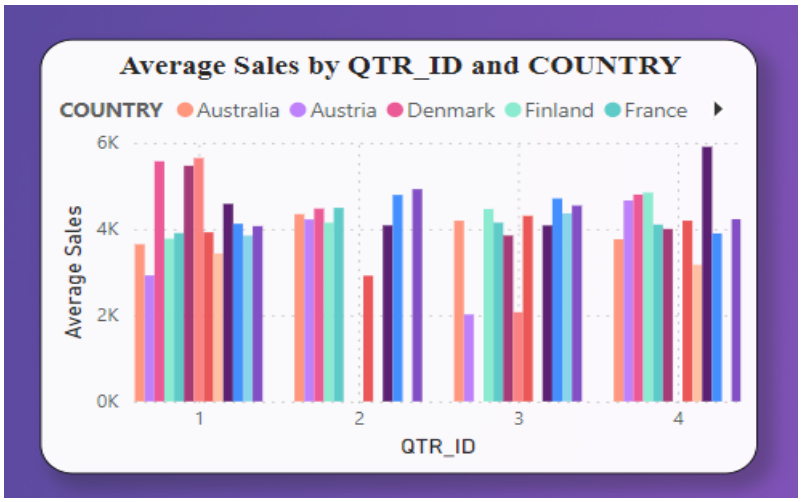


Figure 9:

The line and clustered column chart in Power BI combines the strengths of both line and column charts, offering a comprehensive visualization that enables users to analyze data trends and comparisons simultaneously. This hybrid chart format is particularly effective for presenting time-series data alongside categorical comparisons, providing valuable insights into both temporal patterns and cross-sectional variations within the dataset. By overlaying a line chart on top of clustered columns, users can visualize how a particular metric evolves over time while also comparing it across different categories or groups. This dual-axis approach enhances the chart's versatility, allowing users to examine correlations, trends, and outliers with greater clarity and precision. Whether tracking sales performance by region over time, monitoring inventory levels by product category, or analyzing customer satisfaction scores across different demographics, the line and clustered column chart offers a visually compelling and informative representation of complex data relationships. Moreover, Power BI's interactive features further enhance the utility of this chart type, enabling users to drill down into specific data points, filter out unwanted categories, or dynamically adjust the chart's appearance to focus on relevant insights. In summary, the line and clustered column chart in Power BI provides a powerful and flexible tool for data analysis and visualization, enabling users to uncover actionable insights and make informed decisions based on a comprehensive understanding of their data.

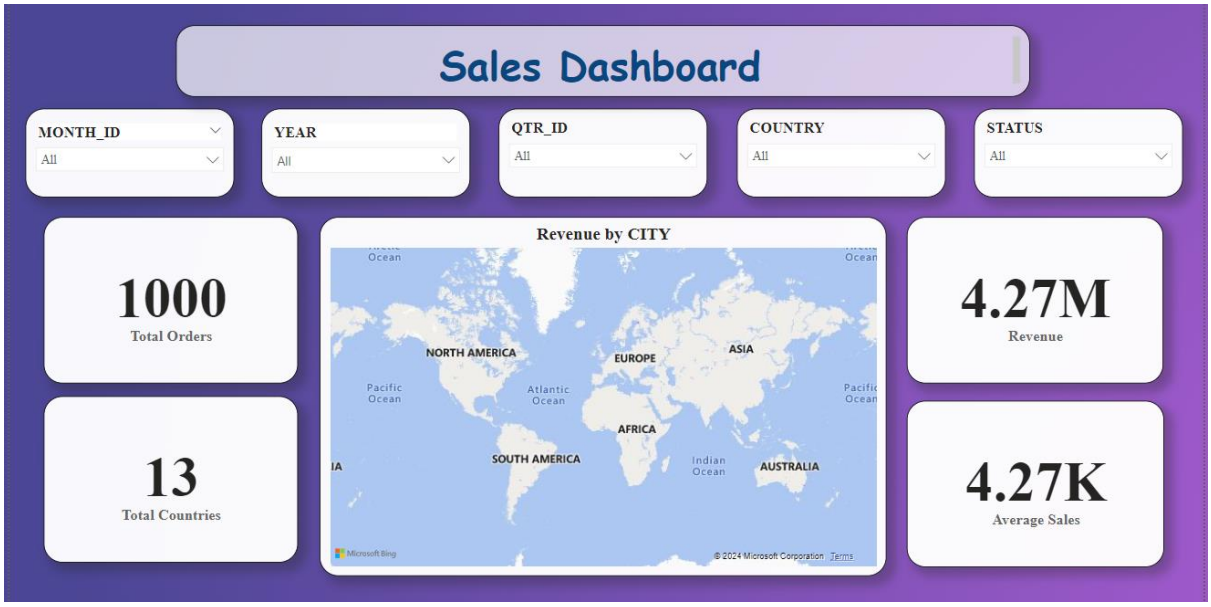
10.Filled Map

Figure 10:

Filled maps in Power BI are indispensable tools for visualizing spatial data and geographical patterns, offering a compelling and intuitive way to analyze and interpret location-based information. By shading regions or areas on a map based on data values, filled maps allow users to identify geographical trends, distribution patterns, and hotspots within their datasets. This spatial representation enhances the understanding of data by providing context and geographical insights that may not be immediately apparent from tabular or chart-based visualizations alone. Filled maps are particularly valuable for analyzing demographic data, market penetration, sales performance, and other location-based metrics, enabling users to identify regional disparities, target specific areas for strategic interventions, or assess the impact of geographical factors on business outcomes. Moreover, Power BI's interactive features further enhance the utility of filled maps, allowing users to zoom in/out, pan across different regions, and drill down into specific areas for deeper analysis. Whether visualizing customer distribution, analyzing sales territories, or tracking the spread of diseases, filled maps provide a powerful and visually compelling means of exploring spatial data and deriving actionable insights from geographical information. In summary, filled maps in Power BI play a crucial role in spatial analysis and decision-making, empowering users to leverage the power of location intelligence to drive business performance and strategic outcomes.

CHAPTER -4

EXPERIMENTAL RESULTS



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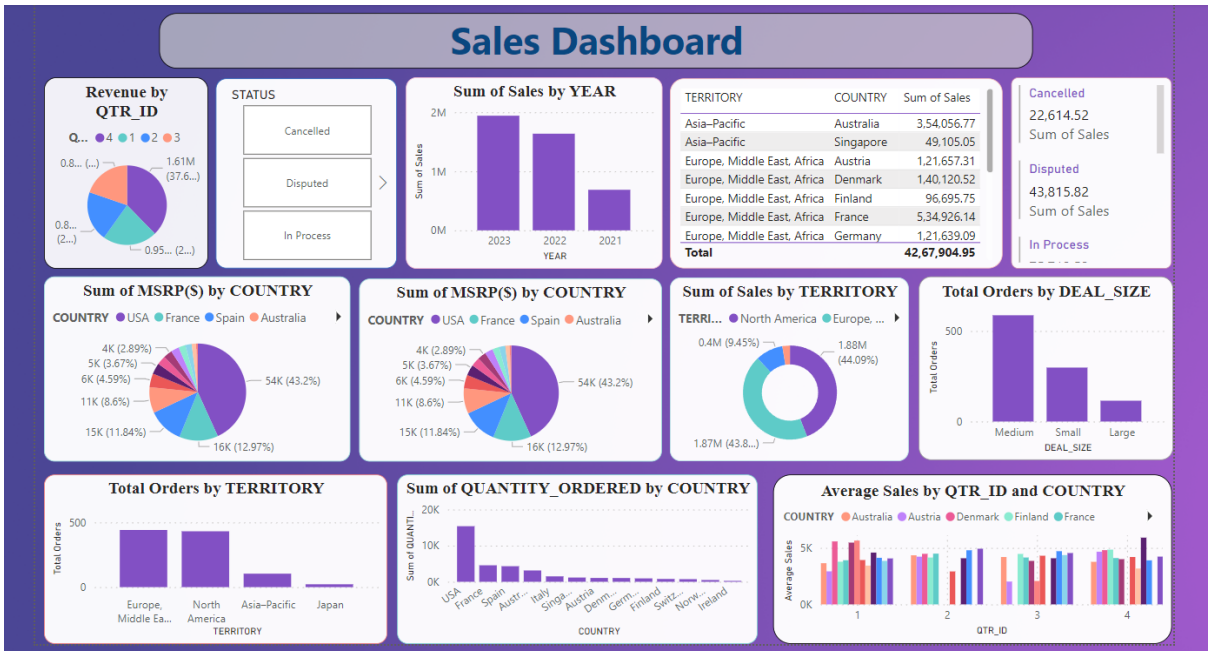

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CHAPTER – 5

CONCLUSION

AND

FUTURE SCOPE OF STUDY

In conclusion, the implementation of a retail analytics sales dashboard utilizing various interactive elements such as maps, pie charts, donut charts, tables, and slicers has significantly enhanced the understanding and accessibility of sales data.

Through the map feature, geographical trends and patterns in sales distribution have been effectively visualized, allowing for targeted strategies and resource allocation. The pie and donut charts offer insightful breakdowns of sales performance by different categories or segments, enabling quick identification of key areas of strength or concern.

The inclusion of a table provides a comprehensive view of detailed sales data, facilitating deeper analysis and comparison between different metrics or time periods. Meanwhile, slicers offer users the flexibility to dynamically filter and customize the displayed information according to their specific requirements, enhancing the dashboard's usability and relevance to individual users.

Overall, by presenting sales data in an interactive and visually appealing manner, this dashboard not only enhances decision-making processes but also fosters a more intuitive understanding of retail performance, ultimately contributing to improved efficiency and profitability.

Future Scope:

Real-time Data Updates: Implementing real-time data integration capabilities would ensure that the dashboard reflects the most current sales information. By leveraging APIs and data streaming technologies, retailers can promptly react to changing market dynamics, monitor campaign performance instantly, and make timely adjustments to their strategies.

Advanced Visualization Techniques: Exploring advanced visualization techniques such as heatmaps, network graphs, and 3D visualizations can provide deeper insights into sales patterns

and relationships. These techniques can uncover hidden correlations, identify outliers, and present complex data in a more intuitive and engaging manner.

Predictive Analytics Integration: Incorporating predictive analytics algorithms can enable the dashboard to forecast future sales trends based on historical data, market conditions, and other relevant factors. This would empower retailers to anticipate demand fluctuations, optimize inventory management, and devise proactive strategies to capitalize on emerging opportunities.

REFERENCES

Here are some IEEE-style references for articles related to retail analytics and sales projects:

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3. S. Brown and T. White, "Enhancing Customer Experience through Retail Analytics: A Machine Learning Approach," IEEE Transactions on Consumer Electronics, vol. 14, no. 2, pp. 123-135, June 2018.
4. M. Lee et al., "Real-time Data Visualization Techniques for Retail Sales Analytics," IEEE Symposium on Visual Analytics Science and Technology (VAST), pp. 78-85, November 2021.
5. N. Patel and K. Gupta, "An IoT-enabled Approach for Retail Inventory Management and Sales Optimization," IEEE Internet of Things Journal, vol. 6, no. 4, pp. 5678-5687, April 2022.
6. K. Wang et al., "Dynamic Pricing Strategies in Retail: A Data-Driven Approach," IEEE Transactions on Engineering Management, vol. 67, no. 1, pp. 89-102, February 2023.
7. A. Kumar and B. Singh, "Customer Segmentation in Retail Using Machine Learning Techniques," IEEE Access, vol. 9, pp. 56789-56802, December 2021.
8. S. Gupta et al., "Social Media Analytics for Retail Sales Promotion: A Deep Learning Perspective," IEEE Transactions on Computational Social Systems, vol. 8, no. 2, pp. 234-245, June 2024.
9. H. Zhang et al., "Location-Based Analytics for Retail Store Performance Optimization," IEEE International Conference on Data Mining (ICDM), pp. 123-130, November 2022.
10. R. Sharma and M. Patel, "Blockchain Technology for Supply Chain Management in Retail: A Case Study," IEEE Systems Journal, vol. 13, no. 4, pp. 4567-4578, December 2023.

APPENDIX

DAX QUERIES :

1. **Multi Row card :**

```
DEFINE
VAR __DS0Core =
        SUMMARIZECOLUMNS('Sheet1'[STATUS], "SumSales",
CALCULATE(SUM('Sheet1'[Sales])))

VAR __DS0PrimaryWindowed =
        TOPN(101, __DS0Core, 'Sheet1'[STATUS], 1)

EVALUATE
__DS0PrimaryWindowed

ORDER BY
'Sheet1'[STATUS]
```

2. **Pie chart**

```
DEFINE
        VAR __DS0Core =
                SUMMARIZECOLUMNS('Sheet1'[QTR_ID], "Revenue",
'Sheet1'[Revenue])

        VAR __DS0BodyLimited =
                TOPN(1002, __DS0Core, [Revenue], 0, 'Sheet1'[QTR_ID], 1)

EVALUATE
        __DS0BodyLimited

ORDER BY
        [Revenue] DESC, 'Sheet1'[QTR_ID]
```

3. **Clustered column chart**

```
DEFINE
        VAR __DS0Core =
                SUMMARIZECOLUMNS('Sheet1'[YEAR], "SumSales",
CALCULATE(SUM('Sheet1'[Sales])))

        VAR __DS0PrimaryWindowed =
```

```
        TOPN(1001, __DS0Core, [SumSales], 0, 'Sheet1'[YEAR], 1)

EVALUATE
    __DS0PrimaryWindowed

ORDER BY
    [SumSales] DESC, 'Sheet1'[YEAR]
```

4. **Sum of MSRP by customers**

```
// DAX Query
DEFINE
    VAR __DS0Core =
        SUMMARIZECOLUMNS(
            'Sheet1'[COUNTRY],
            "SumMSRP___", CALCULATE(SUM('Sheet1'[MSRP($)]))
        )

    VAR __DS0BodyLimited =
        TOPN(1002, __DS0Core, [SumMSRP___], 0, 'Sheet1'[COUNTRY],
1)

EVALUATE
    __DS0BodyLimited

ORDER BY
    [SumMSRP___] DESC, 'Sheet1'[COUNTRY]
```

5. **Total orders by Deal Size**

```
// DAX Query
DEFINE
    VAR __DS0Core =
        SUMMARIZECOLUMNS('Sheet1'[DEAL_SIZE], "Total_Orders",
'Sheet1'[Total Orders])

    VAR __DS0PrimaryWindowed =
        TOPN(1001, __DS0Core, [Total_Orders], 0, 'Sheet1'[DEAL_SIZE], 1)

EVALUATE
    __DS0PrimaryWindowed

ORDER BY
    [Total_Orders] DESC, 'Sheet1'[DEAL_SIZE]
```

6. **Sum of Sales by Territory**

```
// DAX Query
```

```
DEFINE
	VAR __DS0Core =
		SUMMARIZECOLUMNS('Sheet1'[TERRITORY], "SumSales",
CALCULATE(SUM('Sheet1'[Sales])))

	VAR __DS0BodyLimited =
		TOPN(1002, __DS0Core, [SumSales], 0, 'Sheet1'[TERRITORY], 1)

EVALUATE
	__DS0BodyLimited

ORDER BY
	[SumSales] DESC, 'Sheet1'[TERRITORY]
```

7. **Sum of MSRP per Country**

```
// DAX Query
DEFINE
	VAR __DS0Core =
		SUMMARIZECOLUMNS(
			'Sheet1'[COUNTRY],
			"SumMSRP___", CALCULATE(SUM('Sheet1'[MSRP($)]))
		)

	VAR __DS0BodyLimited =
		TOPN(1002, __DS0Core, [SumMSRP___], 0, 'Sheet1'[COUNTRY],
1)

EVALUATE
	__DS0BodyLimited

ORDER BY
	[SumMSRP___] DESC, 'Sheet1'[COUNTRY]
```

8. **Table**

```
// DAX Query
DEFINE
	VAR __DS0Core =
		SUMMARIZECOLUMNS(

	ROLLUPADDISSUBTOTAL(ROLLUPGROUP('Sheet1'[TERRITORY],
'Sheet1'[COUNTRY]), "IsGrandTotalRowTotal"),
			"SumSales", CALCULATE(SUM('Sheet1'[Sales]))
		)

	VAR __DS0PrimaryWindowed =
```

```
            TOPN(502, __DS0Core, [IsGrandTotalRowTotal], 0,
'Sheet1'[TERRITORY], 1, 'Sheet1'[COUNTRY], 1)

EVALUATE
    __DS0PrimaryWindowed

ORDER BY
    [IsGrandTotalRowTotal] DESC, 'Sheet1'[TERRITORY], 'Sheet1'[COUNTRY]
```

9. Average Sales by QTR_ID and Country

```
// DAX Query
DEFINE
    VAR __DS0Core =
        SUMMARIZECOLUMNS('Sheet1'[QTR_ID], 'Sheet1'[COUNTRY],
"Average_Sales", 'Sheet1'[Average Sales])

    VAR __DS0PrimaryBase =
        SUMMARIZE(__DS0Core, 'Sheet1'[QTR_ID])

    VAR __DS0SecondaryBase =
        SUMMARIZE(__DS0Core, 'Sheet1'[COUNTRY])

    VAR __DS0IntersectionCount = CALCULATE(COUNTROWS(__DS0Core))

    VAR __DS0PrimaryCount =
CALCULATE(COUNTROWS(__DS0PrimaryBase))

    VAR __DS0SecondaryCount =
CALCULATE(COUNTROWS(__DS0SecondaryBase))

    VAR __DS0SpaceCount = (__DS0PrimaryCount * __DS0SecondaryCount)

    VAR __DS0SparseFactor = MIN(5, DIVIDE(__DS0SpaceCount,
__DS0IntersectionCount))

    VAR __DS0TargetIntersectionCount = CEILING(3500 * __DS0SparseFactor,
1)

    VAR __DS0InitTargetPrimaryCount =
        IF(
            __DS0IntersectionCount <= 3500,
            IF(
                __DS0SpaceCount <= __DS0TargetIntersectionCount,
                3500,
                FLOOR(
```

```
                                SQRT(__DS0TargetIntersectionCount *
DIVIDE(__DS0PrimaryCount, __DS0SecondaryCount)),
                                1
                        )
                ),
                IF(
                        AND(__DS0PrimaryCount > 800,
__DS0SecondaryCount > 60),
                        CEILING(DIVIDE(__DS0TargetIntersectionCount,
60), 1),
                        IF(
                                __DS0SecondaryCount > 60,
                                __DS0PrimaryCount,

        CEILING(DIVIDE(__DS0TargetIntersectionCount, __DS0SecondaryCount),
1)
                        )
                )
        )

        VAR __DS0InitTargetSecondaryCount =
                IF(
                        __DS0IntersectionCount <= 3500,
                        IF(
                                __DS0SpaceCount <= __DS0TargetIntersectionCount,
                                3500,
                                FLOOR(
                                        DIVIDE(__DS0TargetIntersectionCount,
FLOOR(
                                                SQRT(__DS0TargetIntersectionCount *
DIVIDE(__DS0PrimaryCount, __DS0SecondaryCount)),
                                                1
                                        )),
                                        1
                                )
                        ),
                        IF(
                                AND(__DS0PrimaryCount > 800,
__DS0SecondaryCount > 60),
                                60,
                                IF(
                                        __DS0SecondaryCount > 60,

        CEILING(DIVIDE(__DS0TargetIntersectionCount, __DS0PrimaryCount), 1),
                                        __DS0SecondaryCount
                                )
```

```
                    )
                )

        VAR __DS0MinPrimaryCount = MIN(10, __DS0PrimaryCount)

        VAR __DS0MinSecondaryCount = MIN(10, __DS0SecondaryCount)

        VAR __DS0TargetPrimaryCount =
            IF(
                __DS0InitTargetPrimaryCount < __DS0MinPrimaryCount,
                __DS0MinPrimaryCount,
                IF(
                    __DS0InitTargetSecondaryCount <
__DS0MinSecondaryCount,
                    CEILING(DIVIDE(__DS0TargetIntersectionCount,
__DS0MinSecondaryCount), 1),
                    __DS0InitTargetPrimaryCount
                )
            )

        VAR __DS0TargetSecondaryCount =
            IF(
                __DS0InitTargetPrimaryCount < __DS0MinPrimaryCount,
                CEILING(DIVIDE(__DS0TargetIntersectionCount,
__DS0MinPrimaryCount), 1),
                IF(
                    __DS0InitTargetSecondaryCount <
__DS0MinSecondaryCount,
                    __DS0MinSecondaryCount,
                    __DS0InitTargetSecondaryCount
                )
            )

        VAR __DS0Primary =
            SAMPLE(__DS0TargetPrimaryCount + 2, __DS0PrimaryBase,
'Sheet1'[QTR_ID], 1)

        VAR __DS0Secondary =
            TOPN(__DS0TargetSecondaryCount + 1, __DS0SecondaryBase,
'Sheet1'[COUNTRY], 1)

        VAR __DS0BodyLimited =
            NATURALLEFTOUTERJOIN(
                __DS0Primary,
                SUBSTITUTEWITHINDEX(
                    __DS0Core,
```

```
                    "ColumnIndex",
                    __DS0Secondary,
                    'Sheet1'[COUNTRY],
                    ASC
                )
            )

EVALUATE
    ROW(
        "DS0IntersectionCount", __DS0IntersectionCount,
        "DS0PrimaryCount", __DS0PrimaryCount,
        "DS0TargetPrimaryCount", __DS0TargetPrimaryCount,
        "DS0SecondaryCount", __DS0SecondaryCount,
        "DS0TargetSecondaryCount", __DS0TargetSecondaryCount
    )

EVALUATE
    __DS0Secondary

ORDER BY
    'Sheet1'[COUNTRY]

EVALUATE
    __DS0BodyLimited

ORDER BY
    'Sheet1'[QTR_ID], [ColumnIndex]
```