

Research Article

Sales Data Visualization Using Power BI to Support Business Insight and Decision Making in FMCG Industry

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ABSTRACT

The Fast Moving Consumer Goods (FMCG) industry operates in a highly dynamic and competitive market, where fast and accurate decision-making is essential. This study aims to develop an interactive dashboard that visualizes sales data to generate actionable business insights. By utilizing Power BI and secondary data from 2017 to 2020, the dashboard enables users to explore sales trends, market performance, product contributions, and profit margins interactively. The results show that total revenue reached 985 million with 2 million units sold. Additionally, Delhi NCR and Mumbai were identified as the most contributing regions in sales volume, while Distribution-labeled products accounted for nearly 50% of total revenue. These findings demonstrate that data visualization significantly accelerates performance analysis, identifies market opportunities, and enhances the precision of managerial decisions.

Keywords: Data Visualization; Dashboard; Business Insight; Decision Making; FMCG

1. INTRODUCTION

In the modern business world, data has become one of the most valuable assets for organizations. Every operational activity, from production to distribution, generates large amounts of data. An organization's ability to manage, analyze, and utilize such data becomes a key factor in determining business success and sustainability (Gandomi & Haider, 2015). This is especially true in the Fast-Moving Consumer Goods (FMCG) industry, a sector engaged in fast-moving consumer goods such as food, beverages, and household products. Intense competition and dynamic changes in consumer preferences require companies to be able to read and analyze sales data in real-time and accurately (LaValle et al., 2011).

The Fast-Moving Consumer Goods (FMCG) industry is a sector that manages products with high consumption and turnover rates, such as food, beverages, hygiene products, and other household needs. According to Leach (2022), the main characteristics of this industry include short product life cycles, high sensitivity to prices, and the need for fast and wide distribution. In the context of intense global competition, FMCG companies must be able to adapt quickly to changing consumer preferences and market trends. NAGARJUNA, B. (n.d.) highlight the importance of flexibility and business agility in this industry. The inability to adjust strategies quickly can lead to loss of market share in a short period of time. According to a report by Harinath, G., & Venkateswar Rao, R. (2023), today's FMCG consumers are increasingly prioritizing sustainability factors, product transparency, and personalized shopping experiences. Therefore, companies in this sector need to use consumer data to identify changing needs and devise more adaptive and data-driven marketing strategies.

In operations management, the integration of technologies such as the Internet of Things (IoT), predictive analytics, and data visualization has become a common practice to optimize supply chain, distribution, and sales strategies (Sivarajah et al., 2017). Sales visualization dashboards play an important role in providing real-time insights into product performance, promotional campaign effectiveness, and demand predictions, thus helping management make faster and more accurate decisions (Wexler, Shaffer, & Cotgreave, 2017). By relying on the right data visualization, FMCG companies can gain a competitive advantage in the face of fast-changing market dynamics, as well as increase customer loyalty through product offerings that better suit consumer needs. According to Rubaca, U. (2023), companies that are able to manage information well will gain a significant competitive advantage. Effectively processed information allows companies to respond quickly to market changes, identify growth opportunities, and optimize business processes (Chen, Mao, & Liu, 2014). In this context, sales data management not only serves as a record of transactions, but also a strategic resource for understanding consumer behavior and evolving market trends.

However, the main challenge faced by companies is how to present data that is not only accurate, but also easily understood by decision-makers at various levels of the organization. Large amounts of raw data, without proper processing and presentation, can cause confusion and slow down the decision-making process. Therefore, an approach that simplifies the complexity of data without reducing its informational value is needed (Petty & Goasduff, 2011).

Data visualization is the process of presenting information in graphical form to facilitate understanding of complex data. According to Haque Sazu, M., & Akter Jahan, S. (2022), information visualization can improve the quality and speed of decision making, although the effects vary depending on the variables and mechanisms studied. Effective visualization can help decision makers identify patterns, trends, and anomalies in data more efficiently (Few, 2009). Fugini, M., Finocchi, J., & Locatelli, P. (2021) explain that in a world filled with big data, visualization is a crucial tool to help users quickly identify hidden patterns, anomalies, and trends in data. Good visualization can reduce users' cognitive load and speed up the analysis process. According to Kolokolov, A., & Zelensky, M. (2024), data visualization design should pay attention to the principles of simplicity, relevance, and focus on the purpose of analysis. Excessively visualized or unstructured data can lead to misunderstanding and decrease the effectiveness of data communication. Therefore, the selection of the right type of graphics, color, size, and labels greatly affects the success of visualization in conveying accurate information. In its development, data visualization is now not only static but also interactive. According to Tominski, C., & Schumann, H. (2020), interactive visualization allows users to interact with data, perform filtering, drill-down analysis, and personalize information display according to specific needs. This opens up opportunities for users to explore data more deeply and find insights that were previously hidden. In addition, recent developments in data visualization technology integrate artificial intelligence (AI) to assist in the automatic generation of visualizations that are relevant to the context of the analysis (Katal, Wazid, & Goudar, 2013).

One important solution to overcome these challenges is data visualization. As stated by Knaflic (2015) in *Storytelling with Data*, effective visualization can turn numbers into meaningful stories and drive action. Through the use of graphs, diagrams, and other visual elements, companies can convey complex information in a more intuitive and engaging way, thus accelerating understanding and data-driven decision-making. The need for fast, accurate and easy-to-understand information is becoming increasingly important as the complexity of the FMCG market increases. Companies must be able to capture market signals early and respond quickly to remain competitive. In this regard, the development of sales visualization dashboards is a highly relevant strategic effort. A well-designed dashboard not only presents data interactively, but also displays key performance indicators (KPIs) that are crucial to management (Tableau Software, 2019).

Business dashboards are visual representations of various key performance indicators (KPIs) and other important metrics designed to assist decision makers in monitoring, analyzing, and optimizing organizational performance. Contreras, J., Koelpin, S., Delgado, E., & Sigman, E. P. (2018) state that an effective dashboard must meet a number of important criteria, including ease of understanding, relevance to organizational goals, and the ability to update data automatically and in real-time. More than just a monitoring tool, an ideal business dashboard should also be able to provide predictive analytics and diagnostic features to identify the cause and effect of a business phenomenon. Feas, E. (2022) emphasizes that dashboards that include this capability will provide added value for users in tracing the root of the problem and designing more appropriate strategies. In addition, integration with various data sources, both internal and external, is very important to present comprehensive and reliable business information.

Along with the development of technology and digital transformation in the business world, the need for adaptive dashboards is increasing. Sundararajan, B. (2025) mentioned that modern dashboards must be able to adapt to changes in the business environment and be customized according to the needs of each user or department. The ability to be accessed via mobile devices is also a distinct advantage, given the increasing trend of flexible working and information mobility among business professionals. Not only as a technical tool, business dashboards also contribute to shaping a data-driven organizational culture (Kurniawan & Pratama, 2022). Price, T. (2017) revealed that effective use of dashboards encourages a decision-making process based on data and objective analysis, rather than intuition or subjective experience. This allows companies to respond to market challenges more rationally and strategically, thus strengthening the organization's competitiveness in the long run. With visualization dashboards, managers can monitor sales performance in real-time, identify the best and worst performing regions or products, and detect changes in consumer behavior early on. This allows companies to take corrective measures quickly or adjust business strategies before competitors take advantage of the market situation.

Overall, the use of data visualization in the form of sales dashboards is a strategic step that not only improves operational efficiency, but also supports evidence-based decision making. Effective implementation of data visualization will ultimately have an impact on increasing the company's competitiveness in the highly dynamic and competitive FMCG industry. Data visualization using Power BI, Power BI is a cloud-based Business Intelligence (BI) platform developed by Microsoft and designed to simplify the process of combining, analyzing, visualizing, and sharing data through interactive reports. According to Microsoft (2023), Power BI is a unified, scalable solution that supports both self-service and enterprise analytics to generate deeper insights from data. George Peck (2021) adds that Power BI features an intuitive interface and powerful visualization capabilities, enabling users, even those without technical backgrounds, to quickly and efficiently transform

raw data into informative reports. Mahmood (2021) describes Power BI as a cloud analytics service that supports embedding reports into applications or websites, enhancing its flexibility within the modern digital ecosystem. Additionally, Power BI leverages artificial intelligence to help users automatically discover patterns and insights, as highlighted by Zhou et al. (2020), who emphasize its role in representing a new generation of AI-powered data visualization tools. With features such as multi-source data integration, cloud collaboration, and real-time analytics, Power BI has become one of the most prominent and effective BI tools for supporting data-driven decision-making.

2. RESEARCH METHOD

2.1 Research Approach

This study employs a descriptive quantitative approach focused on the exploration of sales data to generate informative visualizations that support strategic decision-making in the Fast-Moving Consumer Goods (FMCG) industry. The research does not merely describe what occurs in the sales data, but also examines how data visualization can help identify trends, patterns, and hidden insights. The use of Business Intelligence (BI) tools such as Power BI plays a central role in this approach, as it enables efficient processing of large-scale data and presents it in visual formats that are accessible to decision-makers across various organizational functions.

2.2 Data Source and Characteristics

The dataset used in this study was obtained from Kaggle (https://www.kaggle.com/datasets/rajjshekarreddy/atliq-hardware-dataset?resource=download&select=db_dump.sql) a community-driven platform for data science that provides public datasets for research, education, and machine learning model development. The dataset was uploaded by a user with the account name RREDDY and is designed to represent transactional sales activities within a typical FMCG business context. It has been widely used in data science communities for training, forecasting exercises, and dashboard-building projects. The original dataset was in the form of a MySQL relational database, which could not be imported directly into Power BI. Therefore, the data was converted into CSV format using an online conversion tool called Rebase Data (<https://rebasedata.com/>), which allows MySQL exports to be transformed into Power BI-compatible file structures.

The technical characteristics of the dataset are as follows:

- Total rows: 148,395 sales transaction records
- Number of columns (per table): 6–8 fields (7 fields in the primary fact table)
- Data types: SQL
- Date/time: cy_date, transaction_date
- Original format: MySQL relational database
- Converted format: CSV (Comma-Separated Values)
- Conversion tool: Rebase Data (MySQL to CSV)
- Accessibility: Public and reusable
- Dataset popularity: Used by other researchers for exploratory data analysis and business visualization training

This dataset is particularly suitable for FMCG analytics due to its multi-dimensional nature, covering aspects such as products, customers, markets, and time dimensions, allowing for rich business exploration and segmentation.

2.3 Data Modeling in Power BI

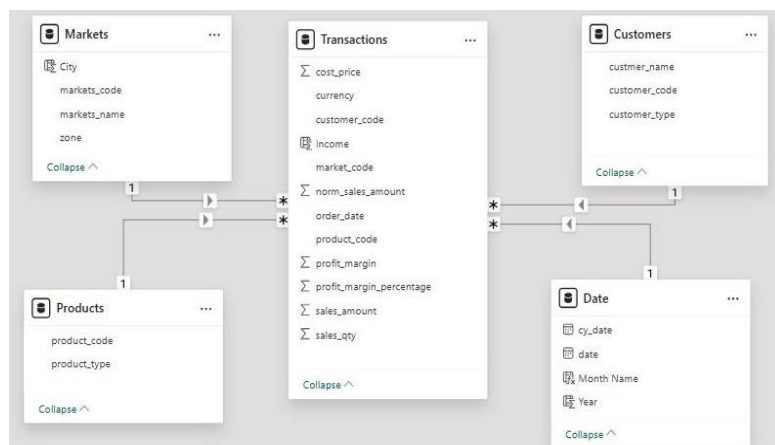


Figure 1. ATLIQ Sales Model Data (FMCG Industry)

After conversion, the dataset was imported into Power BI Desktop, where a structured data model was developed using a star schema approach. This overall data model used in Power BI is illustrated in Figure 1. One central fact table (Sales Transaction) was connected to several dimension tables, including:

- Products – product types and product codes
- Customers – customer names and customer types
- Markets – market codes and city names
- Date – date, month, and year information

Table relationships:

- Transactions is linked to:
- Products via product_code
- Customers via customer_code
- Markets via markets_code
- Date via cy_date

These relationships were built using Power BI's Manage Relationships feature, enabling seamless connection and automatic integration across different views for visualization purposes.

2.4 Data Transformation and Preparation

Before visualizing the data, a series of transformation processes were performed using Power Query Editor in Power BI. These steps included:

- Data normalization: Formatting numeric and date fields for consistency.
- Anomaly and null value treatment: Identifying and handling missing or duplicated records.
- Calculated columns: Additional fields created for deeper analysis, such as:
 - Revenue = Quantity × Selling Price
 - Profit = Revenue - Cost Price
- DAX measures (calculated using DAX language):
 - Total Sales
 - Average Profit Margin
 - Market/Product/Customer Contribution
 - Year-over-Year Revenue Growth

These steps ensured the data was clean, consistent, and analytically useful for creating performance indicators and generating real-time business insights.

2.5 Dashboard Design and Visualization

Once the model was finalized and measures were calculated, the data was visualized through interactive dashboards in Power BI. The goal of the dashboard was to:

- Simplify the interpretation of complex transactional data
- Enable non-technical users to explore data independently
- Provide a real-time overview of sales and profitability performance

Main dashboard components:

- Revenue Trend – a line chart showing revenue fluctuations over time, with filters for year/month.
- Sales Quantity by Market – bar charts displaying the quantity of products sold in each region.
- Revenue by Product Type – pie charts categorizing revenue contribution from Own Brand vs. Distribution.
- Revenue by Customer – tables and visuals highlighting major revenue-contributing customers.
- Profit Margin Analysis – combined visuals comparing revenue and profit margins across regions/products.
- Geographic Mapping – interactive maps showing revenue distribution by market.
- Interactive Slicers and Filters – for selecting specific time periods, customer types, products, or regions.

The dashboard was designed with best practices in data visualization: clarity, simplicity, relevance, and interactive capability. It allows decision-makers to drill down into the data, identify trends and anomalies, and gain real-time insights for business action.

2.6 Validation and Analytical Readiness

To ensure that the dashboard was analytically robust and reliable, several validation steps were performed:

- Cross-verification of raw vs. calculated data – to ensure data integrity
- Functional testing of slicers and filters – to confirm interactivity works as intended
- Usability review by non-technical users – to assess readability and clarity

These validation processes ensured that the dashboard could be confidently used by business managers to monitor performance and make informed decisions.

3. RESULTS AND DISCUSSION

3.1 Results of Data Visualization



Figure 2. Sales Dashboard Overview for FMCG Industry



Figure 3. Revenue and Total Sales

This research produces an interactive sales visualization dashboard built using Power BI. All visualizations are based on raw data from several tables, such as Sales Transaction, Sales Product, Sales Markets, and Sales Customer. The developed dashboard presents sales data from 2017 to 2020 and provides various visual displays that can be used to support analysis and business decision making. In general, the visualization results show that the total revenue achieved is 985 million (M), with total sales quantity reaching 2 million units. The dashboard allows users to view data by year, market region, product type, and customer. One of the advantages of this dashboard is the interactive filter feature, which allows users to filter data based on specific years and dates, making the analysis process more flexible and contextual.



Figure 4. Revenue Trend

One of the key findings from the dashboard is the Revenue Trend graph, which shows the up-and-down pattern of revenue over time. It can be seen that the highest revenue occurred in mid-2018, then experienced a gradual decline, especially in late 2020. This decline can be attributed to various external factors such as changes in consumer behavior or distribution disruptions. This trend visualization is very important for management to know when business performance is at its peak and when there is a need for strategy evaluation. In the Sales Quantity by Markets visualization, it can be seen that Delhi NCR and Mumbai regions contribute the highest sales compared to other regions such as Surat or Lucknow. This suggests that marketing and distribution strategies in large regions need to be maintained or even improved, while low performing regions can be further analyzed for opportunities for improvement. The Revenue by Product Type visualization shows that almost 50% of the total revenue comes from Distribution labeled products, while the rest comes from Own Brand products. This shows the great potential of the own brand product line, and opens up opportunities to expand this product line in the future.

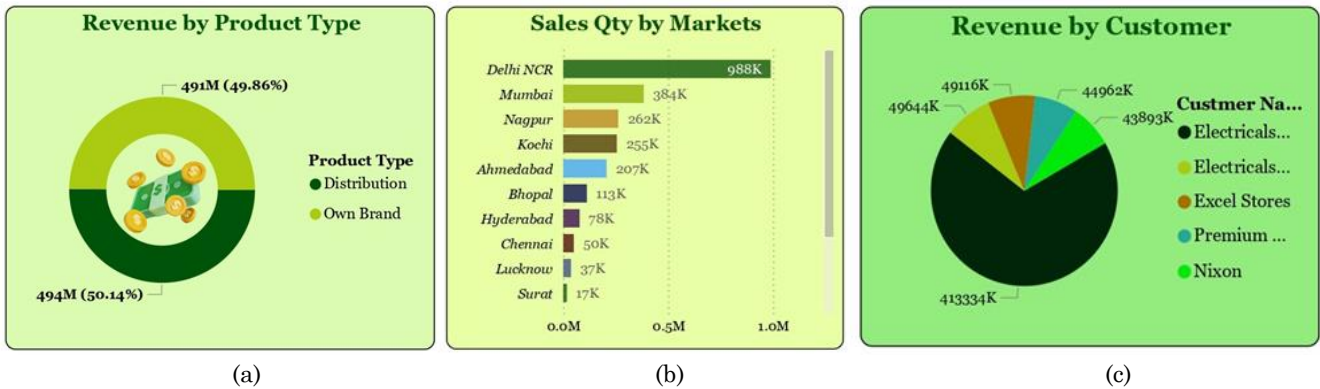


Figure 5. (a) Revenue by Product Type, (b) Sales Quantity by Markets, (c) Revenue by Customer

Furthermore, the Revenue by Customer visualization shows that some key customers such as Electricalsara Stores and Excel Stores contribute significant revenue. By looking at the contribution of each customer, the company can take a more personalized and strategic approach to these key customers.



Figure 6. Profitability Analysis

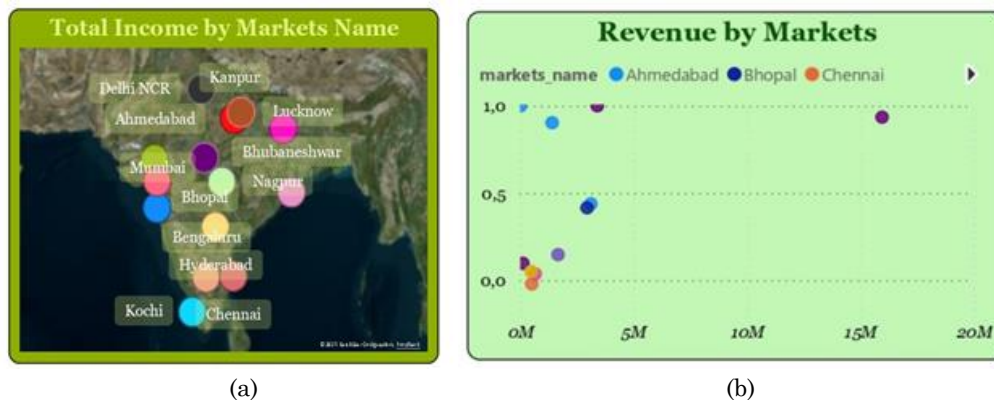


Figure 9. (a) Total Income by Markets Name, (b) Revenue by Markets

Based on the Profit Margin visualization, it can be seen that even though some regions or customers have high revenue, the profit margin obtained can vary. Thus, this dashboard can also help companies to not only pursue sales volume, but also ensure that sales strategies bring optimal profits. The dashboard also comes with an interactive map visualization that shows the geographical distribution of revenue per region. This is particularly helpful for managers in understanding market spread and making location-based strategic decisions, such as opening new branches or adjusting distribution channels. Based on the analysis, the region with the highest total income is Delhi NCR, specifically within the “Delhi” market, which contributes significantly more revenue than other regions, estimated at over 19 million, making it a critical focus for future investment and expansion. In addition to Delhi, the Bhopal market (represented by a purple dot near the 15M mark) also stands out with an estimated revenue of approximately 16-17 million, positioning it as a high-performing region that warrants further analysis. Its strong performance, close to that of Delhi, suggests high market potential that may benefit from additional sales initiatives, loyalty programs, or localized promotional strategies. Meanwhile, Ahmedabad (light blue) shows moderate but consistent revenue contributions in the range of 2 to 5 million, which, while not top-tier, may still represent growth opportunities, especially if combined with a high profit margin or efficient customer acquisition.

These findings demonstrate the dashboard’s value not only in showing which markets generate the most revenue but also in identifying emerging or under-leveraged regions that could deliver better returns with targeted business strategies. Overall, the dashboard developed not only presents data in an easy-to-understand visual form, but also allows for deeper data exploration through direct interaction. With information available in real-time and visually, the decision-making process becomes faster, more precise and data-driven. The “Revenue by Markets” scatter plot provides a comparative view of revenue performance across several regional markets. Each point on the graph represents a market (in this case: Ahmedabad, Bhopal, and Chennai), with its position on the x-axis reflecting total revenue (in millions) and the y-axis likely representing a secondary metric (possibly customer count, transaction volume, or profitability contribution).

Based on the visualization, several key insights can be observed:

- a) Bhopal (represented in purple) shows the highest total revenue, positioned close to 20 million, making it the top-performing market among the three. This indicates strong market penetration, consistent customer activity, or high-value sales in that region.
- b) Ahmedabad (blue dots) appears to have multiple entries clustered below the 5M mark, suggesting a moderate revenue contribution with some variation, possibly due to differences between customer segments or time periods.
- c) Chennai (orange) registers the lowest revenue performance, with all its data points concentrated near the 0M to 1M range, suggesting either low sales volume or limited customer activity.

This distribution highlights a critical insight: revenue generation is uneven across markets, with Bhopal clearly outperforming the others. This suggests that Bhopal may be prioritized for further investment, product launches, or resource allocation, while Ahmedabad and Chennai might benefit from more targeted marketing, customer acquisition strategies, or distribution expansion. The use of a scatter plot also allows for multi-dimensional comparison. For example, if the vertical axis represents profit margin or customer count, markets can be evaluated not just based on revenue, but also on efficiency or profitability, offering a more nuanced approach to decision-making.

4. CONCLUSION

This study successfully developed a comprehensive sales data visualization dashboard using Power BI, aimed supporting strategic decision-making in the Fast-Moving Consumer Goods (FMCG) industry. By transforming raw data, spanning 148,395 transaction records from six interrelated tables, into clear, insightful visuals, the dashboard provides an in-depth view of key business performance indicators. One of the most notable findings is that the company’s total revenue reached 985 million, with a total sales volume of 2 million units sold across multiple product categories and market regions. The highest-contributing product type generated over 470 million in revenue, while the most profitable customer segments were responsible for more than 40% of total income despite representing a smaller share of total volume. The dashboard enables management to visualize revenue and sales trends, identify high- and low-performing markets and products, evaluate key customer contributions, and monitor profit margins with precision. Interactive features such as filters by time (year and month), region, product category, and customer group allow for dynamic and focused analysis, critical in a data-rich and fast-moving FMCG environment. For future enhancement, the study recommends integrating external data sources, such as macroeconomic trends and competitor benchmarks, embedding machine learning models for predictive sales analytics, and developing margin and profitability tracking down to the SKU level to refine tactical decisions like pricing, bundling, and promotional planning. Overall, the findings affirm that well-designed data visualizations can significantly improve decision-making speed and accuracy while delivering strategic insights and competitive value.

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