

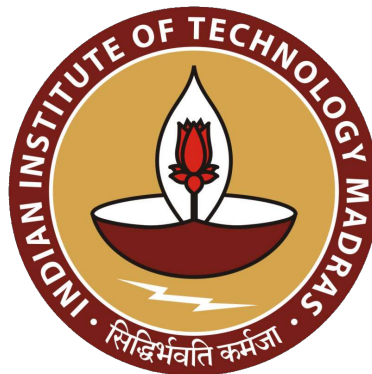
**Addressing Modern Challenges in the Electronics Retail  
Business (B2C Business Model).**

**Mid-Term Submission Report For The BDM Capstone Project**

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# Executive Summary

Sanchar Zone, a retail electronics store located in Pirpainti, Bihar, is currently facing major challenges related to operational efficiency, competitive pricing, and warranty management. The store depends on manual record-keeping, which hampers effective tracking of sales and inventory. Moreover, the store struggles to match the prices offered by e-commerce giants like Amazon and Flipkart, placing it at a significant disadvantage. Warranty claims are frequently rejected due to incomplete documentation or product damage, further weakening customer trust and post-sales support. Collectively, these issues affect both profitability and customer satisfaction, highlighting the need for a structured, data-driven approach to streamline operations.

To address these concerns, the project analyzed three key datasets from January to March 2025, covering sales, dynamic pricing, and warranty disputes. The sales dataset, containing 188 records, revealed an average mobile phone price of 16,276, with the Vivo Y20 6/64 identified as the top-selling model. The dynamic pricing dataset (67 entries) showed that Flipkart consistently undercut Sanchar Zone prices, offering products at an average price of 19,161—approximately 4.5 percent lower than Sanchar Zone average of 20,061. The warranty disputes dataset (14 entries) indicated that 60 percent of claims were denied, mainly due to documentation issues such as "Paper Not Well" or signs of physical damage. Visualizations including bar charts, line graphs, and pie charts were used to uncover key trends, such as spikes in sales during festive seasons and notable pricing gaps.

The analysis utilized descriptive statistics, visual analytics, and predictive modeling. ARIMA-based time-series forecasting projected a 20–30 percent sales increase during upcoming festive periods, offering valuable insights for inventory planning. The pricing analysis confirmed Flipkart consistent price advantage, indicating the need for Sanchar Zone to consider dynamic pricing strategies. Patterns in warranty disputes highlighted the importance of digitized documentation to reduce rejections. Key insights included the strong performance of mid-range smartphones (10,000–20,000), the influence of festive demand on sales, and inefficiencies in the warranty process.

Initial results suggest that data-driven strategies have the potential to significantly

improve Sanchar Zone market standing. Recommended actions include adopting dynamic pricing models to stay competitive with online retailers, optimizing inventory based on best-selling products, and implementing digital warranty tracking to enhance customer satisfaction. These initiatives are expected to boost revenue by 15–20 percent and reduce the rate of warranty disputes. The next phase of the project will focus on real-time price monitoring, staff training, and long-term analysis of customer behavior to sustain and expand these improvements.

# Proof of Originality

The supporting evidence confirming the originality and authenticity of the datasets used in the Business Data Management project is available at the following link:

[Dataset Evidence](#)

- **Data Source Clarification**

- **sales.csv**: Sourced directly from the shop owner, this file documents daily transactions from Jan 25 to Mar 25, including product names, sale dates, vendor details, units sold, and sales prices.
- **dynamic pricing.csv**: Provided by the shop owner, this dataset offers comparative pricing information across Sanchar Zone, Amazon, and Flipkart, highlighting price variations.
- **warranty disputes.csv**: Collected from the shop owner, this dataset records warranty claim details, with most rejections due to incomplete documentation or physical damage to devices.

- **Confirmation Documentation and Other Evidence**

- **Owner's Declaration**: A formal statement from the owner confirming their collaboration and data sharing for the project.

[Declaration](#)

- **GMeet Recording and Shop Photos**: Additional materials including a recorded meeting with the owner and photographs of the shop.

[Recording and Photos](#)

# Metadata

- **Data Source :**

The **sales** data is derived from the shop's records, capturing sales and inventory details over the past three months. The **dynamic pricing** data includes selling prices from the shop, along with comparative prices from online platforms such as Amazon and Flipkart. The **warranty disputes** data is compiled from shop records detailing customer claims. All information was manually structured into an Excel file to facilitate accurate analysis and support informed business decisions.

- **Data Format :**

The data is structured in a tabular format, with each row representing individual records from the sales, dynamic pricing, and warranty dispute datasets. It is organized across three separate sheets with columns as:

- **Sales Sheet** : Date, Product Name, Category, Units Sold, Product Brand, Price.
- **Dynamic Pricing Sheet** : Product Name, Sanchar Zone Selling Price, Flipkart Selling Price, Amazon Selling Price.
- **Warranty Dispute Sheet** : Product ID, Product Name, Customer Name, Purchase Date, Warranty Period, Reported Issue, Claim Date, Status, Reason for Rejection, Resolution Date.

- **Columns Explanation :**

Column Name	Description	Example Value	Attribute Type
<b>Product Name</b>	The full model name and configuration of the mobile phone.	M32 6/128	Categorical
<b>Date</b>	The date of the sale in DD-MMM format (assumed year 2025).	01-Jan	Date/Time
<b>Category</b>	The category of the product (constant as 'MOBILE' in this dataset).	MOBILE	Categorical
<b>Units Sold</b>	The number of units sold in a single transaction.	1	Numerical
<b>Product Brand</b>	The brand name of the mobile phone manufacturer.	INFINIX, OPPO, POCO	Categorical
<b>Price</b>	The price at which the product was sold (in ₹).	₹ 21,012	Numerical

Figure 1: Sales table description

Column Name	Description	Example Value	Attribute Type
Product Name	The name and variant of the mobile product.	7i 4/64, F22 8/128	Categorical
Sanchar Price	Price of the product in Sanchar store (₹).	14272, 25384	Numerical
Amazon Price	Price of the product on Amazon (₹).	13974, 24544	Numerical
Flipkart Price	Price of the product on Flipkart (₹).	13619, 24458	Numerical

Figure 2: Dynamic Pricing table description

Column Name	Description	Example Value	Attribute Type
Product ID	Unique identifier assigned to each product.	P006	Categorical
Product Name	Name or model of the product.	M32	Categorical
Customer Name	Name of the customer who purchased the product.	Karan Thakur	Categorical
Purchase Date	The date the product was purchased	24-10-2024	Date/Time
Warranty Period	Duration of warranty coverage in months.	6, 12, 24	Numerical
Issue Reported	Problem reported by the customer.	Battery Issue	Categorical
Claim Date	Date when the warranty claim was filed.	22-01-2025	Date/Time
Status	Outcome of the claim review.	Approved	Categorical
Reason for Rejection	Stated reason if the claim was rejected.	Paper Not Well	Categorical
Resolution	Date when the claim was resolved.	26-01-2025	Date/Time

Figure 3: Warranty Table Description

▪ **Timespan :**

The dataset covers the period from January to March 2025, providing insights into both past trends and ongoing business activities.

▪ **Insights :**

This dataset is comprehensive and captures key business metrics, including:

- **Sales Trends:** Variations in sales over a three-month period, including peaks during festival seasons, demand trends across different product brands, and customer purchasing behavior such as frequently bought items and quantities.
- **Dynamic Pricing:** Price fluctuations of products compared to online platforms like Amazon and Flipkart, highlighting potential pricing gaps and market positioning.
- **Warranty Disputes:** Records of warranty-related issues, such as product damage and rejections due to incomplete documentation from the shop's side.

▪ **Scope of Datasets :**

Scope of Analysis: Sales Data, Dynamic Pricing Insights, and Warranty Rejection Reasons.

- The total sales generated for mobile phones between January 25 and March 25, covering both festive and peak seasons, amounted to approximately 188 units. The highest-selling phone was the Vivo Y20 6/64, with 8 units sold, while the lowest-selling phone was the Vivo Y20 3/64, with just 1 unit sold.



- The highest selling product brand is infinix.
- The dynamic pricing file provides insights into the price differences between online platform prices and shop prices.
- The warranty disputes data reveals that the primary reason for warranty rejections is due to issues with the documentation, specifically the condition of the papers.

# Descriptive statistics

To analyze our dataset effectively, i am computing descriptive statistics for key numerical columns. Descriptive statistics provide a concise summary of the dataset's main features, offering a simple yet powerful way to interpret and understand the data. This approach helps us identify overall trends—such as peak season sales, festive offer impacts, dynamic pricing variations, and warranty dispute patterns—while also uncovering anomalies and gaining insights into potential issues. This dataset is composed of three distinct parts:

- **Sales Dataset:** Contains 188 entries across 6 columns, covering the time period from January 2025 to March 2025.
- **Dynamic Pricing Dataset:** Includes 67 entries with 4 columns, focusing on pricing fluctuations.
- **Warranty Dataset:** Consists of 14 entries and 10 columns, capturing details related to warranty issues.

Together, these datasets provide a comprehensive overview of sales performance, pricing dynamics, and post-sale warranty trends within the specified period. This analysis serves as a crucial metric, as it directly reflects business performance, demand trends, pricing variations, and more. By analyzing the relevant columns, we can gain valuable insights into trending products that contribute most to revenue, as well as understand sales variability—both of which are essential for optimizing inventory management and pricing strategies.

## ▪ Overview of Sales Dataset

- **Mean / Average:** Represents the average price of mobile phones sold in the city, which is Rs. 16,276.
- **Median:** The middle value in the range of mobile phone prices sold in the city, which is Rs. 16,699.
- **Mode:** The most frequently occurring mobile phone price in the city is Rs. 18,593.

- **Maximum:** The highest mobile phone price recorded in the city is Rs. 24,928.
- **Minimum:** The lowest mobile phone price recorded in the city is Rs. 6,059.
- **Standard Deviation:** Indicates how much the mobile phone prices vary from the mean, reflecting the overall fluctuation in prices.

The above summary provides a detailed statistical overview of total sales along with inventory management, helping to analyze trend variability and key performance indicators.

#### ▪ **Overview of Dynamic Pricing Dataset**

- **Sanchar Price:** The average price is Rs. 20,061, with a minimum of Rs. 8,472 and a maximum of Rs. 33,071. The standard deviation indicates the variability across products.
- **Amazon Price:** Shows similar price distribution to Sanchar, with an average of Rs. 19,448 and prices ranging between Rs 7,799 and Rs. 32,401.
- **Flipkart Price:** Has slightly lower average prices Rs. 19,161, indicating a competitive pricing strategy. Prices range from Rs. 7,305 to Rs. 32,016.
- **Price Variability:** A comparison of standard deviations across platforms highlights the consistency or fluctuation in pricing.

This summary helps evaluate how dynamic pricing differs across platforms and provides insight into market competitiveness, product positioning, and pricing strategies.

#### ▪ **Overview of Warranty Disputes Dataset**

- Descriptive statistics such as mean, median, and standard deviation highlight that the average warranty period is around 14 months, with most products offering a 12-month warranty.
- The most common reasons for warranty disputes include battery issues, screen damage, speaker and software issue.
- Approximately 40% of the warranty claims are approved, while 60% are rejected, indicating areas for service process improvement.
- These insights help in identifying patterns in product quality, customer grievances, and service effectiveness, supporting better warranty and product policies.

# Detailed Explanation of Analysis Process

1. **Data collection, Cleaning and Preparation** We use three key datasets to analyze product performance, pricing trends, and dispute handling:

- **Sales Dataset:** Contains daily sales reports across products, including units sold, pricing, and sales trends during peak or festive periods.
- **Dynamic Pricing Dataset:** Compares in-shop prices with those listed on e-commerce platforms (e.g., Amazon, Flipkart), enabling us to track real-time pricing differences and fluctuations.
- **Warranty Disputes Dataset:** Captures customer complaints, reported issues, and reasons for rejections, helping identify recurring problems and product quality concerns.

The data is collected from internal systems and external sources, updated regularly, and stored in CSV format. As part of the cleaning process, we handle missing values, remove duplicates, standardize date and price formats, and ensure consistent product identifiers across datasets. After cleaning, the datasets are transformed and merged using common keys to create a unified structure for downstream analysis.

This structured approach enables a comprehensive view of sales performance, pricing dynamics, and dispute patterns within a single integrated workflow.

2. **Analysis Process/Methods**

- **Descriptive Analysis of the Datasets**
  - Basic descriptive statistics such as MEAN, MEDIAN, MAX, MIN, etc were applied to product sales, unit sold, and dispute counts to summarize the overall dataset.

- Using tools like Excel and Python (Pandas), summary statistics were generated across all three datasets to understand key metrics such as total sales, average pricing differences, and frequency of warranty issues.
- To simplify interpretation and draw insights quickly, various pictorial representations such as bar charts, line charts, and pie charts were created.
- Comparative bar and column charts were used to analyze price differences across Sanchar, Amazon, and Flipkart, revealing the most competitively priced products and external pricing influence on shop sales.
- Additionally, pie charts highlighted revenue contributions from top-selling models and pinpointed products with high warranty dispute rates, while line charts captured sales trends during festive and peak periods.

### 3. Data-Driven Insights and Justifications Across Sales, Dynamic Pricing, and Warranty Disputes

#### ▪ Sales:Festive Season Sales Trend Forecast,Top performing products

- **Description:** To forecast sales during peak and festive periods, historical sales data was analyzed using ARIMA. This method was applied to predict demand, and a bar chart was used to highlight the contribution of top-performing products to total sales, aiding in the identification of bestsellers.
- **Insight:** The analysis of festive season sales revealed expected demand surges, providing valuable insights for inventory stocking and preparation. The identification of top-selling products showed that a few SKUs dominate sales volume, indicating that these should be prioritized in procurement and marketing strategies.
- **Technology Justification:**
  - \* **ARIMA** were used to model time-dependent patterns with trends and seasonal fluctuations.
  - \* **Pandas** were used to prepare time-series data, manage indexed datasets, and efficiently aggregate product-level sales data.
  - \* **Line charts** were used to clearly visualize evolving sales patterns over time.
  - \* **Plotly.express** was leveraged to create interactive and visually appealing bar charts, enhancing stakeholder engagement by allowing deeper exploration of the data compared to static charts.

- **Dynamic Pricing Analysis:**

- **Description:** A bar chart was used to compare the prices of top-selling product models across Sanchar, Amazon, and Flipkart.
- **Insight:** It revealed clear pricing gaps, with some SKUs priced significantly higher or lower across platforms, suggesting room for strategic repricing.
- **Technology Justification:**
  - \* **Pandas** was used to clean and merge pricing data across platforms efficiently.
  - \* **Plotly.express** enabled grouped bar chart creation, ideal for side-by-side comparisons.
  - \* **Bar charts** were chosen for their clarity in displaying discrete price differences.

- **Warranty Dispute Analysis**

- **Description:** This pie chart broke down warranty complaints by product model, helping identify recurring post-sale issues.
- **Insight:** A few models account for the majority of disputes, suggesting manufacturing or quality issues that need attention.
- **Technology Justification:**
  - \* **Pandas** grouped complaint logs by product to quantify dispute frequency.
  - \* **Plotly.express** pie chart was used to intuitively show percentage breakdown for the reasons of rejections.

# Results and Findings

## 1. Sales: Festive Season Sales Trend Forecast

An analysis of sales data from Jan to Mar 2025 highlights distinct peaks during the festive season, demonstrating a recurring pattern of seasonal variation. The data confirms that festive periods significantly boost sales and order volumes.

### ▪ Key Observations

- **Sales and Order Surge:** A substantial increase in both sales and number of orders is observed during the festive period. The chart reflects a multi-fold rise, indicating effective festive campaigns and discounts.
- **Peak Performance:** The most spike occurs during the mid-festive weeks, suggesting that these days are crucial for maximizing sales.
- **Strategic Insight:** Businesses should plan promotional activities and ramp up inventory in advance of the central festive week to fully capitalize on the heightened demand.

### ▪ Graph Representation

- **Line Graphs:** Line charts were employed to illustrate the progression of sales over time, making seasonal trends more discernible.
- **Forecasting Utility:** The chart highlights distinct peaks during the festive season, providing insights for demand forecasting and campaigns.

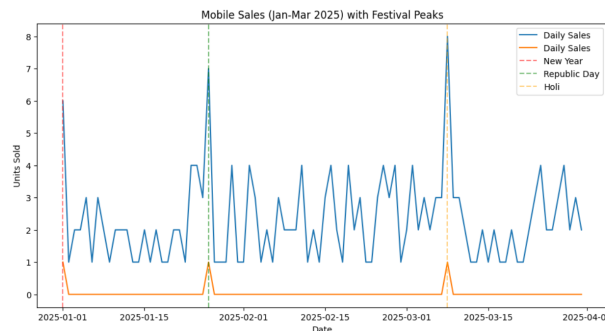


Figure 4: Line-Chart: Festive Season Sales Trend Forecast

## 2. Sales: Top Performing Products

The frequency of units sold per model and brand was analyzed to determine consumer preferences and market demand.

### ▪ Key Observations

- **Best Sellers:** The Vivo Y20 6/64 led with the highest units sold, followed by models like F22 6/128, Nord CE 6/64, and G30 8/128, indicating strong demand in the mid-range smartphone segment.
- **Brand Performance:** Brands like Vivo and Infinix showed consistent performance, reflecting their stronghold in budget and mid-range categories.
- **Consumer Insight:** This data helps businesses align inventory planning and marketing strategies to match consumer preferences.

### ▪ Graph Representation

- **Bar Chart:** A horizontal bar chart was used to visually compare the units sold for the top 20 models, with color gradients representing sales volume.
- **Visualization Value:** The chart provides a clear depiction of popular products and supports strategic decisions for stock management.

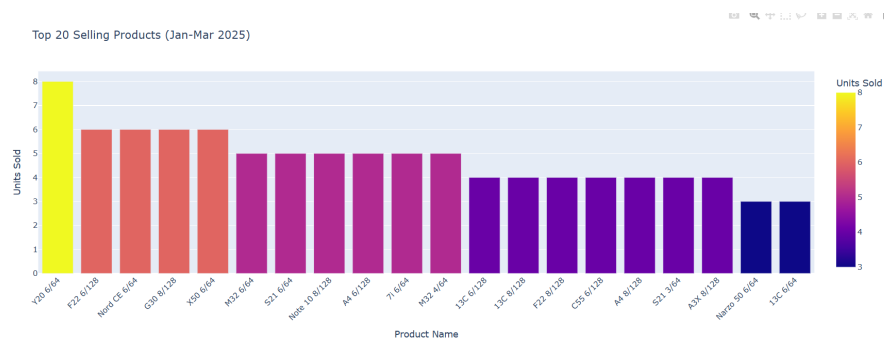


Figure 5: Top Performing Products: Units Sold

## 3. Dynamic Pricing Analysis

Dynamic Pricing Analysis reveals pricing trends across Shop, Flipkart, and Amazon, with Flipkart offering the most competitive prices, Amazon displaying volatility, and Shop maintaining stable, premium-priced offerings.

### ▪ Key Observations

- **Flipkart Offers Most Competitive Prices:** Flipkart consistently offers the lowest price, suggesting an aggressive pricing strategy or strong promotional discounts.



- **Shop Pricing Strategy:** Shop has relatively stable prices, higher than Flipkart, indicating a more premium or value-based positioning.
- **Amazon's Volatility:** Amazon displays fluctuating prices, suggesting frequent automated price adjustments or promotional campaigns.
- **Strategic Insights:** Shop should consider adopting dynamic pricing models or price-matching strategies to stay competitive with Flipkart and monitor Amazon's price changes to optimize conversions.

#### ■ Graph Representation

- **Bar Chart:** A bar chart was used to compare the pricing trends of the product across the three platforms. Each platform is represented by a different color line, showing price fluctuations over time.
- **Visualization Value:** The chart provides a clear comparison of pricing behaviors, helping businesses adjust pricing strategies and stay competitive in the market.

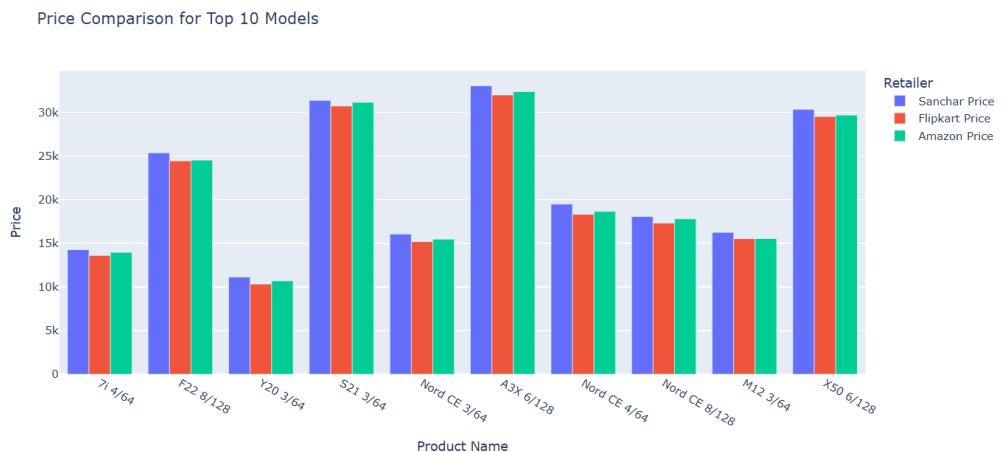


Figure 6: Dynamic Pricing Analysis – Shop vs Flipkart vs Amazon

4. **Warranty Dispute Analysis** This mainly highlights key reasons behind elevated support volumes due to warranty-related concerns.

#### ■ Key Observations

- **High Ticket Volume:** A notable number of warranty dispute tickets suggest damaged phone or paper/bill not correct is the issue of rejection.
- **Support Load Impact:** Warranty disputes significantly burden the customer support team, potentially delaying other resolutions.
- **Strategic Insights:** Strengthen product documentation, clarify warranty policies, and enhance supplier vetting for high-dispute categories.

- **Graph Representation**

- **Pie Chart:** Displays the distribution of warranty dispute issues of rejection.
- **Visualization Value:** Helps identify root causes driving customer dissatisfaction and support inefficiencies.

Warranty Claim Rejection Reasons



Figure 7: Warranty Dispute Analysis – Major Key Causes