

# Optimizing Inventory Management and Asset Utilization for Rental Business

End-term report for the BDM capstone Project

Submitted by

Name: Saksham Gupta

Roll number: 22f3000721



IITM Online BS Degree Program,  
Indian Institute of Technology,  
Madras, Chennai, Tamil Nadu, India, 600036

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# 1. Executive Summary

This project addresses the critical operational challenges of Gupta Building Material, a B2B construction equipment rental business located in Hanumangarh(Rajasthan) facing inefficient inventory management and poor asset utilization. These issues have led to significant capital being tied up in underutilized stock, negatively impacting the company's profitability and cash flow. To resolve these problems, this report presents a comprehensive, data-driven analysis of the company's rental records from October and November 2024. The methodology included advanced techniques such as Return on Net Asset Cost (RoNAC) analysis, asset utilization rate calculations, ABC customer segmentation, and time-series demand analysis.

The analysis yielded several critical findings. First, asset utilization is extremely low across all categories, with every equipment type being used less than 5% of the time, providing quantitative proof of significant over-stocking. Second, a "profitability paradox" was uncovered: the most frequently rented item, 'Phati', is not the highest revenue generator but is the most profitable from a return-on-investment perspective (126.5% RoNAC). Finally, the business is heavily dependent on a small core of seven customers who are responsible for over 85% of the total revenue.

Based on these findings, a four-pronged strategic recommendation is proposed:

1. Optimize the inventory by pruning low-return assets and investing in high-performers
2. Implement dynamic pricing to boost the utilization of idle stock
3. Develop a customer relationship program to retain key clients and mitigate risk
4. Introduce a data-driven proactive maintenance schedule. The implementation of these strategies is expected to enhance operational efficiency, increase profitability, and drive sustainable growth.

## 2. Detailed Explanation of Analysis Process/Method

This chapter outlines the systematic process followed to collect, prepare, and analyze the data for this project. The methodology ensures that the findings are robust and the recommendations are grounded in empirical evidence.

### 2.1 Data Collection

All the data used in this project was **collected physically**. A register had been maintained by the business owner where entries for all transactions were rigorously recorded for the period of **October 1, 2024, to November 30, 2024**. This register served as the single source of truth for all rental activities. After physically collecting the data from this register, it was carefully digitized into Microsoft Excel to facilitate cleaning and analysis.

### 2.2 Data Preprocessing and Feature Engineering

After digitization, a significant amount of data cleaning and preprocessing was performed digitally to transform the raw data into a structured and analysis-ready format. This was a critical step to ensure the accuracy and integrity of the results. The process involved handling inconsistencies, standardizing entries, and consolidating item categories. For instance, the initial dataset contained entries for five distinct item types, but after verification with the business owner, these were consolidated into the four final standardized equipment categories used for the analysis: Gadar, Phati, Plate, and Taak.

The final, clean dataset consisted of several key features. The core transactional details transcribed from the source register included the Customer Name, the standardized Items Taken category, the Quantity of items rented, the Rate (INR/Day), the Rental Date, and the Return Date.

To enable deeper analysis, two new features were engineered from this original data. First, the rental duration, No. of Days, was calculated for each transaction by finding the difference between the Return Date and the Rental Date. Second, the total revenue per transaction, Total Cost (INR), was calculated using the formula:  $\text{Quantity} * \text{Rate (INR/Day)} * \text{No. of Days}$ . This clean, enriched dataset formed the basis for all subsequent analysis.

Dataset Link: [Link](#)

## 2.3 Data Analysis Techniques

The analysis of the collected data was performed using Microsoft Excel and was divided into two distinct stages: a foundational analysis to get a broad overview and a series of advanced analyses to probe specific business questions.

### 2.3.1 Foundational Analysis

The initial phase of the project involved a descriptive analysis of the dataset to understand the overall business landscape and key operational metrics. This foundational step was necessary to get a high-level view before committing to more complex analyses. The total revenue generated during the two-month period was **₹5,76,434.60** from a total of **17,256 items rented**. A statistical summary of the overall rental data showed that an average rental transaction involved approximately **81 items** and generated a mean revenue of **₹2,719.03**.

To understand the drivers behind these numbers, the data was further segmented by equipment category. This breakdown highlighted the core operational dynamic of the business.

**'Phati' was the clear leader in rental volume, accounting for 8,845 items, which is 51.26% of the total quantity.** In contrast,

**'Gadar' was the leader in revenue generation, bringing in ₹198,600, or 34.45% of the total revenue.** This foundational finding—that the most frequently rented item was not the highest revenue generator—was crucial for directing the subsequent, more advanced analyses.

### 2.3.2 Advanced Analysis

To gain deeper, actionable insights, five specific analyses were conducted:

## 1. Assessing Asset Profitability

- **Purpose:** The goal was to determine the true financial performance of each equipment category beyond just the revenue it generated. This analysis aimed to find out which assets provide the best return on the capital invested in them over their entire lifecycle.
- **Method:** The **Return on Net Asset Cost (RoNAC)** was calculated. This metric is superior to simple revenue analysis because it incorporates the asset's full cost, including its initial purchase price and its final scrap value.
- **Why this approach was chosen:** A simple revenue analysis can be misleading as it ignores capital costs. To address this, the Return on Net Asset Cost (RoNAC) method was used, which factors in an asset's full lifecycle cost by subtracting its scrap value from the acquisition cost. This reveals the most profitable assets relative to their long-term cost, rather than just their revenue.
- **Feature Explained:**

Feature Name	Description	Formula / Origin
<b>Total Inventory Count</b>	The total number of units the business owns for that category.	Provided by business owner
<b>Acquisition Cost per Unit</b>	The initial purchase price for one unit of the asset.	Provided by business owner
<b>Scrap Value per Unit</b>	The estimated value of the asset at the end of its usable life.	Provided by business owner
<b>Net Cost per Unit</b>	The true depreciable cost of the asset.	Acquisition Cost - Scrap Value
<b>Total Net Asset Cost</b>	The total capital consumed by the entire inventory of a category.	Net Cost per Unit * Total Inventory Count
<b>Total Revenue</b>	The total revenue generated by the category over the analysis period.	Aggregated from transaction data
<b>Return on Net Asset Cost (%)</b>	The final profitability score showing the percentage return.	Based on Total Revenue and Total Net Asset Cost

*Table 1: Features of Assessing Asset Profitability*

## 2. Assessing Operational Efficiency

- **Purpose:** This analysis was designed to objectively measure how efficiently the company's large inventory was being used. The aim was to quantify idle time and identify underperforming or overstocked asset categories.
- **Method:** A standardized **Utilization Rate (%)** was calculated for each category. This metric compares the total time the assets were actually rented out against the total time they were potentially available for rent.
- **Why this approach is chosen:** This approach was chosen because it offers an objective, standardized way to measure asset activity by comparing total rented days to total potential rental days. By normalizing for differences in inventory size, it allows fair comparisons across asset categories, highlights overstocking risks, and pinpoints underutilized equipment with clear, quantitative evidence rather than subjective impressions.
- **Features Explained:**

Feature Name	Description	Formula / Origin
<b>Total Rented Days</b>	The sum of the rental duration for every transaction in a category.	Aggregated from transaction data
<b>Total Inventory Count</b>	The total number of units the business owns for that category.	Provided by business owner
<b>Utilization Rate (%)</b>	The final efficiency metric showing what percentage of time the inventory was rented out.	$(\text{Total Rented Days} / (\text{Total Inventory Count} * 52)) * 100$

*Table 2: Features of Assessing Operational Efficiency*

## 3. Customer Value Analysis

- **Purpose:** To understand the revenue distribution across the customer base and to identify the most valuable clients who are critical to the business's success.

- **Method:** An **ABC Analysis** was performed. This involved sorting all customers by the total revenue they generated and then segmenting them into three categories (A, B, C) based on their cumulative contribution to the total revenue.
- **Why this approach is chosen:** This approach was chosen because ABC Analysis uses the Pareto principle to clearly separate high-value customers from lower-value ones, providing more insight than a simple revenue ranking. It quantifies the business's reliance on top clients, helps assess revenue concentration risk, and offers a solid foundation for targeted marketing and retention strategies.
- **Features Explained:**

Feature Name	Description	Formula / Origin
<b>Category (A, B, C)</b>	The assigned segment for a group of customers (top, mid, lower tier).	Calculated from cumulative revenue
<b>Number of Customers</b>	The count of unique customers within each segment.	Calculated (Preliminary Customer Revenue table)
<b>% of Total Customers</b>	The proportion of the total customer base that falls into that category.	Calculated (Preliminary Customer Revenue table)
<b>Revenue Generated</b>	The absolute sum of revenue (in INR) contributed by all customers in that segment.	Aggregated from transaction data
<b>% of Total Revenue</b>	The proportion of the company's total revenue generated by that segment.	Calculated (Preliminary Customer Revenue table)

*Table 3: Features of Customer Value (ABC) Analysis*



#### 4. Rental Duration Analysis

- **Purpose:** To understand the typical business cycle by identifying the standard length of a rental period for different items. This information is crucial for forecasting equipment availability.
- **Method:** Key statistical measures were calculated for the No. of Days feature for each equipment category.
- **Why this approach is chosen:** This approach was chosen because statistical duration analysis provides a comprehensive view of rental patterns by capturing both central tendencies (mean and mode) and variability (minimum and maximum). Unlike examining individual contracts, it delivers a robust summary that reveals whether the business mainly serves short- or long-term projects—insights essential for accurate equipment forecasting and setting realistic customer expectations.
- **Features Explained:**

Feature Name	Description	Formula / Origin
<b>Average Rental Duration</b>	The mean of rental periods, showing the typical rental length.	Calculated from No. of Days
<b>Most Common Duration</b>	The mode of the rental periods, revealing the most frequent rental contract length.	Calculated from No. of Days
<b>Minimum/Maximum Duration</b>	The shortest and longest rental periods recorded.	Calculated from No. of Days

*Table 4: Features of Rental Duration Analysis*

#### 5. Time-Series Demand Analysis

- **Purpose:** To visualize how rental demand fluctuates on a day-to-day basis. This helps in identifying weekly patterns, peak demand days, and overall demand trends.
- **Method:** The transaction data was aggregated by date to get a daily count of the total quantity of items rented for each category. This data was then plotted on a time-series line chart.
- **Why this approach is chosen:** This approach was chosen because time-series analysis reveals daily and weekly demand patterns that total demand figures would

obscure. By plotting daily aggregated rentals, it makes trends, seasonality, and recurring cycles visible—insights that are essential for identifying peak and low-demand periods, improving short-term inventory planning, and enhancing operational readiness.

- **Features Explained:**

Feature Name	Description	Formula / Origin
<b>Date</b>	The specific day of the observation.	Original data
<b>Gadar, Phati, Plate, Taak</b>	The total quantity of that specific item that was rented out on a single day.	Aggregated from transaction data

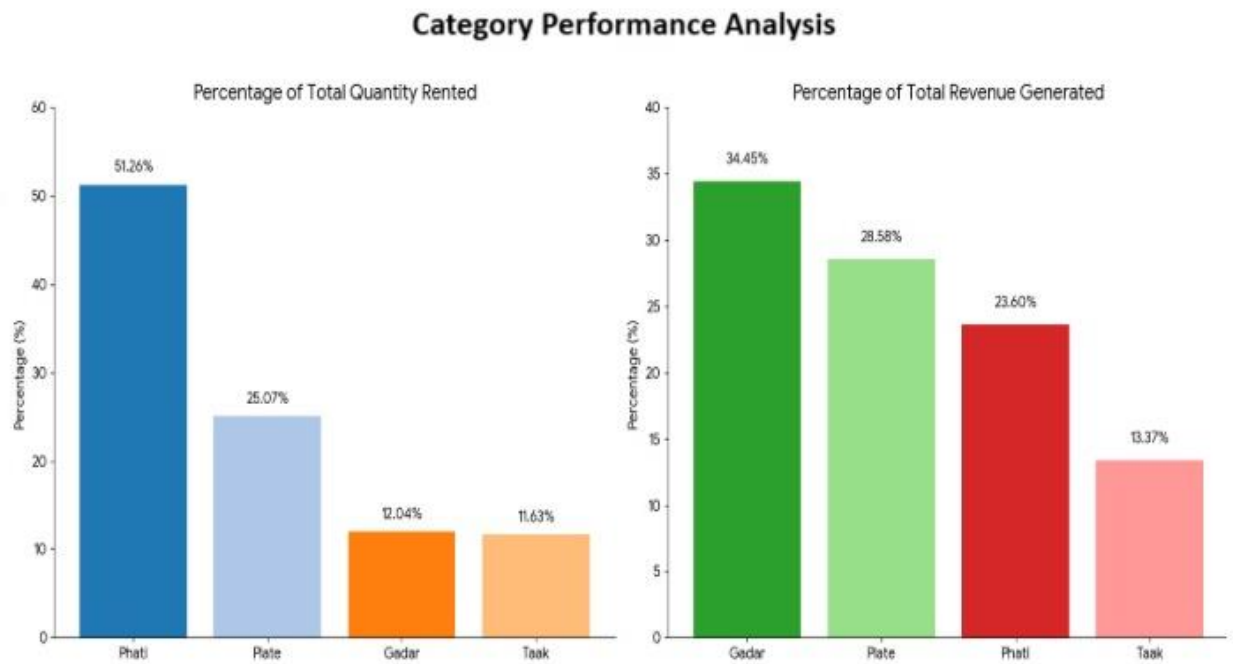
*Table 5: Features of Time-Series Demand Analysis*

### 3. Results and Findings

This section presents the detailed results of the data analysis. Each finding is supported by a specific type of analysis and visualization chosen to best reveal the underlying business insights.

#### 3.1 Category Performance Analysis

To understand the core business drivers, it was essential to separate rental volume from revenue generation. Using side-by-side bar charts for this comparison was a deliberate choice, as it provides an immediate visual contrast that a simple table could not, starkly illustrating the operational disconnect.



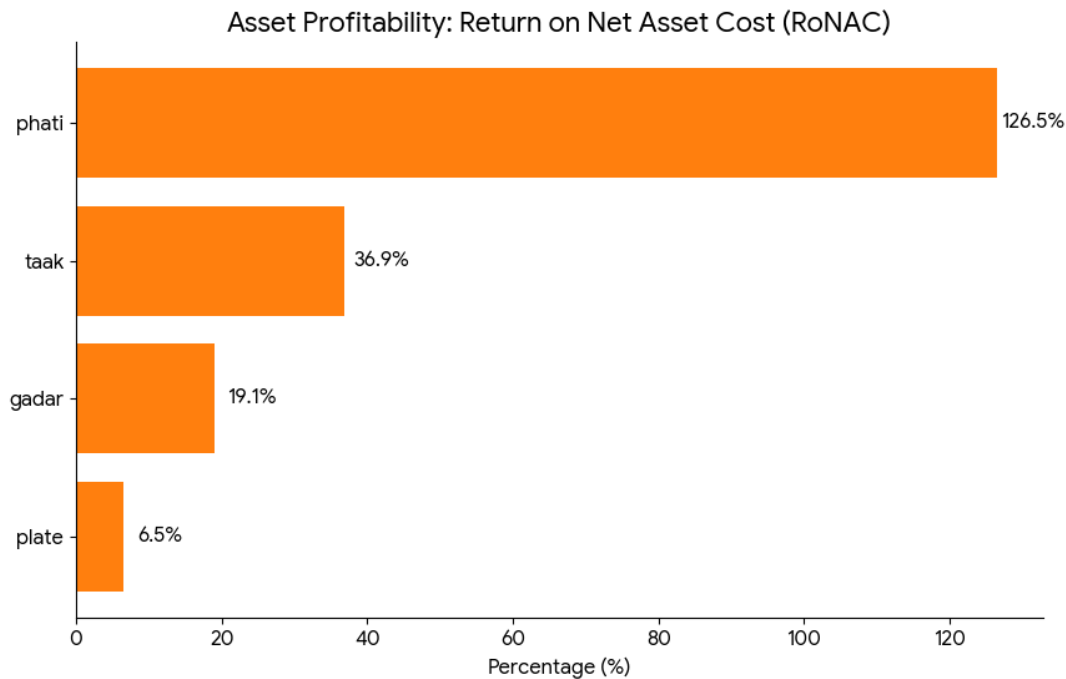
*Figure 3.1: Category Performance Analysis*

**Interpretation:** The bar chart on the left clearly illustrates that **'Phati' is the dominant category in terms of rental volume, contributing over half of all items rented at 51.26%**. This is more than double the next category, 'Plate' (25.07%). In contrast, the chart on the right, displaying revenue, tells a different story. **'Gadar', a low-volume item, is the clear revenue leader, generating 34.45% of the total income.**

This stark visual contrast is crucial. It reveals a business model that is not driven by its most frequent activity. The high volume of 'Phati' rentals suggests it's a staple, commodity item, likely with a low price point that attracts a broad range of customers for various needs. However, the business's financial health and profitability depend on securing the less frequent but much more lucrative 'Gadar' rentals. This suggests a need for a dual strategy: one focused on operational efficiency for the high-volume commodity items, and another focused-on value and marketing for the high-margin premium items.

### 3.2 Asset Profitability Analysis

A simple revenue comparison would be misleading as it ignores asset costs. Therefore, the **Return on Net Asset Cost (RoNAC)** was analyzed to measure true financial efficiency. A horizontal bar chart was chosen as it is the most effective way to rank the categories and clearly communicate their relative financial performance.



*Figure 3.2: Asset Profitability: Return on Net Asset Cost (RoNAC)*

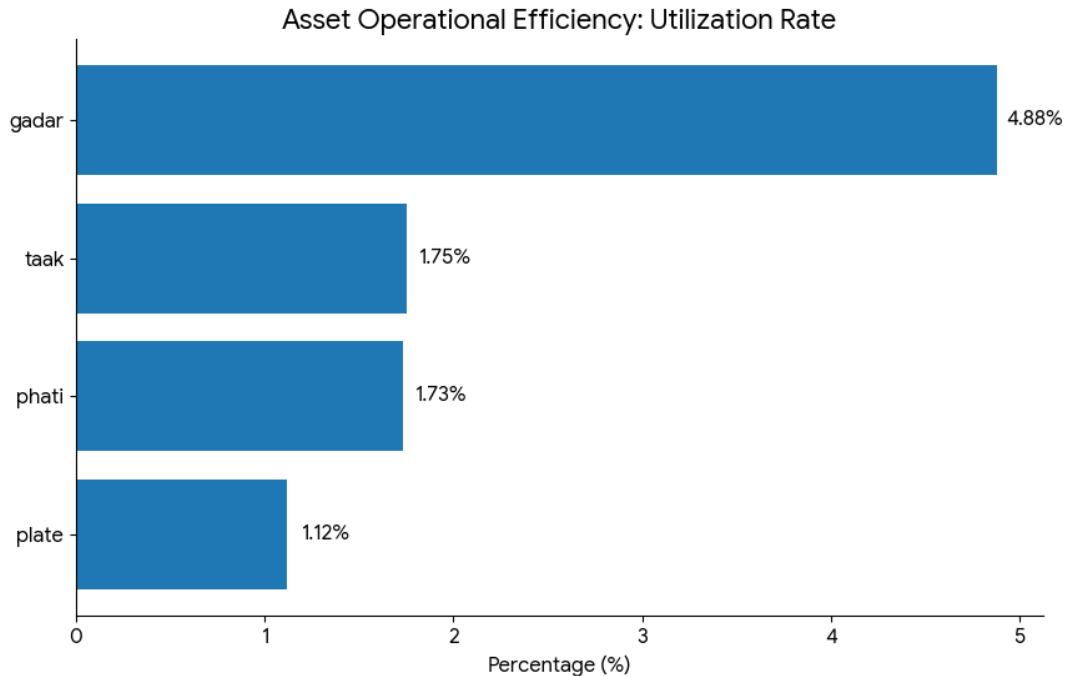
**Interpretation:** This chart (*Figure 3.2*) ranks the assets by their true financial return, providing a clear visual hierarchy of profitability. **'Phati' stands out with an exceptionally high RoNAC of 126.5%**, dwarfing all other categories. 'Taak' follows at a distant 36.9%, while the revenue-leader 'Gadar' sits at 19.1%. **'Plate' is at the bottom with a very low return of 6.5%.**

This analysis uncovers the 'profitability paradox' in full detail. The extraordinary performance of 'Phati' is not due to high revenue, but to its extremely low net cost—the capital at risk for the business is minimal, making it a low-risk, high-return asset. On the other hand, 'Plate' represents a significant financial liability. Its high net cost combined with moderate revenue makes it a 'capital trap'—an asset that consumes capital without providing a worthwhile return. This analysis proves that focusing on revenue alone is a flawed strategy; the business must consider the underlying cost structure of its assets to make sound investment decisions.

### 3.3 Asset Utilization Analysis

To objectively measure inventory efficiency, a standardized **Utilization Rate** was calculated. This approach was essential to create a fair comparison across categories with

different inventory sizes. A horizontal bar chart was again used to visually emphasize the magnitude of the findings.



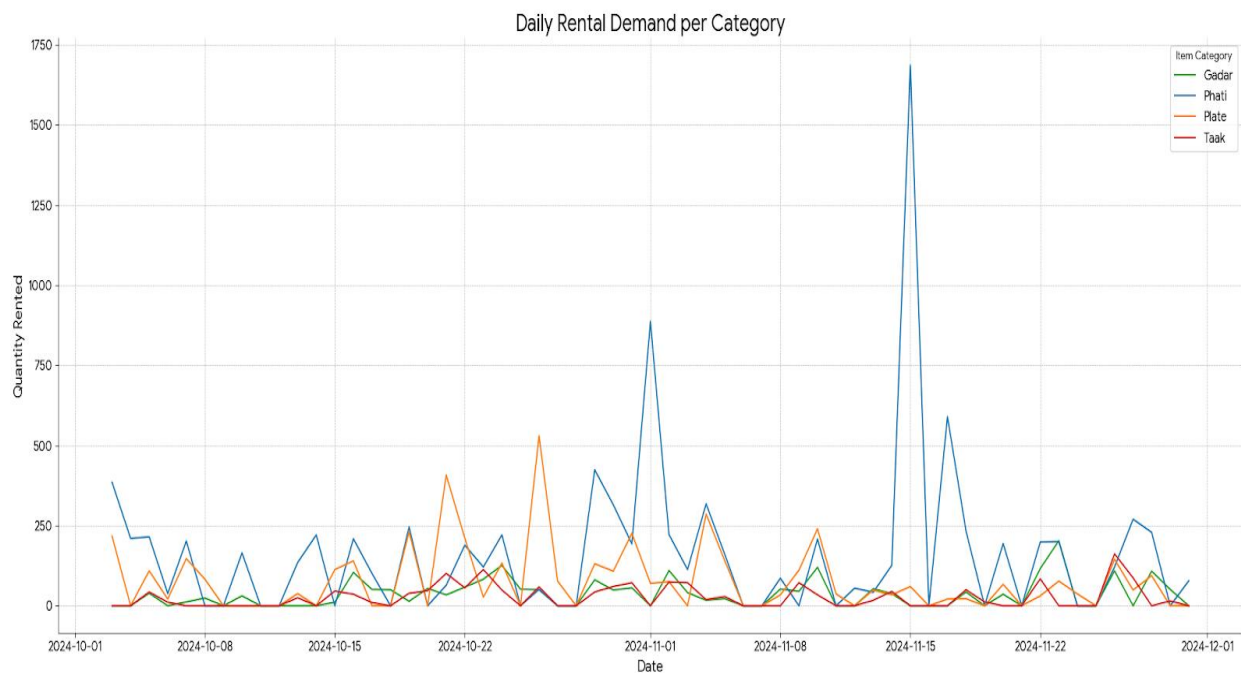
*Figure 3.3: Asset Utilization Analysis: Utilization Rate*

**Interpretation:** This chart (Figure 3.3) starkly visualizes the critical operational weakness of the business. The bars for all four categories are alarmingly short, indicating extremely low utilization rates. **'Gadar', the most utilized asset, is only in use 4.88% of the time.** The rates for 'Taak' and 'Phati' are even lower, around 1.7%, and 'Plate' is at the bottom with a dismal 1.12%.

This visualization provides indisputable, quantitative evidence for the core problem stated at the project's outset: a severe over-stocking of inventory relative to current demand. The business struggles with inefficient tracking of equipment usage resulting in excess inventory. Most of the company's capital is physically sitting idle in a warehouse, depreciating and incurring storage costs without generating any income. This is not a minor inefficiency; it is a fundamental flaw in the current inventory strategy that directly suppresses profitability and cash flow.

### 3.4 Time-Series Demand Analysis

To understand the nature of customer demand, a **time-series analysis** was required. Simply summing demand over the period would have hidden crucial daily patterns. A line chart was specifically chosen as it is the only method that can visually represent demand fluctuations over time.



*Figure 3.4: Daily Rental Demand per Category*

**Interpretation:** The line chart (*Figure 3.4*) plots the daily rental quantity for each of the four categories over the two-month period. The lines for all categories are highly volatile, characterized by sharp, sudden peaks and long valleys where they drop to or near zero. For example, we can see a massive spike in 'Phati' rentals in early November, which quickly falls back to a low baseline. This directly reflects the challenge of an unpredictable reduction in stock levels.

This pattern reveals that the business operates in a project-based, not a continuous-demand, environment. Success is dependent on securing large, intermittent contracts rather than a steady flow of smaller, daily rentals. This 'feast or famine' demand pattern is the root cause of the low utilization rates and presents a significant forecasting challenge. While long-term trends are hard to spot in two months, the chart (*Figure 3.4*) does show

that the business needs an operational model focused on flexibility and readiness to be able to deploy large quantities of equipment on short notice to capture these crucial projects.

### 3.5 Customer Value Analysis

To understand the revenue distribution across the client base, an **ABC Analysis** was performed. This is a standard industry technique chosen to segment customers into tiers based on their value contribution, applying the Pareto Principle (or 80/20 rule). A bar chart is the most effective way to visualize the stark difference in revenue contribution between these customer segments.

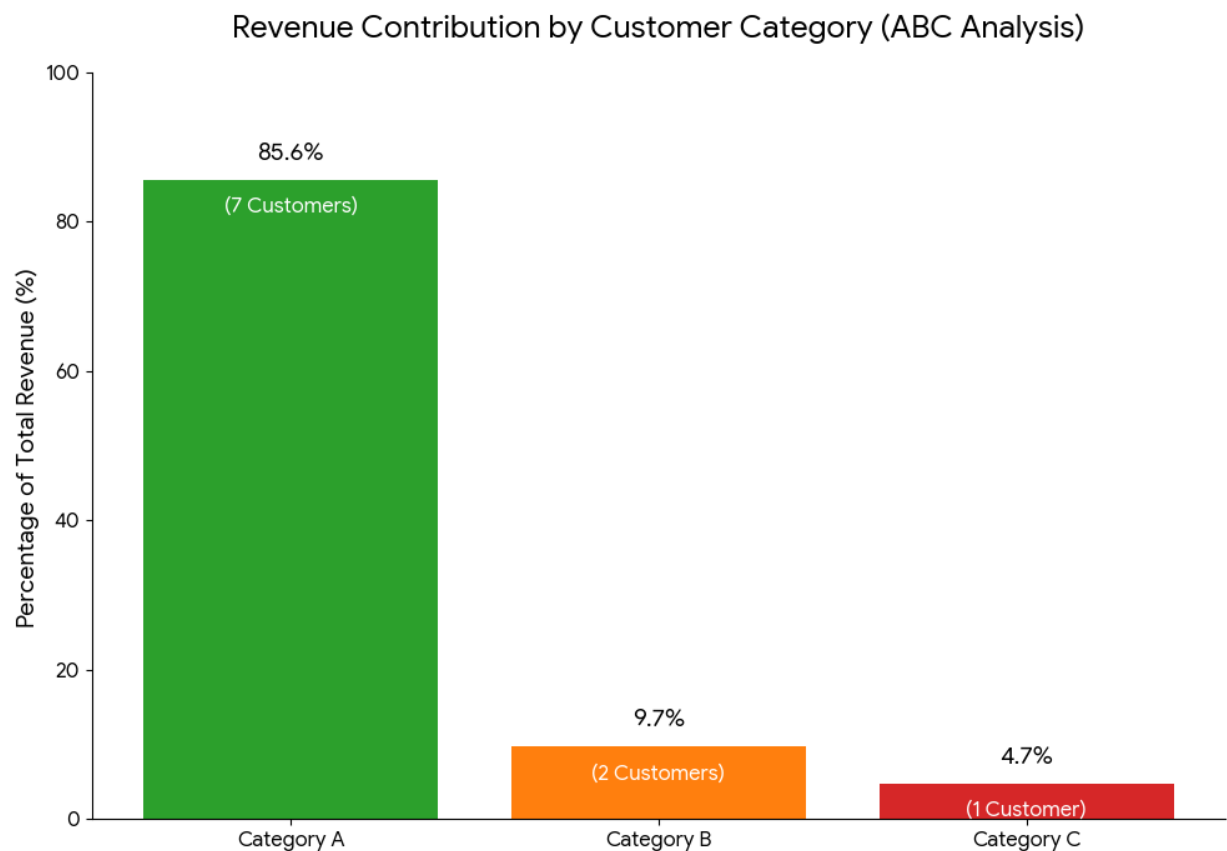


Figure 3.5: Revenue Contribution by Customer Category (ABC Analysis)

**Interpretation:** The chart (Figure 3.5) above provides a clear and powerful visualization of the company's customer landscape. It shows that **Category A, comprising just 7 customers (70% of the base), contributes a massive 85.6% of the total revenue**. The remaining revenue is split between Category B (2 customers contributing 15.7%) and Category C (1 customer contributing 7.5%).

The significance of this finding is profound. It confirms a critical business dependency on a small cohort of high-value clients. This extreme concentration, while indicative of strong relationships with key accounts, creates a major strategic risk. The potential departure of even one or two "Category A" clients would severely impact the company's financial stability. This analysis proves the urgent need for a dual-pronged customer strategy: first, a robust retention program to protect the invaluable "Category A" revenue stream, and second, a dedicated growth strategy to develop Category B and C customers to diversify the revenue base and ensure long-term resilience.

## 4. Interpretation of Results and Recommendation

This section translates the raw data and findings into a coherent business narrative. It interprets what the results mean for Gupta Building Material and then proposes a set of specific, data-driven recommendations to address the company's core challenges.

A thorough review of the analytical findings reveals a series of interconnected challenges and opportunities for Gupta Building Material. The data tells a complex story of a business operating with a dual-engine model, burdened by inefficient capital allocation, and exposed to significant customer-related risks.

- **The Volume vs. Value Conflict: -**

☐The most fundamental insight is the clear disconnect between the company's rental volume and its revenue generation. The analysis shows that

**'Phati' is the high-volume workhorse, accounting for over half of all items rented,** suggesting it is a low-margin commodity product essential for maintaining market presence and day-to-day cash flow. In contrast,

**'Gadar' is the high-value specialist, bringing in over a third of the total revenue from a much smaller rental base.** This indicates the business is effectively running on two different engines: one that keeps the lights on through frequent, small-margin transactions, and another that drives actual profitability through less frequent, high-margin engagements. The strategic challenge is that these two engines are not synchronized, and the success of the business depends on managing both effectively.

- **The Profitability Paradox and Capital Inefficiency:**

the Return on Net Asset Cost (RoNAC) analysis uncovers a critical paradox regarding capital efficiency. While 'Gadar' is the revenue leader,



**'Phati' is the most financially efficient asset with an exceptional 126.5% ROI.** This is a direct result of its extremely low net cost; every rupee invested in 'Phati' is working very hard. Conversely,

**'Plate' is a "capital sink,"** tying up a significant amount of capital for a meager 6.5% return. This finding proves that a large portion of the company's capital is allocated inefficiently. The business's current investment in its assets is not aligned with the actual returns those assets generate, leading to suppressed overall profitability.

- **The Underutilization Crisis and its Root Cause**

The most alarming finding is the **critically low asset utilization rate across all categories, with none exceeding 5%.** This provides undeniable, quantitative evidence that the business is severely overstocked for its current level of demand. The root cause of this underutilization is revealed by the time-series analysis: the company operates in a volatile, "feast or famine" demand environment driven by large, intermittent projects rather than a steady daily flow. This forces the business into a difficult strategic position—it must maintain a massive inventory to be able to service these large projects when they arise, but this same inventory sits idle and drains resources during the frequent lulls, causing the low utilization rates.

- **Customer Concentration and Strategic Risk**

The ABC analysis highlights a significant strategic vulnerability: an extreme reliance on a small number of clients. The finding that **7 customers generate over 85% of the total revenue** means the company's financial stability is tied to the fortunes and loyalty of a very small group. While these strong relationships are a competitive advantage, this concentration poses an existential risk. The loss of a single "Category A" customer could wipe out 10-15% of the company's revenue overnight. This makes customer retention the single most important strategic priority for ensuring the long-term viability of the business.

## 4.1 Strategic Recommendations

Based on the comprehensive interpretation of the findings, the following four strategic recommendations are proposed. Each recommendation is designed to be an actionable, data-driven solution that directly addresses the key challenges and opportunities identified during the analysis.

### 1. Optimize Inventory with a "Prune & Grow" Strategy:

The analysis of profitability and utilization provides a clear mandate for inventory optimization. The current portfolio is not balanced, with significant capital tied up in underperforming assets. It is recommended that the company adopt a "Prune & Grow" strategy to systematically reallocate its capital. This involves **pruning** the inventory of the worst-performing asset, '**Plate**', which suffers from both a low Return on Net Asset Cost (6.5%) and the lowest utilization rate (1.12%). Simultaneously, the business should **grow** its inventory of '**Gadar**', the proven high-revenue and high-utilization asset. The expected outcome is a significant improvement in capital efficiency. By divesting from 'Plate', the company can free up capital that is delivering poor returns and reinvest it to increase the availability of a product that customers clearly demand, leading to higher overall revenue and profitability.

## **2. Implement a Dynamic Pricing Model :**

The chronic underutilization of certain assets suggests that the current static pricing model is not effective. It is recommended that the business implement a dynamic pricing strategy to better align price with demand and asset availability. This would involve introducing promotional discounts for assets with low utilization, like 'Phati' and 'Plate', specifically for longer-term rentals. This could incentivize customers to use these idle assets for an extended period, thereby increasing their Total Rented Days and generating incremental revenue. Conversely, a **premium surcharge** could be applied to the high-demand 'Gadar' for short-notice or peak-period rentals. This strategy uses price as a tool to balance demand across the entire inventory, improving the revenue generated from both idle and popular stock.

## **3. Develop a Customer Relationship Management (CRM) Program:**

The ABC analysis revealed a critical business risk: an over-reliance on a small group of seven "Category A" customers who generate over 85% of the revenue. To mitigate this risk, it is strongly recommended that the company develop a formal CRM program. The primary goal would be to **increase the retention and loyalty** of these key clients through a dedicated program offering benefits like priority service, first access to new equipment, or exclusive pricing. This will increase the "stickiness" of these crucial relationships. The second goal would be to launch a targeted outreach campaign to Category B and C customers to better understand their needs and grow their contribution to revenue, thereby diversifying the customer base and making the business more resilient.

## **4. Introduce a Data-Driven Maintenance Schedule:**

To address the initial problem of managing unpredictable "wear and tear", it is recommended that the company shift from a reactive to a **proactive maintenance schedule based on actual equipment usage**. The data on Total Rented Days clearly shows that assets like 'Gadar' and 'Phati' work much harder than others and thus experience more wear. By scheduling inspections and maintenance for these items based on usage milestones (e.g., after every 150 rental days) rather than just on a fixed calendar, the company can ensure its most valuable and in-demand assets are always in optimal condition. This will reduce unexpected downtime, minimize costly emergency repairs, extend the productive lifespan of the equipment, and ultimately lead to higher customer satisfaction and reliability.