BDM Capstone Project
Final submission

Data-driven solutions for weak customer footfall at Annapurna Mega Mart

Rajya Lakshmi Jampani

22f3002986

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Executive Summary

For any business outlet, customer footfall is the primary parameter that determines sales. However, luring customers can be a cakewalk to some retailers but a challenging task to many. One such retailer who is struggling to increase walk-ins is identified as a part of this project.

Annapurna Mega Mart, owned solely by Mr. G. Narendar, is a well-established Kirana store in Bhagya Nagar Colony of Kukatpally, Hyderabad. Opened in 2016, the business continued to record a net profit margin of 15-20% till 2019. However, the store encountered two major twitches in 2020, COVID pandemic and an unavoidable relocation to an adjacent building due to certain non-financial reasons. As a result, the revenue started falling at an alarming rate recording a drop of more than 60% in 2 years. Even after the lockdown, when all the markets bounced back to regular operations, the business could not witness any rise in sales.

It was obvious that, post-relocation, the store is unable to attract enough number of customers and meet their expectations. A welcoming shopfront, exciting product deals, good quality stock, availability of variety of products, consistent open hours etc. are listed out to be some among several factors that determine whether or not customers choose to visit a particular outlet. Upon visiting the store with an intent to identify gaps in meeting customers' expectations, it was spotted that the display counter of the store was not well-organized and failed to create a great first impression. Also, a random examination of some of the packaged products revealed that a substantial amount of stock was already expired.

To study these potential reasons behind weak customer footfall, Display Container Utilization and Quality of Stock are considered as two variables of interest. The data related to total capacity vs utilized capacity of each container put on display was collected manually. The %Utilization of each jar is then calculated using the above two columns. A sample of packaged products was selected such that it involves wide categories of Stock Keeping Units (SKUs) like household supplies, healthcare products, instant foods, cookies, chocolates, snacks, soft drinks, oils, pickles, kitchen supplies etc. The manufacturing and expiry dates of each of the product and its quantity available in the store were recorded. The monthly revenue data from January 2020 till March 2023, available with the store owner as a handwritten copy, was also collected to analyze the business problem further. The daily customer footfall data, which includes no. of customers who purchased something, total revenue generated, no. of customers who left empty handed, items

they asked for, was collected for a period of one month (starting from 1st May 2023 to 31st May 2023).

All the data collected was loaded into MS Excel and appropriately segregated into separate sheets. Upon analyzing the revenue data, it was identified that there is a drop of 61.8% in sales from 2020 to 2023. Q3-Q4 of 2022 recorded the highest Quarter-over-Quarter (QoQ) drop of 36.39%. The footfall counts never exceeded 15 per day during the month of data collection. Wednesdays seemed to be recording higher numbers among all other days of the week both in terms of customer count and the total revenue. The number of customers who left empty handed was 1 or 2 per day and there are only 6 such days in the month. From the Display Container Utilization data, 32% of the containers are empty. Out of the 68% utilized containers, 42% are under filled (<25% of their capacity). Stock Quality data showed that 35% of the stock is expired and Cookies, Kitchen supplies, Pickles occupy a major portion in it. Another 47% of the stock is expiring soon (< 6 months left) and Cookies, Instant foods are the major categories in it.

These findings back the conclusion that it is necessary for Annapurna Mega Mart to focus on shop-front organization and maintaining good quality stock in order to improve sales. Since the empty containers can create an impression of No Stock, either removing them from display or filling them with attractive products can grab customer attention. Also, to mitigate the problem of under-utilization of containers, large containers can be replaced with smaller ones. This way, the same quantity of product available can appear to be full stock. Timely cleanup of both packaged and loose goods is highly advisable in order to identify expired and old products and replace them with fresh stock. Since Cookies occupy a major chunk of both expired goods and the goods expiring soon, they seem to be less moving SKUs. Procuring them in lesser quantities will avoid loss due to wastage. Also, for the available Cookies and Instant foods, necessary offers or price discounts have to be introduced to boost sales and clear the stock before it expires.

The process of data analysis, observations, the above-mentioned recommendations and the feasibility of implementing them have been discussed with the business owner in great detail. Initially he was under the impression that it is impossible to gain customers back and was reluctant to spend any additional penny towards correcting the business issues. However, after the discussion, he was convinced that a little care and investment in the proposed solutions can save his business from crashing further.

Analysis Process - Raw Data Link

To study the sales trend of the business, all the months from Jan-2020 to Mar-2023 along with their corresponding revenue (in INR) are listed in two columns. A line chart with months on horizontal axis and revenue on vertical axis is plotted. A linear trendline is added to chart to identify the rate of drop in sales. The trendline is extended by forecasting it to future periods till it reached the horizontal axis indicating a complete zero revenue. A frequency distribution of sales data with classes of revenue as 0-5 lakhs, 5-10 lakhs, 10-15 lakhs, 15-20 lakhs, 20-25 lakhs is generated using the FREQUENCY function of Excel. These calculations helped observe key aspects like what the frequent revenue range is, how varied is the revenue from its mean value, how many months recorded good sales etc.

The same sales data is split year and month-wise. 12 rows one for each month, 3 columns for the years 2020, 2021 and 2022 are set up and corresponding revenue details are listed. The available data of 2023 (Jan-Mar of 2023) is ignored as a part of data cleaning in order to achieve a consistent graph. A single line chart with 3 different lines for the years 2020,2021 and 2022 is plotted to compare the month-wise performance of the business across years. Also, for each quarter from Q1 of 2020 till Q4 of 2022, quarterly revenue is calculated by summing up the values of corresponding months. From this, the Quarter-over-Quarter change is calculated using the formula

$$\% \text{ QoQ change} = \left(\frac{Revenue\ of\ current\ quarter}{Revenue\ of\ previous\ quarter} - 1\right) * 100$$

These quarterly revenue figures and % change of QoQ plotted onto same combo chart (bar + line) on two different axes to understand the quarterly performance of the store.

For every day from 1st May 2023 till 31st May 2023, customer footfall data is recorded manually at the store. This included daily number of customers who purchased something, total sales of the day, number of customers who asked for some product which was not available and so returned without purchasing and the items they asked for. A small chunk of data is pasted below for reference.

Date	Weekday	No. of customers purchased something	Total sales	No of customers who left empty handed	Items they asked for
14/05/2023	Sunday	0	0	0	NA
15/05/2023	Monday	8	7274	0	NA
16/05/2023	Tuesday	11	6783	2	Ashirwad atta, Tamarind Pickle

A printed document with these columns is shared with the store owner and requested him to record the values daily. At the end of the duration of data collection, the data is loaded into MS Excel. After marking 0 or NA in appropriate columns for days on which the store was closed, the details are segregated weekday wise using PIVOT table option. For each day of the week, sum of customer footfall and sum of revenue is calculated and this information is fed to another combo chart (bar + line) where bars represent customer counts and a continuous line that represents revenue. Date on X-axis vs number of customers who left empty handed on Y-axis is also plotted to observe any trends in the data.

For collecting the Display Container Utilization data, each jar on the display counter was checked manually and its contents, total capacity, stock quantity present in the jar i.e., the capacity utilized are noted down. Few rows from the sheet are inserted below.

Contents	Total Capacity (in Kg)	Utilized capacity (in Kg)	%Utilization
Ajwain Phool	1	0.5	50
Mint	1	1	100
Black Jeera	0.25	0.2	80

The last column of the above table is calculated as

$$\% \text{ Utilization} = \frac{Utilized\ Capacity}{Total\ Capacity} * 100$$

These % Utilization values are grouped into bins as Empty, 1-25% filled, 26-50% filled, 50-75% filled and 76-100% filled. The corresponding number of jars is obtained by feeding the data to FREQUENCY function in Excel. A pie chart with only two segments, % jars Empty and % jars Utilized is drawn. The Utilized jars pie is again broken down into a bar chart with % Utilization values calculated as a fraction of filled jars, as below.

%Utilization	Fraction of whole	Fraction of whole	Fraction of filled
Empty	0.32	0.32	NA
76-100% filled	0.13	0.68	0.19
50-75% filled	0.05		0.08
26-50% filled	0.21		0.31
< 25% filled	0.29		0.42

For example, jars that are 76-100% filled occupy 0.13 fraction of all jars but 0.19 ($\frac{0.13}{0.68} = 0.19$) fraction of filled (utilized) jars.

The stock quality data collected includes SKU name, category (manually identified), date of manufacture, date of expiry and its quantity available in the store. Below formulae are used in MS Excel to calculate age and the time left for the products to expire.

Age of SKU (in years) = (Today – Mfg. Date) / (30*12)

Months left to expire = (Exp. Date – Today) / 30

Months left to expire is divided into 4 bins (Expired, 0-6 months left, 6-12 months left, > 1 year left). A PIVOT table is created to sum up number of items under each of these bins and a pie chart is created from it. The "Expired" sector of the pie chart is further elaborated as a pie-of-pie to include the contribution of category of SKUs. This is achieved using another PIVOT table that sums up number of items under each category with a filter applied on Months left to expire. The same approach is followed for the bin "0-6 months left" to study which category of SKUs contribute majorly towards the expired and soon expiring products.

Results and Findings

From the line graph of overall sales trend, it can be observed that, even though there are ups and downs in monthly revenue values, the linear trendline (with $R^2 = 0.91$) shows a negative slope indicating a steep fall in sales. Also, a forecast of the trendline shows that, with the current rate of fall, the business will reach **Zero sales by October 2023**.

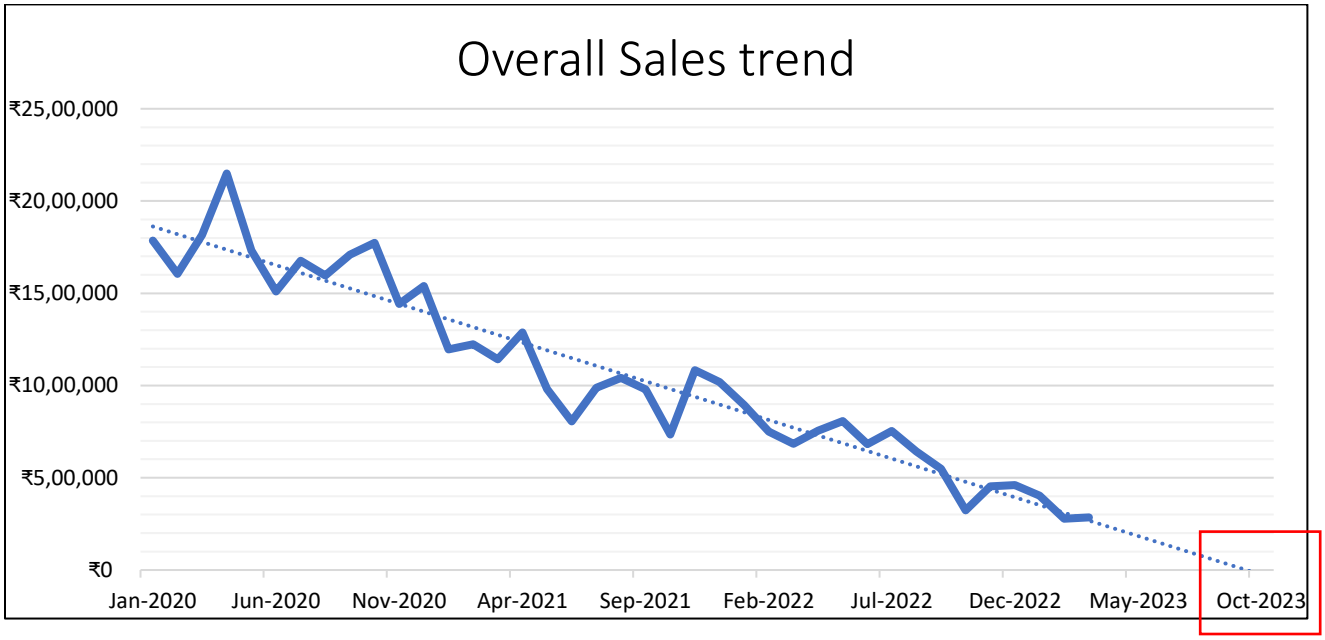

Fig. 1 Overall Sales Trend

The average monthly sale amount from January 2023 till March 2023 is ₹10.64 lakhs. Only 17 out of 39 months recorded above average sales. April 2020 recorded a revenue of ₹21.49 lakhs, the highest among all the months of the 2-year duration. This can be attributed to the fact that during lockdown, consumers preferred stocking up goods at home and hence consumption increased. A year-wise sales trend is shown in the below figure.

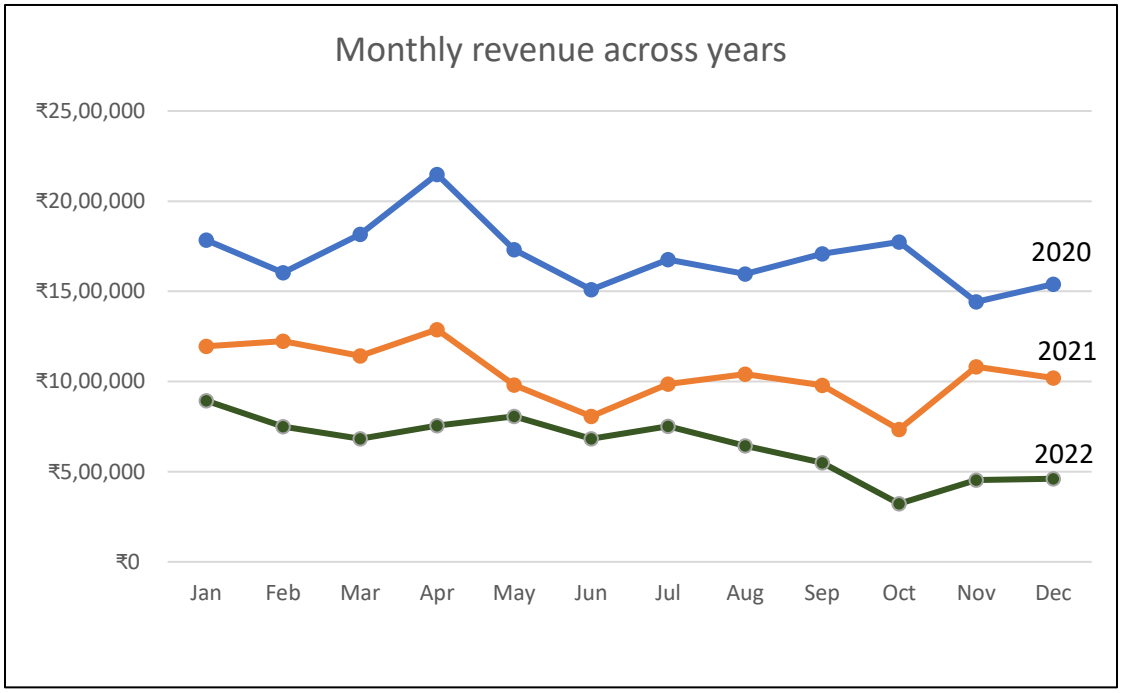

Fig. 2 Monthly revenue

The graph shows that for any given year, the trend of sales remains almost consistent with peak sales around the months of April or May and least sales around the months of October or November. Taking up bulk orders of oil for seasonal pickle preparation is identified to be the major reason behind increased revenue in summer. Each yearly curve is at a subsequently lower level than its earlier year's curve indicating a fall in revenue. Also, the curves never intersected, meaning that any revenue value from one year was never matched again at a later year. The average monthly revenue was ₹16.94 lakhs for 2020, ₹10.4 lakhs for 2021 and ₹6.46 lakhs for 2022. Also, the total yearly revenue was ₹2.03Cr for 2020, ₹1.24Cr for 2021 and ₹77.54Cr for 2022. This indicates a sales drop of 61.8%.

A bar chart representing quarterly revenues from Q1 of 2020 till Q3 of 2022 is inserted below. The horizontal axis represents quarters and the vertical axis represents corresponding revenue. On a secondary axis, %Quarter-Over-Quarter change is also plotted as a line graph.

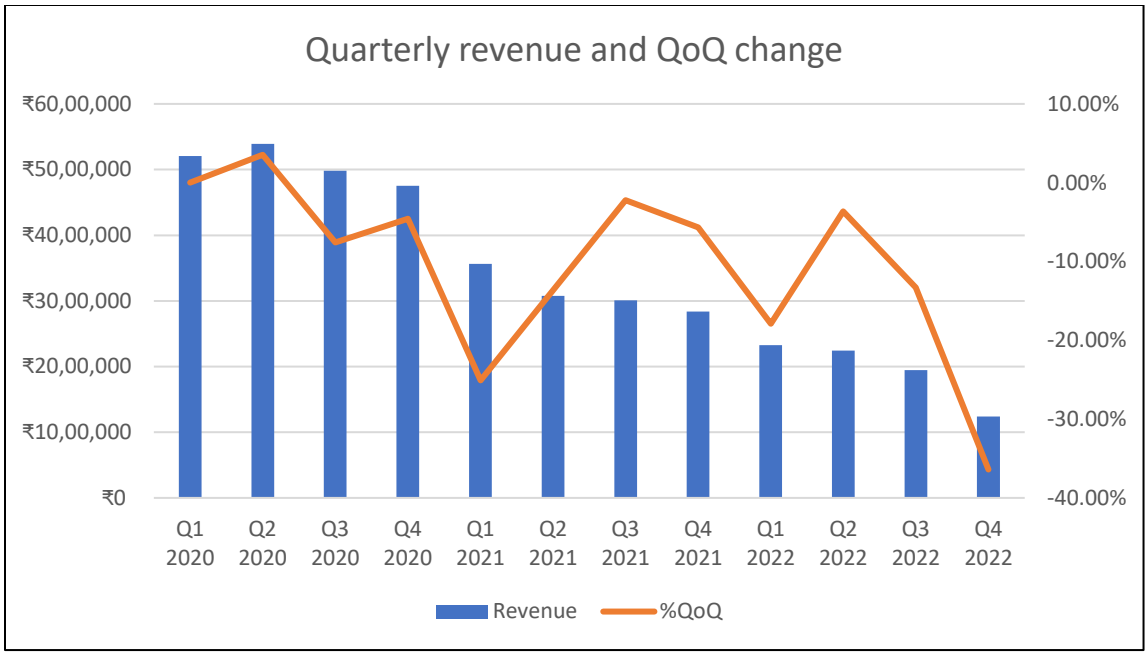

Fig. 3 Quarterly revenue and %QoQ change

From the graph, we see that quarterly revenue values of the business are falling rapidly from each quarter to its next one. Q2 2020 is the only exception where the sales increased slightly by 3.54%. This is captured as the only positive % QoQ change across the entire duration of analysis. The reason behind this is the highest revenue recorded in April 2020 which comes under Q2 2020. In the same grounds as that of monthly sales, attributing to peak sales in summer of every year, the QoQ drop from Q1 to Q2 is lesser when compared to other intervals. Also, extreme falls in revenue are consistently observed from Q4 to Q1 across years. Q3-Q4 of 2022 recorded the highest drop in revenue with a change of -36.39%. The second highest revenue drop is from Q4 2020 – Q1 2021 which stood at -25.08%.

Corresponding to customer footfall data, a pivot table is created with weekday, the sum of footfall values and sum of revenue values for a duration of one month (May 2023). The pivot combo chart with horizontal axis representing the days of the week, vertical axis representing the sum of count of customers who purchased something from the store on the day and the secondary axis representing the sum of revenue generated on the day is inserted below. The graph shows that first 3 days of the week have lesser customers when compared to the second half of the week. Correspondingly, the revenue generated is also higher towards the end of the week. A total of 256 customers visited the store in the month and 47 out of them visited on Wednesdays. This is the

highest among other days of the week. Similarly, out of the total ₹2.23lakh revenue generated in May 2023, Wednesday sales are ₹48,709 (21%).

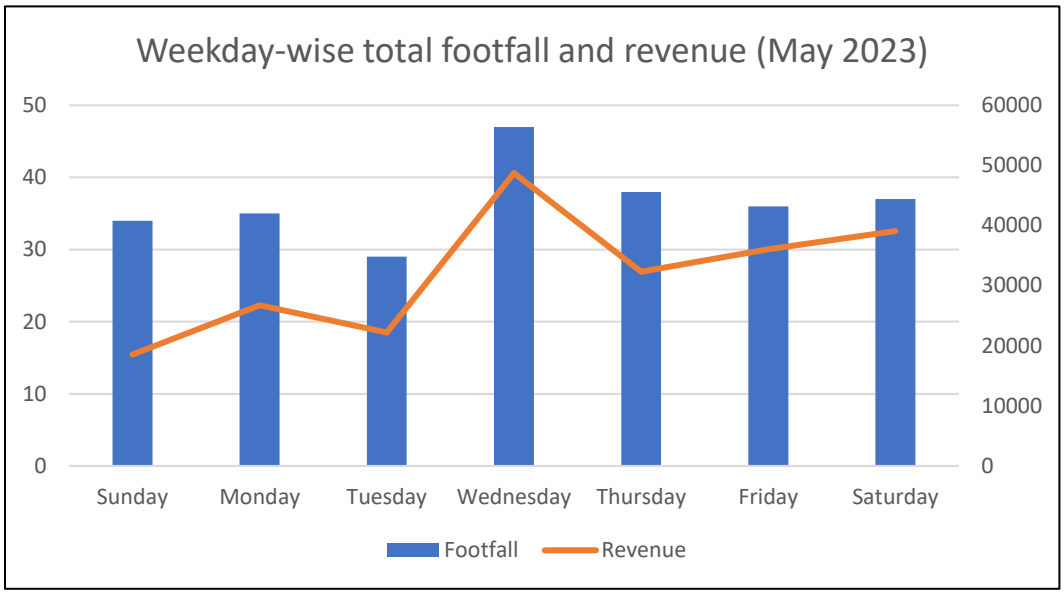

Fig. 4 Weekday-wise footfall and revenue

This is in-line with the general retail sales in the area, where re-stocking happens mid-week and people prefer Wednesdays expecting fresh stock, less crowd and less waiting time. In addition to that, the colony in which the store is located has some temples where people serve self-cooked offerings on Thursdays. This is another reason that drives more consumers of the area to buy groceries on Wednesdays.

Fig. 5 No. of customers who left empty handed

To identify the areas where the store is not meeting customers' expectations, the importance of number of customers who left empty-handed from the store cannot be dismissed. The collected data shows that there are no more than 2 such customers per day. Also, the store could limit such instances to only 6 in a month's duration. This clarifies that the store is keeping enough stock ready and the customers too know what to expect from the store. Since the numbers and their frequencies are low, no specific patterns / trends can be drawn out of these values. In other words, this category of information does not seem to add any notable insights to the business problem being faced.

Fig. 6 A shelf at the display window

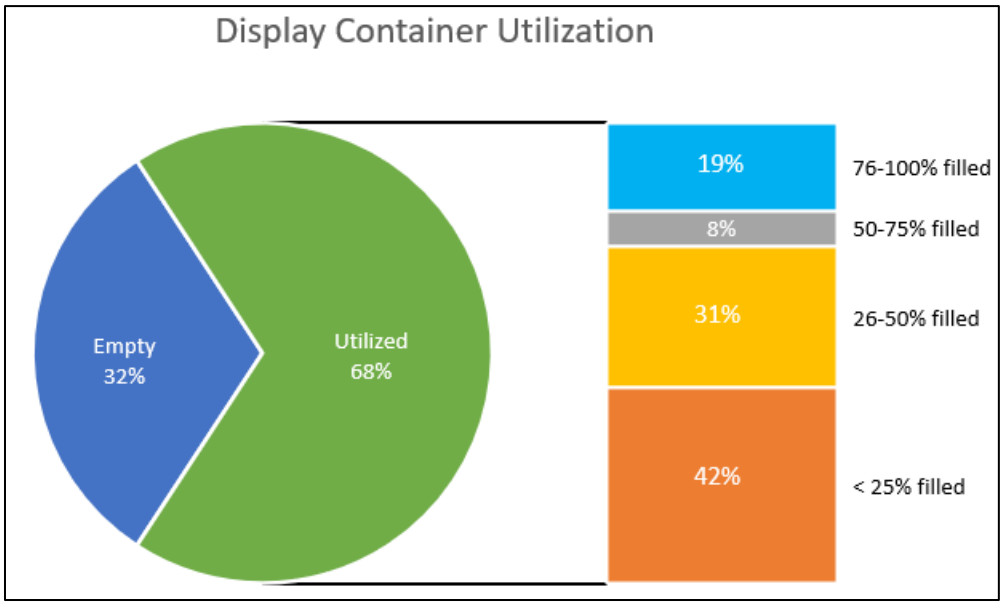

Fig. 7 Display Container Utilization

The above figures show a poorly organized display counter of the store. It is visibly clear that the containers are not properly utilized and most of them are left empty. The %Utilization data of Display Container Utilization when put into bar of pie chart shows that 32% of the containers (12 out of 38) are empty. Only 68% of all the containers put up on display window have some amount stock in them. This 68% when further classified into 4 bins according to the % filled, a major portion of 42% is occupied by the containers that are <25% filled. Just 19% of the containers are having a satisfactory amount of goods filled up to 76-100% of their total volume. This shows that even if containers are used, their capacity is not properly utilized. This can definitely impact how customers presume stock availability in the store. When analyzed from consumer's shoes, this is not so good sign of creating a great first impression and attracting new customers.

A total of 597 SKUs are sampled for the purpose of Stock Quality analysis and they are split into 21 distinct categories (Chocolates, dairy, oils, toothcare, kitchen supplies, pickles etc.). 210 out of them are found expired which corresponds to 35%. This 210 when counted category wise gives % contribution of each category of SKUs into the expired goods. The pie-of-pie representation for the analysis is below.

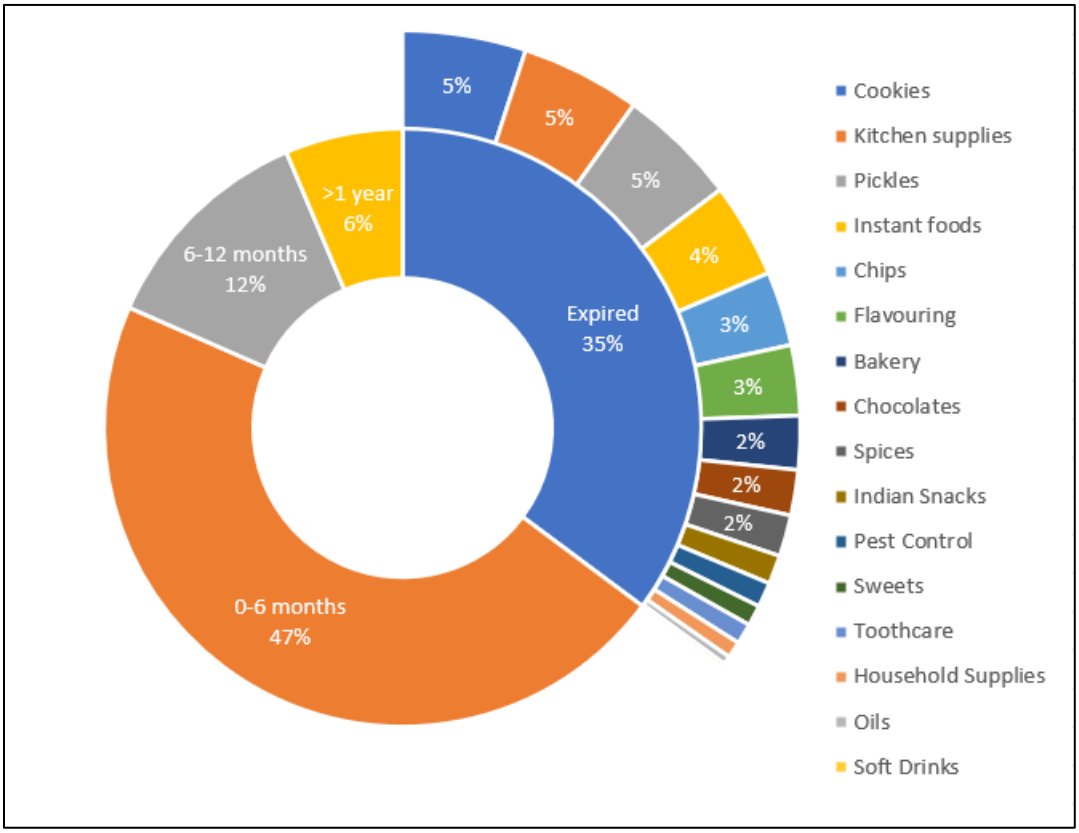

Fig. 8 Analysis of expired goods

The above figure shows how much % of goods are expired, expiring soon (0-6 months later), due expiry in 6-12 months, can last more than a year (as of project analysis date, June 2023). Extending the pie of expired goods further, we see that cookies, kitchen supplies and pickles contribute 5% each, i.e., a total of 15%. The other 20% is from narrow shares of several categories like instant foods, bakery items, spices etc. This implies that the store failed to make revenue out of all these products and whatever capital invested on procuring them got wasted due to expiry. This cost can be considered as **Sunk Cost**.

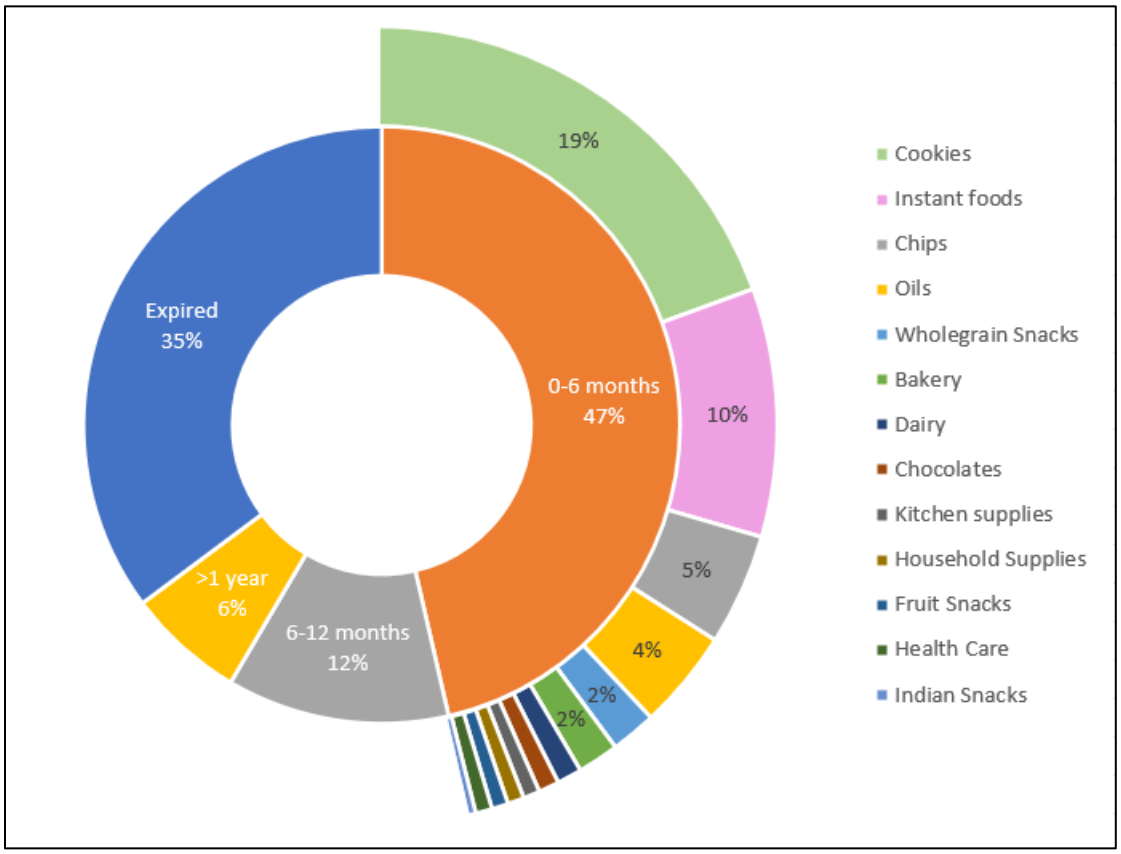

Fig. 9 Analysis of the goods expiring soon

A similar analysis is also performed on the pie that represents the goods expiring in another 0-6 months. From the graph, we see that the share of cookies in this category is extremely high at 19% of the total 47%. Instant foods (like Noodles, Pasta etc.) occupy another 10%. These two categories together sum up to 61% (29% of 47%) of the goods expiring soon. There are other group of products too with relatively smaller contribution as indicated in the chart.

From comparing both the above analyses, we can conclude that Cookies have been procured in huge quantities, way more than what is demanded.

Recommendations to business

Annapurna Mega Mart is facing tough time accepting its crashing revenue. The trends clearly show a warning sign that immediate corrective measures are extremely important. To mitigate the losses due to drop in revenue, the store owner has already taken below decisions in terms of controllable operating expenses:

- Stopped providing computerized bills to customers there by reducing the computer maintenance costs, billing software expenses and billing operator costs.
- Suspended CCTV operations to save power and maintenance expenses.
- Gave up maintaining digital inventory.
- Disconnected landline and cable connections at store.
- Stopped accepting credit cards to avoid credit card merchant fees.
- Took up in-store promotions for the brands like Jio Smart Kirana, Cadbury and Kwality Walls.

The above actions can reduce the costs incurred to the business but cannot help towards addressing the business problem. For this purpose, we can frame below set of recommendations based on the data collected and analyzed.

From Monthly revenue analysis:

By understanding monthly revenue analysis in terms of seasons, we observe that summer and rainy seasons are recording notably good sales. However, sales are at their least numbers in winter. Below ideas can help the business to perform better.

- Promote seasonal products like herbal teas, instant soups, instant popcorns and snacks with catchy hashtags like End of Season sales, Stock clearance sales etc.
- Promote winter body care products like oils, moisturizers, body wash products etc. to attract customers.
- Launch discounts on winter holiday themed products like assorted chocolates and cookies.
- Introduce customization facility on products like candles and chocolates on the eve of special occasions like Christmas and New Year.
- Continue bulk oil orders in summers even if the profit margin is disturbed slightly.

From customer footfall data:

Customer footfall data shows that Wednesdays record peak productivity both in terms of footfall and revenue. Tuesdays have low figures recorded. Below recommendations can be drawn out of this information.

- Never take a holiday on Wednesday.
- Put extra attention on Wednesday sales, record the details of products on demand. For the next week, use this data to study the patterns and stock up enough quantity of products.
- Launch product offers or discounts on Tuesdays to attract customers.
- Continue keeping the counts of "no-purchase customers" as low as possible by avoiding stock outs.

From Display Container Utilization data:

This section has put forward some alarming numbers to consider. Empty containers occupying 32% of the store counter do not create a visually appealing display. The store can select any of the below options.

- Remove empty jars from the display counter.
- Else, since the display is just next to the payment counter, consider filling the containers with attractive products like chocolates, candies etc. which tempt the customers while paying their bills.
- To reduce the odds of customers assuming stock out, fill the containers with stock up to their maximum capacity.
- Else, choose jar size according to the quantity decided to place in it and replace big containers with smaller ones. This avoids the problem of container under-utilization.
- Exercise special care in identifying eye-catchy products and consider them for display.

From Expired products' data:

From the data collected, expired stock sums up to as high as 35% of the entire stock. This is a huge barrier in providing fresh quality goods to customers. This in turn is a hindrance to meet customers' expectations and gain their loyalty. The business should consider below measures to avoid this scenario.

- Consider timely investigation / clean up of the stock to identify expired goods and replace them with fresh stock.
- Since cookies, kitchen supplies and pickles take up a major segment of expired goods, consider them as slow-moving SKUs and procure them with caution.
- Resume digital inventory as soon as possible in order to avoid manual errors in identifying expiry dates of goods.
- Recheck the dates on the products while billing, in order to avoid customer dissatisfaction at a later time.

From the data of products expiring soon:

This data is extremely important in terms of identifying goods that are about to expire. This helps taking necessary actions as early as possible to avoid loss due to expiry.

- Since 47% of the stock has a lifetime of less than 6 more months, maintain a separate list of these items and watch out their dates regularly.
- Launch special discounts and offers on these products at any profit margin (even negative) and clear the stock.
- Minimize procuring cookies to as low numbers as possible since they are stocked up and are occupying major shares in goods expired and about to expire.
- Consider inspecting the goods under "6-12 months left" and ">1-year left" categories also, not immediately but on a necessary basis.

From Sales trend forecast:

An extensive list of recommendations that are supported strongly by different sections of the business' real-time data is provided above. All the measures recommended are cost-effective i.e., they require least financial investment but are capable of demonstrating great improvement in business operations. They are also feasible to implement requiring no major organizational or store layout changes.

However, the sales trend forecast shows that if left unrepaired, the business will collapse to Zero sales by October 2023. Hence, it is important for the business to understand the urgency in taking up the corrective actions and implement them as soon as possible.

Conclusion

Even in the era of e-commerce, retail Kirana business stands as the backbone of Indian economy and occupy 75-78% of total consumer goods sales in India, as per Ambit Capital's estimates. However, despite being located in one of the prime commercial areas, Annapurna Mega Mart, a retail B2C Kirana store in Hyderabad is witnessing a downfall in revenue in the recent times. Huge loss in revenue caused by extremely low customer footfall count has been a matter of concern for the business since 2020. This project has been effective in identifying the underlying reasons behind the business problem.

Overall sales trend, month and year-wise sales trend, patterns in customer footfall for a period of one month, utilization of the containers put on display window of the store, quality of the stock available i.e., details of the stock expired and details of the stock going to expire soon are studied at a great detail. A drop in 61.8% of revenue is attributed to key parameters like 32% of empty containers on display creating an impression of No Stock among customers and a whopping 35% of expired goods identified in the in-store merchandise. Good Wednesday sales, high summer sales, least number of disappointed customers (who asked for something not available at store) are certain positive traits observed.

A comprehensive list of recommendations framed out of the insights drawn from the data analysis is presented in the report and was explained to the business owner too. The feasibility of implementing the solutions proposed and the timeline within which they need to be taken up were also discussed.

Special thanks to Mr. G. Narendar, the owner of Annapurna Mega Mart without whose extensive support, the project could not have been smooth. Despite his low academic qualification, he has shown huge respect towards IIT as an institution and strongly believed that projects from its students will definitely add value to his business. He was instantly willing to share necessary data and was always ready to sit and discuss the insights and recommendations. This project could successfully convince him that his business can soon return to its former glory, provided the proposed solutions are taken up for implementation at emergency.

Thanks to Dr. Aditya sir, Dr. Ashwin sir and team who were extremely helpful all through the course of the project. They were readily available over discourse and emails any time to clarify even the smallest of the doubts at any phase of the project. Thanks to TAs who evaluated my earlier submissions and provided comprehensive and constructive feedbacks on-time without which incrementally better project reports and a smooth flow of project would not have been possible.

********* End of the report *********