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A Study of Inventory Control Techniques to Optimise Revenue in Small Retail Stores

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Abstract- According to an estimation, there were around 12.65 million retail grocery stores in India in 2020. These Stores typically covered 100-200 square feet and kept stock of around 500-1000 items. These small retail shops generate yearly average revenue of 18-25 lac, of this the profit margins are around 3-4% i.e., Rs 54,000-72,000 yearly. From discussions with shop owners running small to medium retail stores from two-three generations, the challenge seems to be either overstocking leading to wastage, or stock-out leading to customer diversion. Small retail stores usually are managed using the primitive hit and trial method when it comes to inventory management, that only becomes moderately efficient in case of extensive experience of the manager. The following paper presents a study of three inventory control techniques in order to optimize revenue by controlling the inventory efficiently for small retail stores in India. The purpose of this study is to figure out a pattern connecting inventory control with optimal revenue which may further be converted into an algorithm for software that may help small retail store owners all over India.

Keywords: Inventory Control, Optimise, Small retail stores.

I. INTRODUCTION

Retail stores have been vital for the Indian economy, accounting for about 10% of the GDP. As in earlier days, India having retailing industry was basically owner-manned small shops. In 2010, higher arrangement convenience stores and supermarkets reported for about 4% of the industry, and this type of retail shop was present only in large city centers. Basically, typical Indian retail shops are very small. As of 2020, over nineteen million outlets operate in the country and only four percent of them are larger than five hundred square feet in size. For every thousand people, India has about eleven shops.

The vast majority of the unorganized retail shops in India employ family members and do not have the scale to procure or transport products at a high-volume wholesale level.Some studies claim that the lack of infrastructure and competitive retail industry is a key cause of India's persistently high inflation. Well over 30% of food staples and perishable goods produced in India spoil because of poor infrastructure and small retail outlets prevent hygienic storage and movement of the goods from the farmer to the consumer. India's poor infrastructure and small retailer outletsOver thirty percent of food staples and fresh goods in India.

A review paper on production and operations management was introduced by Vergin. R. C et. all in1975. Hatefi et. all implemented ABC inventory classification for several inventory items in the presence of both quantitative and qualitative criteria. Jose, T et. all developed an inventory control technique model for an effective inventory management system.

Kumar, P et. all used ABC analysis for an inventory management study of scooters in India. With the help of HML analysis Kumar. Y et. all developed Inventory Management in Steel Plant. Kuo-En Fu et. all analyse the ABC model for the multiple products inventory control. Lee et. all developed inventory management control for women's clothing. Mahant. H et. all used ABC analysis for the medium-scale industry. Mitra et. all implemented inventory management using ABC and HMAL model in the manufacturing industry. Nazar Sohail et. all studied inventory management systems. Biswas. S.K et. all analysed the different inventory control systems in retail shops.

Indian online grocery market is estimated to exceed sales of about US$ 3.95 billion in 2021.India's population is taking to online retail big way.With the

overwhelming boom in the e-retail platforms and tech awareness among both rural and urban populations in India, the retail sector is rising, but the offline retail stores are being affected proportionally, the pandemic and lockdown had already broken the backs of the family-owned retail stores, the boom in the e-retails stores further cemented their decline. In such an environment where the sale is uncertain, the offline small retailers are confused, and their regular experience with the inventory is no longer useful. In order to overcome these problems, proper inventory control techniques are necessary. Inventory control is a systematic method, which ensures the incessant supply of required quantity and quality of inventory.

II. RESEARCH METHODOLOGY AND STATEMENT OF THE PROBLEM

This research is restricted to the analysis of inventory management in a small FMCG retail store based in Jaunpur, UP. This paper presents a study of three different inventory control techniques for an efficient inventory management system of a retail shop in a small city in northern India. Although there are several Inventory control techniques for maintaining proper inventory management, here three different control techniques are applied which are discussed below.

ABC Analysis

ABC analysis is based on the Pareto principle (80-20 rule) which states that 80% of the overall consumption value (expense) is based only on 20% of the total items i.e. small portion of the items may typically represent the bulk of money value, while a relatively large number of items may form a small part of the money value.

An item: money value is highest 70%, represent only 10% of items

- should have tight inventory control under more experienced management.
- Re-orders should be more frequent
- B items: money value is medium 20%, representing about 20% of items
- require medium attention for control.
- An important aspect of class B is the monitoring of potential evolution toward class A or, on the contrary, toward the class C

C items: money value is lowest 10%, representing about 70% of items

- require minimum attention and may be kept under simple observation.
- Re-ordering is less frequent.

HML Analysis

The High, Medium & Low (HML) analysis is similar to the ABC analysis except the difference is that instead of the Annual consumption value used in the ABC classification cost per unit criterion is used in the HML analysis. The items under this classification scheme are arranged in descending order of their unit price. The classification of the items based on unit price is decided completely by the management. It helps managers to take decisions on buying policies which means H & M items should not be ordered more than the required quantity. The frequency of stock checking is also initiated by this method. Most valuable items require frequent stock checking.

Economic Order Quantity (EOQ)

In inventory management, two important costs are ordering costs incurred on communicating the order and holding costs required for carrying inventories. To minimize carrying costs, items should be ordered frequently in small lots which will in turn increase the ordering cost. As these two costs are opposite, an innovative model is required to make a balance between them. To minimize the total inventory cost, the economic order quantity (EOQ) model helps the managers. It defines the optimum quantity that minimizes the total cost (both ordering & holding costs) of stocked material. Economic order quantity (EOQ) & order frequency are calculated by using the following formula:

$EOQ = \sqrt{2DSH}$

where, D = Demand per year (units) S = Re-order cost/ Procurement cost H = Carrying or holding cost/ unit/ year $n = DEOQ$

where, D = Demand per year (units) EOQ = Economic order quantity

III. DATA COLLECTION & CALCULATION

Data Collection

Necessary data for this study were collected from Pandey Kirana stores, Jaunpur, UP, and some data were collected by personal interaction with retailer shops, direct observation, and the remaining data were collected by turnover data, monthly statement of inventory, and record file. The proposed methodology was applied to 20 different items. Table 2 shows the annual demand & unit price of 20 different items of the company. Based on the data, two inventory control techniques have been performed

Table 1: Demand and Price of inventory

Sl.No.	Product	Demand per Year(In Kg)	Cost/Kg	Sl.No.	Product	Demand per Year(In Kg)	Cost/Kg
1	Mustard oil	36000	280	11	Black gram	36500	90
2	Wheat flour	182500	33	12	Noodles	18250	300
3	Toor dal	36500	250	13	Gram flour	36500	100
4	Turmeric powder	36500	260	14	Almonds	18250	750
5	Redchilli Powder	73000	300	15	Cashews	18250	800
6	Garam masala	36500	980	16	Raisins	36500	320
7	Coriander powder	73000	370	17	Refined oil	73000	200
8	Salt	54750	20	18	Desi Ghee	73000	550
9	Sugar	73000	58	19	Refined flour	73000	40
10	Rice	182500	55	20	Camphor	365	1800

Calculations - Abc Analysis

To classify items under the ABC classification scheme, the annual usage/ consumption value is calculated by multiplying the average daily sale by 365. Items are arranged in descending order of their annual usage starting with the highest usage down to the most minor usage. The yearly usage value gives the percentage of each annual usage item. The next step is to calculate the percentage cumulative usage of twenty items. The percentage of the cumulative items is expressed by the number of items. Items are segregated into A, B, and C categories following ABC classification rules which are shown in Table 2.

Table 2: ABC Analysis

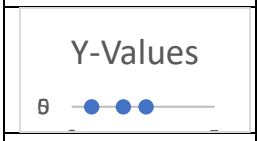
S.No.	Product	Demand per Year (In Kg)	Cost/Kg	Annual Cost (in Rs)	% Annual cost	% Cumulative annual cost	ABC category
1	Mustard oil	36000	280	40150000	16.3564775	16.3564775	A
2	Wheat flour	182500	33	35770000	14.5721345	30.928612	A
3	Toor dal	36500	250	27010000	11.0034485	41.9320605	A

4	Turmeric powder	36500	260	21900000	8.92171501	50.8537755	A
5	Red chilly Powder	73000	300	14600000	5.94781	56.8015855	A
6	Garam masala	36500	980	14600000	5.94781	62.7493955	A
7	Corriander powder	73000	370	13687500	5.57607188	68.3254674	A
8	Salt	54750	20	11680000	4.758248	73.0837154	A
9	Sugar	73000	58	10080000	4.10643321	77.1901486	A
10	Rice	182500	55	10037500	4.08911938	81.279268	B
11	Black gram	36500	90	9490000	3.8660765	85.1453445	B
12	Noodles	18250	300	9125000	3.71738125	88.8627258	B
13	Gram flour	36500	100	6022500	2.45347163	91.3161974	B
14	Almonds	18250	750	5475000	2.23042875	93.5466261	B
15	Cashews	18250	800	4234000	1.7248649	95.271491	B

HML analysis

For HML analysis, all the items whose unit price value is above Rs 500 are categorized as "H" items, items whose unit price lies between Rs 500 and BDT 250 are categorized as "M" items, and items whose unit price is below Rs 250 are categorized as "L" items in this calculation, as shown in Table 3.

Table 3: HML Analysis

S.No.	Product	Demand per Year (In Kg)	Cost/Kg	HML category
	Camphor	365	1800	H
2	Garam masala	36500	980	H
3	Cashews	18250	800	H
4	Almonds	18250	750	H
5	Desi Ghee	73000	550	H
6	Corriander powder	73000	370	M
7	Raisins	36500	320	M
8	Red chilly Powder	73000	300	M
9	Noodles	18250	300	M
10	Mustard oil	36000	280	M
11	Turmeric powder	36500	260	M
12	Toor dal	36500	250	M
13	Refined oil	73000	200	L

14	Gram flour	36500	100	L
15	Black gram	36500	90	L
16	Sugar	73000	58	L
17	Rice	182500	55	L
18	Refined flour	73000	40	L
19	Wheat flour	182500	33	L
20	Salt	54750	20	L

Economic Order Quantity (EOQ)

c and optimum order frequency per year for different components are calculated through Equations mentioned in the Research methodology. Table 4 shows the calculation steps of the EOQ analysis

Table 4: Economic Order Quantity (EOQ) calculation

S.no	Product	Demand per Year	Cost/Kg	Holding cost/unit/ year	ordering cost/orde r	EOQ	n	n(R O)
1	Mustard oil	36000	280	300	28000	1833.03	19.63961	20
2	Wheat flour	182500	33	25	3300	4908.156	37.183	37
3	Toor dal	36500	250	20	25000	6754.628	5.403702	5
4	Turmeric powder	36500	260	20	5200	3080.584	11.8484	12
5	Red chili Powder	73000	300	20	6000	4679.744	15.59915	16
6	Garam masala	36500	980	10	9800	5980.803	6.10286	6
7	Coriander powder	73000	370	20	3700	3674.915	19.86441	20
8	Salt	54750	20	20	2000	2339.872	23.39872	23
9	Sugar	73000	58	20	5800	4601.087	15.86582	16
10	Rice	182500	55	25	5500	6336.403	28.80183	29
11	Black gram	36500	90	10	9000	5731.492	6.368324	6
12	Noodles	18250	300	10	15000	5232.112	3.488075	3
13	Gram flour	36500	100	10	10000	6041.523	6.041523	6
14	Almonds	18250	750	20	15000	3699.662	4.932883	5
15	Cashews	18250	800	20	16000	3820.995	4.776243	5
16	Raisins	36500	320	20	6400	3417.601	10.68	11
17	Refined oil	73000	200	30	10000	4932.883	14.79865	15
18	Desi Ghee	73000	550	25	11000	5667.451	12.88057	13
19	Refined flour	73000	40	25	4000	3417.601	21.36001	21
20	Camphor	365	1800	5	1800	362.4914	1.00692	1

IV. RESULT AND DISCUSSION

ABC ANALYSIS

From the classification result of ABC analysis shown in Table 7, "A" classes are those which constitute 45% of total items and occupy 77.19% of total value usage per annum. "B" classes are those which constitute 30% of total items and occupy 13.99% of total value usage per annum and the "C" class constitutes 25% of total items and occupies 8.82% of total value usage per annum. As per inquiry, the retail shop owner has not employed any inventory control measures, hence this analysis offers the first classification of the inventory, based on the category in the order that can be regulated.

Table 5: Result of ABC Analysis Product

classification	No. of items	% of items	Consumed value (INR)	% of value usage
A	9	45%	189477500	77.19%
B	6	30%	44384000	13.99%
C	5	25%	11607000	8.82%

HML ANALYSIS

HML categories were done to find out items according to their unit price to give relative importance. Table 8 shows that among the selected 20 items of the retail shop, 5 items are found high priced, 7 are found to be medium-priced items, and 8 are found to be low-priced items. HML analysis will help the manager to provide relative importance of items, decide the frequency of stock checking off items, and exercise control on purchase and buying policies. This analysis shows that "H" and "M" category items should be given extra care in comparison to "L" category items.

Table 6: Results of HML Analysis

Product classification	No. of items	% Of items
H	5	25%
M	7	35%
L	8	40%

ECONOMIC ORDER QUANTITY (EOQ)

The EOQ and the number of orders purchased per year have been calculated for the 20 components in the retail shop. The calculated EOQ has been compared with the number of units of each component purchased in the organization which is shown in Fig. 1. It is found that there is a variation in the calculated EOQ and the current ordering policy of the retail shop. This is because the shop place orders frequently when the demand arises without managing EOQ. The company is not following the EOQ model for purchasing the goods and therefore the company inventory management is not satisfactory. The EOQ will help the shop prevent the problem of overstock and reduce the ordering cost.

Previous order vs EOQ

V. CONCLUSION

- Retail stores across India run on experience and face challenges like overstock, wastage, understock, etc.
- The fewer profit margins in such small-scale businesses hence suffer a further loss due to non-management of inventory.
- With the boom in e-retail the small-scale retail sector has further declined and is struggling to make a sustainable profit.
- In such a competitive environment, inventory management becomes vital for the sustenance and progress of offline retail stores.
- There are many techniques available for controlling inventory, ABC, FSN, and EOQ can be considered the basis for optimization.

- This particular study concludes that if Pandey general stores introduce inventory control techniques in its business model, it will surely minimize its waste and maximize revenue.

Further Scope

- once inventory is optimized for a pilot retail store in successive trials using several techniques an algorithm can be devised keeping the initial investment, warehouse space, and expiration dates of products as an initial value depending on the retail owner.
- The Algorithm may further be used to develop a software of mobile application to make small retail stores tech-savvy.

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