ABC Classification for Inventory Optimization

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Abstract : *Inventory Classification is very important to manage inventory efficiently. Popular concept -* ***Importance and Exception (CIE)*** *is employed to ensure that efficiency is maximized with least effort .For inventory optimization and Inventory Forecasting, products need to be classified appropriately. There are several methods used for categorization of products and items in inventory. Most common classification used is the* ***Pareto Analysis****. The focus of this paper is to check if some assumptions for ABC Analysis are taken for granted.*
Keywords: *ABC- Analysis, Inventory Optimization, Inventory Planning*

I. INTRODUCTION

In any industry today inventory optimization is such a vital function. Excess and Shortage of inventory in all levels of the supply chain can affect the availability of products and/or services to consumers. Several monitoring systems and processes can be employed to check inventory imbalances to minimize the supply and demand dynamics. To simply these monitoring systems and process items/materials/products are classified into different groups [1]. Also it is easier to monitor and control vast systems through the Concept of Importance and Exception (CIE).

Several different strategies need to be applied appropriately for Integrating Inventory Classification and Policy Selection [2] so that it benefits the entire Supply Chain and not only individual entities of the Supply Chain . Several such categorization of items / materials / products are based on

1. Price
2. Value
3. Criticality
4. Availability
5. Movement
6. Predictability
7. Weight

ABC Analysis is based on Pareto Analysis [3] which says 20% of the items contribute to 80% of sales. It implies that a small portion of items in Inventory contribute to maximum sales. Typically less than 20% of items classified as A, contribute as much as 80% of the revenue. The next 15% (80% - 95%) contribution to revenue is done by B class Items. The last 5 % revenue is generated by items classified as C'. As the classification is done according to the importance of their relative value, this approach is also known as Proportional Value Analysis (PVA).

Therefore it is a general trend in the industry to focus more on 'A' class items (approx 20%) which results in maximum revenue (80%). In simple terms, planning and forecasting for 'A' class items can yield maximum benefits

II. IMPORTANCE AND NEED

There are so many types of products classification and categorizations available for inventory optimization like ABC, XYZ, FSN, SDE, VED, HML etc. ABC analysis can be used for different purposes. Therefore one must carefully study the requirements before any of these categorizations are applied [4]. There are lots of assumptions for each categorization. ABC classification has an important assumption which is 80-20 rule. Another assumption is the planning horizon. There are no industry standards that define the Period of Analysis and this are randomly decided based on convenience.

III. OBSERVATIONS: PERIOD OF ANALYSIS

Data from an OEM Company dealing in Automotive Plastics is considered for this Study. This company has 330 Finished-Goods items and their sales data is analyzed. The period of analysis has a large impact on ABC analysis. The table below (Table1) shows data with different periods of analysis. The first row shows data for 1 Month period with 67 active items with number of As, Bs and Cs. When the analysis in increased to 2-Months Period (August 12 to Sep 12) the number of active items increases to 103 (54% increase)

and proportionally As, Bs and Cs also increase. Similarly when this analysis is done for 12-Months the number of active items increases to 216 (Almost 3 times). This has a proportional effect on number of items classified as A, B and C.

Table 1- % Difference for different Periods of Analysis

S no	Period Of Analysis	Period	Active Items	% Difference	A	B	C
1	1 Month	Sep-12	67		5	13	60
2	2 Months	Aug12-Sep12	103	54%	7	16	96
3	3 Months	Jul12-Sep12	131	27%	10	22	98
4	4 Months	Jun12-Sep12	143	9%	10	26	119
5	5 Months	May12-Sep12	161	13%	10	26	133
6	6 Months	Apr12-Sep12	171	6%	11	27	136
7	7 Months	Mar12-Sep12	175	2%	12	28	149
8	8 Months	Feb12-Sep12	187	7%	13	29	155
9	9 Months	Jan12-Sep12	190	2%	13	29	157
10	12 Months	Oct11-Sep12	216	14%	14	30	173

As per the above table the minimum percentage difference is seen for 6 months to 9 Months. How do we conclude what is the most optimum period for which ABC analysis should be done.

The data above has been studied for September 2012. For the subsequent months items may jump from one classification to another like A to B or B to C etc. Some products may even become inactive. Some new products may also introduced and get classified as A, B or C. These jump/shift from one category to another are quantified using the following steps. This quantitative assessment [5], [6] may help to improvise the application of ABC Classifications

Table 2 - for Quantification ABC

A	is replaced by	1
B	is replaced by	2
C	is replaced by	3
Inactive is replaced by		4

1. This numeric number is compared with the previous period
2. Difference are Squared.
3. The sum of the Squared Difference in ABC is the total variation.

Let's take the following examples for a specific item when the classification changes from 'A' to 'C'

Table 3 – Steps for Quantifying Variations

	Example	Planning Period 1	Planning Period 2
		A	C
Step 1	Data Reading	1	3
Step 2	Diff in Categorization		(1-3) = -2
Step 3	Square of Difference		$(-2)2 = 4$
Step 4	Variations		4

1-Month ABC Classification for successive period is shown in fig.-1 .

	A	B	C	D	E	F	G
		B3	fx	Sep-12->Sep-12			
3	Product Code	Sep-12->Sep-12	Oct-12->Oct-12	Nov-12->Nov-12	Dec-12->Dec-12	Jan-13->Jan-13	Feb-13->Feb-13
126	A10126	B	B	Inactive	Inactive	A	Inactive
127	A10127	A	B	B	A	B	B
128	A10128	A	A	B	A	A	A
129	A10129	B	B	Inactive	Inactive	Inactive	Inactive
130	A10130	A	A	A	A	A	A
131	A10131	A	C	A	B	A	A
132	A10132	A	A	A	A	B	A
133	A10133	A	B	A	B	A	A
134	A10134	Inactive	A	Inactive	A	A	A
135	A10135	B	Inactive	A	B	B	A
136	A10136	A	A	A	A	A	A
137	A10137	Inactive	Inactive	Inactive	Inactive	Inactive	Inactive
138	A10138	C	Inactive	C	C	Inactive	C
139	A10139	Inactive	Inactive	Inactive	Inactive	Inactive	Inactive
140	A10140	Inactive	Inactive	Inactive	Inactive	Inactive	Inactive

Figure-1

2-Months ABC Classification for successive periods

	A	B	C	D	E	F	G
		B1	fx	Sep-12->Oct-12			
1	Product Code	Sep-12->Oct-12	Oct-12->Nov-12	Nov-12->Dec-12	Dec-12->Jan-13	Jan-13->Feb-13	Feb-13->Mar-13
2	A10126	B	B	Inactive	A	A	Inactive
3	A10127	A	A	A	A	B	B
4	A10128	A	A	A	A	A	A
5	A10129	B	B	Inactive	Inactive	Inactive	Inactive
6	A10130	A	A	A	A	A	A
7	A10131	B	B	A	A	A	B
8	A10132	A	A	A	A	A	A
9	A10133	A	A	A	A	A	A
10	A10134	A	A	A	A	A	A
11	A10135	B	B	B	B	A	A
12	A10136	A	A	A	A	A	A
13	A10137	Inactive	Inactive	Inactive	Inactive	Inactive	Inactive
14	A10138	C	C	C	C	C	C
15	A10139	Inactive	Inactive	Inactive	Inactive	Inactive	B
16	A10140	Inactive	Inactive	Inactive	Inactive	Inactive	Inactive

Figure-2

Using the steps mentioned above the deviations (Movement of Products into different categories of ABC) are quantified and shown below. In order to ensure that the comparison is done correctly, all Periods of analysis have the same ending period. In the below table – 'Fig. 3', Column 'B' indicates all periods ending with September 2012. Similarly column 'D' and 'F' indicates all periods ending with October 2012. The deviations observed for 1 Month analysis is maximum. Whereas minimum deviation is observed when analysis is done for longer periods like 6 – 9 Months

	A	B	C	D	E	F	G
1		**Sep-12**		**Oct-12**		**Nov-12**	
2	**Periods of Analysis**	**Periods**	ABC	**Periods**	ABC	**Periods**	ABC
3	1 Month	Sep12-Sep12	161	Oct12-Oct12	167	Nov12-Nov12	123
4	2 Months	Aug12-Sep12	80	Sep12-Oct12	63	Oct12-Nov12	81
5	3 Months	Jul12-Sep12	65	Aug12-Oct12	41	Sep12-Nov12	43
6	4 Months	Jun12-Sep12	64	Jul12-Oct12	41	Aug12-Nov12	24
7	5 Months	May12-Sep12	41	Jun12-Oct12	42	Jul12-Nov12	30
8	6 Months	Apr12-Sep12	64	May12-Oct12	28	Jun12-Nov12	29
9	7 Months	Mar12-Sep12	46	Apr12-Oct12	52	May12-Nov12	17
10	8 Months	Feb12-Sep12	36	Mar12-Oct12	41	Apr12-Nov12	38
11	9 Months	Jan12-Sep12	53	Feb12-Oct12	26	Mar12-Nov12	29
12	12 Months	Oct11-Sep12	44	Nov11-Oct12	26	Dec11-Nov12	19

Figure-3

IV.   CONCLUSION

Before ABC analysis is done, the need for the analysis has to be studied. For any kind of Sales Forecasting and Planning if ABC Analysis is not done properly, it may lead to serious inventory management issues. If ABC analysis for 1-Month data is used, 5 – 'A' Category products would have been extrapolated for planning purpose leading to serious shortages of critical items resulting is loss of revenue. Similarly if 12-Month data is used, 14 – 'A' class products would have been extrapolated leading to increase in Inventory resulting is Cash-flow issues.

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