

**ST2187 : Business Analytics, applied
modelling and Prediction**

Coursework

Name : Harshit Mehta

Student No: 190480879

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Executive Summary

A global superstore spread across 7 markets is analysing data in respect of profit, sales, discount, shipping cost in order to gain insights into the most profitable regions/product lines to maximize its profits.

To understand the main revenue streams of the global superstore, various types of analysis like country analysis, market analysis and sub-category analysis were performed. Armed with knowledge of centres of profit generation, a logical subsequent step was to probe the loss making centres.

Market Analysis revealed that APAC with profit of approx. 436,000 is the most profitable market for the superstore. This begs the question, what strategy is being followed in APAC that makes it so profitable or is it just a case of more sales (due to population) translating into more profits?

To probe the APAC market, the performance of regions and sub-categories was evaluated. This revealed that a huge chunk of APAC sales are attributable to the economic power houses of Asia, i.e. India and China. However, even in the most profitable market (i.e. APAC), there are some countries that are making losses consistently. The reasons for losses in these countries were probed. Necessary recommendations have been made on how to convert these loss making regions to profit making.

It was also noted that the table-sub category is the only loss making sub-category in APAC (as well as globally). The reasons for the same were analysed and steps have been recommended – whether to discontinue or alter discount rates – on the basis of prevailing market conditions.

Bird's Eye View

A global superstore spread across 7 markets: APAC, EU, US, LATAM, Africa, EMEA and Canada, wishes to understand how to improve its profits by deriving insights from its past years' transaction data.

The global store deals in various segments like Consumer, Corporate and Home office that have offerings in plethora of sub-categories like Accessories, Appliances, Art, Binders, Bookcases, Chairs, Copiers, Envelopes, Fasteners, Furnishings, Labels, Machines, Paper, Phones, Storage, Supplies and Tables.

Before delving into the specifics of any region/category, it would be better to first probe the main revenue streams of the superstore chain.

The Top 5 profit making countries are [Ref. Graph 1 (G1 from story)]:

Country	Profit ₹	Sales
United States	286,397	2,297,201
China	150,683	700,562
India	129,072	589,650
United Kingdom	111,900	528,576
France	109,029	858,931

The Top 5 profit making subcategories are [Ref. G3]:

Sub-Catego..	Profit ₹	Sales
Copiers	258,568	1,509,436
Phones	216,717	1,706,824
Bookcases	161,924	1,466,572
Appliances	141,681	1,011,064
Chairs	140,396	1,501,682

The superstore chain makes a profit in every subcategory except in Tables sub-category, which was profitable only in the African market in 2014:

Market	2011	2012	2013	2014
Africa	937	-1,455	1,981	2,549
APAC	-5,533	-977	-5,894	-7,725
Canada			300	
EMEA	1,392	3,950	1,679	-4,257
EU	-1,600	-7,485	-5,445	-6,467
LATAM	-3,146	1,055	-3,711	-6,504
US	-3,124	-3,510	-2,951	-8,141

Market analysis reveals that the superstore made net profits in every market, with APAC being the most profitable [Ref. G2], but on deeper investigation it is found that there are certain countries that have a very low profit margin ratio.

Countries with profit margin ratio of approx. -1 or lower are [Ref. G4]:

1. Turkmenistan
2. Kazakhstan
3. Yemen
4. Uganda
5. Zimbabwe
6. United Arab Emirates
7. Lithuania
8. Tajikistan

There is an interesting pattern to be found amongst these countries. All these countries have high average discount rate of 70% which is adversely impacting the profits. Therefore it is recommended that if in future also substantial increase in sales is not predicted and the discount rates to effect sales continue to be high, resulting in losses – it is advisable to discontinue operations in these countries.

Understanding Losses Worldwide & Market Focus : APAC

- i. APAC with profit of approx. 436,000 is the most profitable market for the superstore with China, India, Australia, Indonesia, New Zealand and Philippines being the most important countries in terms of sales. [Ref. G6]
- ii. The following countries (amongst APAC countries) are loss making for the superstore [Ref. G5]:
 1. Pakistan (~ -22k)
 2. Philippines (~ -16k)
 3. South Korea (~ -12k)
 4. Thailand (~ -7k)
 5. Myanmar (~ -2k)
 6. Vietnam (~ -2k)

However, there are 2 countries that have been consistently loss making but are significant from sales perspective [Ref. G5]:

1. Pakistan
2. Philippines.

The reasons for the same were probed.

Country in Focus : Pakistan

- i. On plotting average profit across various sub-categories, we observe that only 3 sub-categories, namely Bookcases, Chairs and Furnishing are profit making. What's even more interesting is that they have a commonality among them, i.e. these 3 sub-categories fall in the least discounted cluster at 20%. All the other sub-categories, which are being discounted at a higher rate are showing losses. In fact, the table sub-category which has the highest discount rate of 80% is most loss making sub-category. [Ref. G7]
- ii. The overall discount vs. profit curve also supports the claim that discounts are negatively related to the profits. As the superstore started offering more discounts from 2012, the profits started decreasing even further, though the sales picked up. [Ref. G8]
- iii. The following relation describes the relation in profit and discount (w.r.t Pakistani market):

$$\text{Profit} = -695.065 * \text{Discount} + 218.864$$

Discount is found to be a significant variable in explaining Profit and accounts for approx. 10% of the variation in Profits. We can infer that discount rates have a significant impact on profits though there are other factors also at play in deciding the profit. [Ref. G9]

The equation obtained suggests that the breakeven point occurs at approx. 30% discount rate. Hence it is recommended to cap the discount rates in Pakistani market at 30% to rein in the losses and the discount rates should be gradually reduced to realise benefits of market penetration achieved by offering higher discount rates in past years.

Country in Focus : Phillipines

With sales of approx. 180k, Philippines is one of the most significant countries in the APAC market. However Philippines has been consistently making losses of approx. 4k annually for the superstore. Given the size of Philippines market/amount of sales, making the Philippines market profitable could prove to be big revenue earner for the superstore chain.

There are only 5 profit making sub-categories in Philippines:

[Ref. G10 – Avg. Profit vs. sub-category]

- Appliances
- Chairs
- Binders
- Furnishings
- Phones

It is interesting to note that the superstore is offering a maximum discount rate of 25% in these 5 profit making sub-categories, while offering a minimum discount of 25% (going up to 55%) in the remaining 12 loss making sub-categories. [Ref. G10 – Avg. Discount vs. sub-category]

The following clusters are quite observable in the Philippines market [Ref. G10]:

- Cluster 1: Low sales, High discount rate

The sub-categories in this cluster are loss making and have relatively low amount of sales (below 10k) with high avg. discount rates (approx. 45%). Moreover, the profit ratio is below -0.2 for the all the sub-categories in this cluster.

Following sub-categories fall in this cluster:

- Storage
- Tables
- Accessories
- Supplies
- Envelopes
- Art
- Paper

- Fasteners
- Labels
- Cluster 2 : High Sales, Low discount rate

The sub-categories in this cluster are either profit making (5 profit making sub-categories stated above) or have high amount of sales. The avg. discount rates being offered in this cluster are relatively low (approx. 25%).

Following sub-categories fall in this cluster:

- Appliances
- Chairs
- Binders
- Furnishings
- Phones
- Machines
- Bookcases
- Copiers
- Cluster 1 (Analysis):
Before probing any further, it is worth noting that even at high avg. discount rate of 45%, the sales of the sub-categories in Cluster 1 are quite low. This is perhaps an indicator that the superstore's products in Cluster 1 sub-categories are not in demand/competitive in the Philippines market. Lowering the discount rates would further reduce the sales of the Cluster 1 sub-category products. Therefore it is recommended that sub-categories in Cluster 1 be discontinued in Philippines.
- Cluster 2 (Analysis): High Sales, Low discount rate [Ref. G11]:
Following relations were observed:
 - Significant relation in discounts and profit:

$$\text{Avg. Profit} = -478.404 * \text{Avg. Discount} + 113.374$$

(break-even at approx. 0.2369 discount)

- Significant relation in Sales and Discount

$$\ln(\text{Avg. Sales}) = 2.02763 * \ln(\text{Avg. Discount}) + 8.42334$$

The equation suggests that lowering the discount rate would reduce the sales of products in Cluster 2 sub-category.

Thus the following steps are recommended for the Philippines market:

- Discontinuation of Cluster 1 sub-categories.
- Max. Discounts for Cluster 2 should be capped at approx. 23% - which would impact the following sub-categories:
 - Copiers (presently discounted at 35%)
 - Bookcases (presently discounted at 35%)
 - Machines (presently discounted at 25%)

APAC Table Segment

- i. The table sub-category happens to be the only loss making sub-category in the APAC market. It is interesting to note that all the APAC countries making profits in the table sub-category are offering very low discount rates for tables (max discount rate of 20%).
- ii. Following countries have extremely low profit margin ratio due to low sales and high discount rates (approx. discount rate of 60% and above) for tables:
 - 1. Pakistan
 - 2. South Korea
 - 3. Philippines
 - 4. Thailand
 - 5. Vietnam
 - 6. Myanmar (Burma)

This indicates that products in Table sub-category are not in demand/competitive in the above countries. Hence table sales should be discontinued in these countries. [Ref. G12]

- iii. Moreover it is worth noting that profits in table sub-category is highly sensitive to discounts and their relation is given by the following equation:

$$\underline{\text{Avg. Profit} = -1391.34 * \text{Avg. Discount} + 355.443}$$

Discounts (in table sub-category) not only has significant impact on profits but the variation in discount accounts for approx. 45% of the variation in profits!

As the break-even point for table sub-category occurs at 0.2554, the discounts for table sub-category in APAC market should be capped at 25%. [Ref. G13]

- iv. Thus the discount rates for Table sub-category needs to be capped at approx. 25% (for Breakeven) for the following countries:
 - Australia (presently discounted at 30%)
 - China (presently discounted at 30%)
 - Indonesia (presently discounted at 47%)