Capstone Project : Marketing and Retail Analytics

To Reduce The Excess Inventory Management Costs For E-commerce company ‘OList’

AGENDA

- Objective
- Background
- Insights
- Recommendations
- Conclusion
- Appendix:
  - Data sources
  - Data methodology
  - Data model assumptions

OBJECTIVE

- To **manage the inventory** effectively and reduce any unnecessary costs that the company 'OList' is incurring.
- Identify **top products** contributing to the majority of the **revenue**.
- Identify the **product categories** which can be **omitted** without significantly impacting business revenue.
- Analyze the purchase behavior of customers to identify the **sales pattern of products**.

BACKGROUND

- To be able to meet the demands of the customers, any e-commerce company would obviously need to store tons and tons of products in warehouses which includes fast-moving products as well as slow-moving products.
- Each of the products being stored incurs a cost to the company in terms of space and maintenance, Because of which it is absolutely necessary for the organizations to plan their inventory well.
- 'OList', a e-commerce company, has faced some losses recently and they want to manage their inventory very well so as to reduce any unnecessary costs that they might be bearing.

Optimizing Inventory of Toys category should be our first priority

- 76% of the revenue is generated from individual 'Toys' category which also accounts to 76% of the inventory(unique products). (fig.1)
- Top 40% products from toys category contribute to 75% of the current revenue from toys category. (fig.2)
- Approx. 13% of the categories (9), generate almost 90% of the revenue and contribute to 91% of the orders. Only 10% of revenue is generated from remaining 87% of the categories and contribute to 9% of the orders.(fig.1&3)

1

Product Category Na..	% of Cumm. Revenue	% of cumm categories	% cumm. prod contribution	No. of Orders	% cumm. no. of orders	Sr. No.
toys	75.99%	1.43%	75.59%	73,267	75.94%	1
computers_acces..	78.06%	2.86%	76.86%	1,887	77.90%	2
health_beauty	80.11%	4.29%	78.82%	2,791	80.79%	3
bed_bath_table	82.05%	5.71%	81.24%	2,315	83.19%	4
sports_leisure	83.79%	7.14%	83.45%	2,036	85.30%	5
furniture_decor	85.50%	8.57%	85.52%	1,721	87.09%	6
watches_gifts	87.12%	10.00%	86.54%	1,465	88.60%	7
office_furniture	88.49%	11.43%	86.84%	488	89.11%	8
housewares	89.81%	12.86%	88.74%	1,440	90.60%	9
cool_stuff	90.93%	14.29%	89.33%	935	91.57%	10

2

%(Revenue Vs. ProductsID)for category : **toys**

Product Id	% Cumm. Revenue	% cumm. prod contri..	No. of Orders	% cumm. no. of orders	Sr. No.
[illegible]	[illegible]	[illegible]	2	[illegible]	9,911
fff61776..	75.53%	40.705%	2	83.30%	9,912
00066f42..	75.53%	40.709%	1	83.30%	9,913
0009406f..	75.53%	40.713%	1	83.30%	9,914

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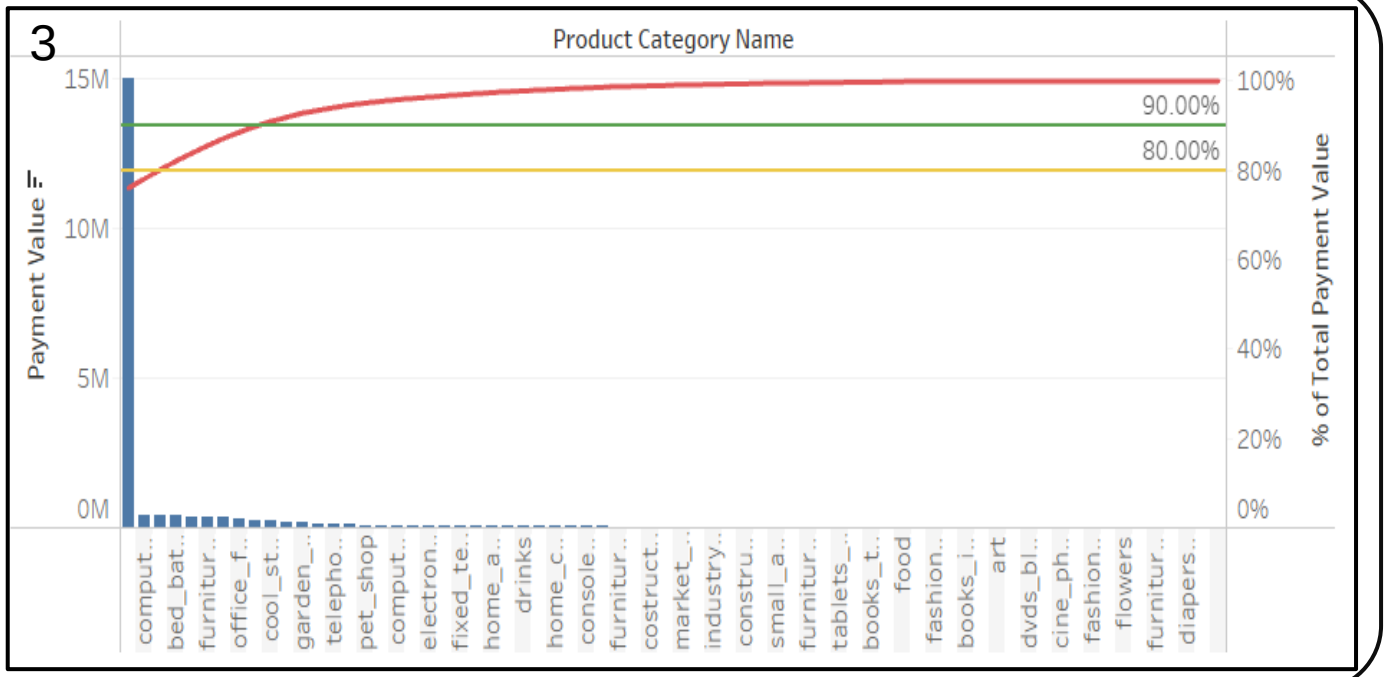
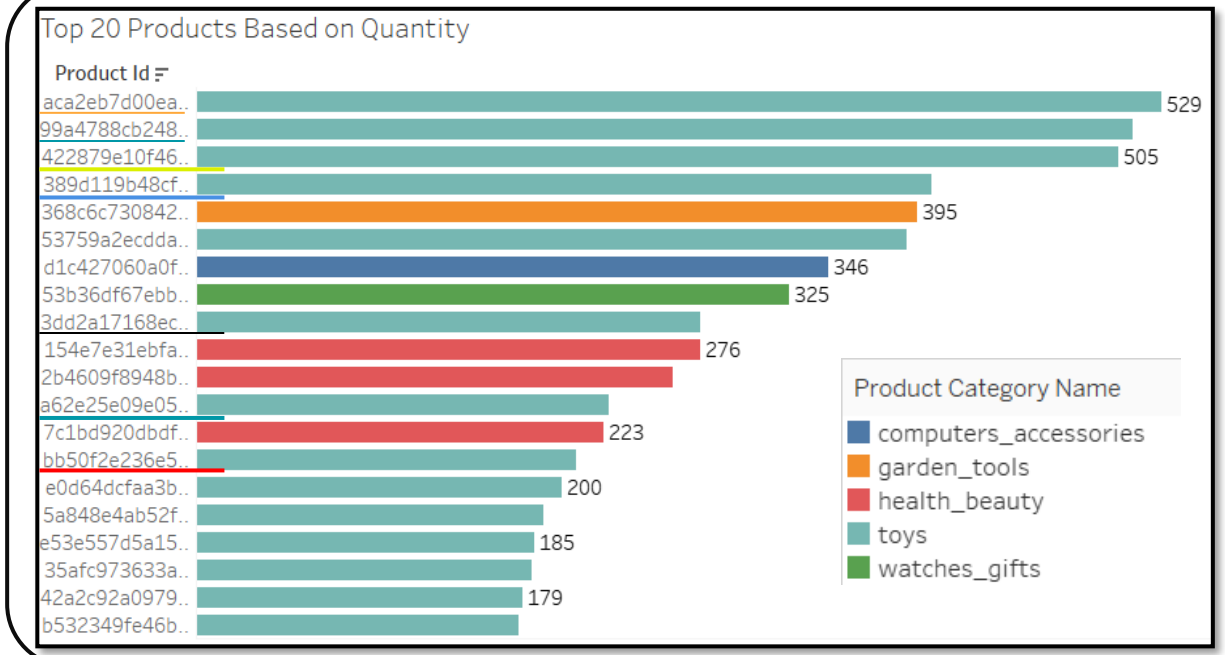
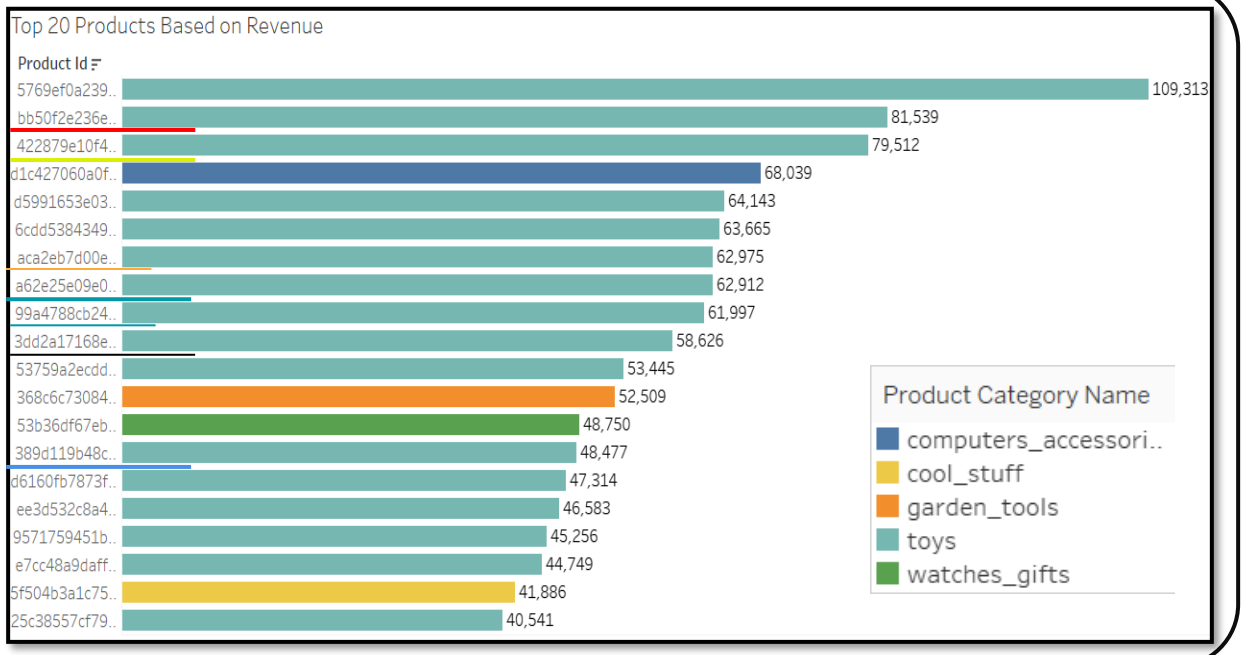


Fast moving products does not mean high revenue

- Most of the top 20 products belong to Toys category. garden_tools, computer_accessories & watches_gifts categories also come under high quantity and high revenue category.
- Some of the products having higher quantity sales fails to overcome products having lower quantity sales, on the basis of revenue.
- Inventory mix should contain slow moving but high revenue generating products





Frequent category sets should be our primary revenue source

- Toys is the most frequently purchased category bought individually as well as with other categories like bed_bath_table, furniture_decor, computer accessories, health_beauty, watches_gifts etc.
- All these 27 categories are present in 94677 orders out of total 96477 orders, together contribute to 31451 products out of 32216 products and can yield 97% of the current revenue.
- As majority of our business is dependent on these categories, we can achieve almost 90% revenue while only focusing on top 75% products.

Product Category Name	furniture_decor	toys	watches_gifts
bed_bath_table	6	291	
furniture_decor		153	
computers_accessories		103	
health_beauty		81	
housewares		63	
sports_leisure		62	
garden_tools		45	
fashion_bags_accessories		41	
auto		39	
perfumery		32	
telephony		30	
stationery		30	
cool_stuff		25	
pet_shop		23	
baby		20	
office_furniture		18	
construction_tools_cons..		12	
luggage_accessories		11	
costruction_tools_garden		11	
musical_instruments		8	
fashion_shoes		8	
electronics		8	
market_place		7	
home_construction		7	
consoles_games		6	
toys			73

%(Revenue Vs. ProductsID)for category : **auto, baby, bed_bath_table and 24 more**

Product Id	Running Sum of Payment ..	% Cumm. Revenue	% cumm. prod contri..	No. of Orders	% cumm. no. of orders	Number of Products
956cf733..	17,285,560	89.91%	75.422%	1	95.70%	23,721
956d19f9..	17,285,778	89.91%	75.425%	1	95.70%	23,722
9571759..	17,331,034	90.14%	75.428%	1	95.70%	23,723

Ideal Category depth comprises top revenue generating products

- According to pareto 80-20 principle, 80% of the revenue contribution is from 20% of the products. (fig.2)
- Category depth refers to the number of SKUs within that category. Overall, 90% of revenue can still be achieved from 44% of the products, provided that the purchase behavior of customers does not vary significantly from the current condition.(fig.1)
- We can tweak the pareto principle and find out ideal category depth for individual category by deciding the revenue % we want to achieve from that category. e.g. computer_accessories, ideal category depth is 80 if we want to achieve 80% revenue, and 150 if we want to achieve 90% revenue.(fig.3)

1

%(Revenue Vs. ProductsID)for category : **All**

Product Id	% Cumm. Revenue	% cumm. prod contri..	Sr. No.
bbdb018..	89.99%	44.323%	14,279
49bfa76a..	89.99%	44.326%	14,280
df969ce5..	89.99%	44.329%	14,281
ecd55901..	89.99%	44.332%	14,282
bef82b9c..	90.00%	44.335%	14,283
351358a..	90.00%	44.338%	14,284

2

%(Revenue Vs. ProductsID)for category : **All**

Product Id	% Cumm. Revenue	% cumm. prod contri..	Sr. No.
3877d1c..	79.99%	25.729%	8,289
4d7bb00..	79.99%	25.733%	8,290
4e3550b..	79.99%	25.736%	8,291
e96bb42..	79.99%	25.739%	8,292
92d5ae8..	79.99%	25.742%	8,293
8e8d71f2..	80.00%	25.745%	8,294

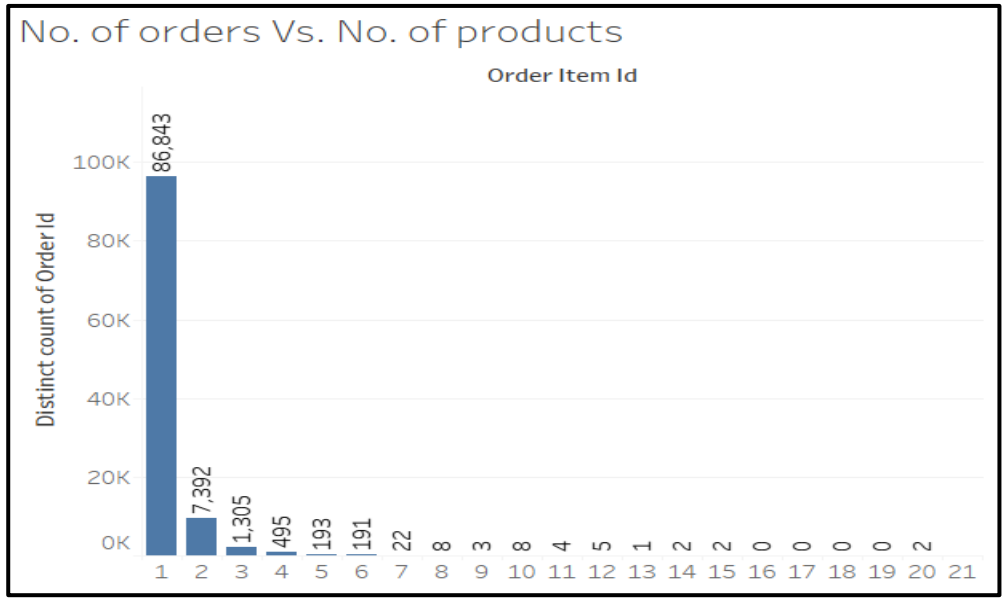
3

%(Revenue Vs. ProductsID)for category : **computers_accessories**

Product Id	% Cumm. Revenue	% cumm. prod contri..	% cumm. no. of orders	Sr. No.
a1a9716..	79.08%	18.248%	65.50%	75
e5e4c79b..	79.31%	18.491%	65.61%	76
887c030..	79.53%	18.735%	65.98%	77
6836192..	79.76%	18.978%	66.08%	78
fea7f0c1..	79.98%	19.221%	66.45%	79
2be7c0f7..	80.20%	19.465%	66.51%	80
2b6bdbd..	80.41%	19.708%	66.56%	81
3a8bbcf3..	89.96%	36.253%	78.38%	149
cff277cb..	90.06%	36.496%	78.43%	150

We need to stimulate purchase of multiple products

- Almost 87000 orders were consisting of individual products.
- Only 10%, approx. 9600 orders were having two or more than two products.
- In future, we will need to drive business from limited number of categories and products.



Order Item Id	No. of orders	no. of orders having >=order_item_id
1	86,843	96,477
2	7,392	9,634
3	1,305	2,242
4	495	937
5	193	442
6	191	249
7	22	58
8	8	36
9	3	28
10	8	25
11	4	17
12	5	13
13	1	8
14	2	7
15	2	5
16	0	3
17	0	3
18	0	3
19	0	3
20	2	3
21		1

RECOMMENDATIONS

- We can reduce the category breadth by only focusing on 27 categories which are frequently selling together like toys, bed_bath_table, furniture_decor, computer accessories etc. at the cost of only 3 % revenue hit while reducing the inventory by almost 900 unique products.
- If category depth is high then it can be reduced by targeting 80% or 90% revenue from that category and retaining only the top revenue generating products which can help us achieve the revenue target.
- Although toys being highest selling as well as revenue generating category, it is the main culprit behind excessive inventory management costs, we can get rid of the products from toys category with only single unit sales and still achieve 75% of the current revenue from toys category and cater to 83% of the customer demand (toys orders) but on the contrary reduce the toys inventory by almost 60%.
- Personalized suggestions and recommendations is required to increase the purchase of products in combination with other products or categories.
- It is recommended to avoid any abrupt changes in the inventory mix, gradual implementation of the above strategies would make sure that the customers also get some time to adapt to the changes.
- The products which we would discontinue or get rid from our warehouse, should be kept under 'on-demand' order category so that we can outsource that product and deliver it to customers if possible. This would ensure that we don't lose the customer to our competitor.

CONCLUSION

- Initially, if we focus on only top 27 categories, we can achieve almost 90% revenue while reducing the inventory by approx. 25%.
- Categories which show comparatively higher confidence (more than 10%) of purchase along with toys are bed_bath_table, construction_tools_lights, construction_tools_garden, fashion_bags_accessories, fashion_shoes.
- While reducing the category depth, it is important to keep an inventory mix of fast moving and slow moving inventory to maintain the revenue as well as inventory management costs.
- Low revenue generating Non-moving inventory could go under ‘on-demand’ order category.

APPENDIX-Data Sources

- Data Sources :

1) Here is a snapshot of the data dictionary

- Orders information like unique order_id, order_item_id, order purchase-approval-delivery timestamp. etc
- Customer's information like unique customer_id, zipcode, city and state
- Payment information like payment_value, payment_type etc.
- Product dimension and specification information like category, weight, length etc.
- Customer preference information like number of reviews and number of reviews per month

2) The provided data is captured from the CRM tool used by 'OList'. (till 17-10-2018 17:30).

APPENDIX

- Data Methodology :
  - Checked and Cleaned the data for any duplicate, null, insignificant values.
  - Checked for outliers, as outliers were actual values, the values were kept as it is instead, used median as central measure.
  - Merged the datasets for further analysis and performed EDA.
  - Created new dataset with only order_id and product_category for Market Basket Analysis.
  - Exported the cleaned datasets in Excel format to upload in Tableau.
  - Used Tableau for visualization of data and created appropriate calculated fields to get the insights.

- Data Assumptions :
  - Only ‘delivered’ orders are considered for analysis.
  - order_purchased_timestamp< order_approved_at < order_delivered_timestamp.
  - Shipping charges given are assumed to be for individual product.

Thank You

Presentation link:-

https://drive.google.com/file/d/1y7EaNtN-IBFWviEV-pdX_BCa4j44sGeT/view?usp=drive_link