Inventory Demand Forecasting for Improved GMRoI

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1. Summary

Studies on inventory related losses have caught attention to the large amount of inventory getting discarded or sold at markdowns due to consumer behavior and lack of supply chain coordination which leads to expired inventory in excess. On the other hand, despite having excess inventories, retailers often experience out of stock situations resulting in lost sales. Out-of-stock situations and excess inventory are an outcome of a mismatch between demand and supply. This whitepaper aims to provide an informational framework which allows organizations to strike a balance between excess inventory and out of stock situations.

2. Introduction

As per a report by the IHL group, retailers are missing out on nearly $1 trillion in sales globally of which $145 billion is in North America because they don't have on hand what customer wants to buy in their stores as an outcome of out-of-stock situations. On the other hand, the US retail industry has $250 billion in overstock inventory every year. As per another report by Coresight research and Celect, U.S. non-grocery retailers lost $300 billion in revenues due to markdowns in 2018, equivalent to 12% of their total sales. Losses due to shrinkages amounted to 1.33% of sales, on average - a total impact on the overall U.S. retail economy of $46.8 billion.

All of this is just the direct impact of the suboptimal forecasting methods. There are associated hidden costs as well in terms of human capital investment, inventory carrying cost, logistics cost, allocated store space to name a few – all that going into a low or non-performing inventory. If effectively managed these same resources can then be allocated to better performing inventories yielding higher returns.

Furthermore, the retail industry off-late is at the peak of hyper-competition and the fact is evident from several signals from the market. In year 2017, the U.S. market saw 6885 stores being closed and 3800+ stores were shut down in year 2018. 68 retailers have declared bankruptcy since 2015. Terms like 'Retail apocalypse' have been coined to signify the magnitude of the impact. Amidst, all of this, fashion is the only segment that has managed to stay aloof from the effect of the price wars, since designs are difficult to copy and hence, fashion retailers are able to differentiate. Also, the ability to earn profits become even more challenging when sales are down because of economy downturn because of profit declining faster than cost reduction efforts taking effect.

To nullify the effect of these forces, organizations need to become nimble for which it is required to identify and change old and typical methods of working.

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3. Challenges with the conventional forecasting methods

Change comes at a cost and hence there is always a risk associated with it but whenever possible, change for good must always be advocated. Those who can foresee and navigate risks have always been more likely to survive than those who can't. That's just as true in business, where the ability to see ahead continues to separate performance leaders from everyone else.

Conventional methods of forecasting have had their own set of challenges. Most forecasting tools use generic algorithms based on assumption that demand can be predicted uniformly for all industries, product lines and geographies. The outcome of one-size-fits-all approach-based model fails to deduce the impact of different demand drivers and to adapt as market conditions and consumer behaviors evolve. To gain effective results, these models the demand manual concurrence on the forecast and more frequently and the outcomes of the model must be tweaked and adjusted to reduce the error. Further, cognitive bias along with limited data feeds makes this task even more error prone. For example: Imagine a simple scenario where a merchandiser for corporate styles adjusts the forecasted outcome for street styles.

Considering causal relationships was a challenge as multiple and distinct type of data feeds were required that makes the overall model highly complex to implement and even more difficult to operate with limited computational power but that has changed now.

Key challenges with the traditional methodologies against the modern and evolved methods

	Intervention	Little-to-no
Manual		
Not considered	Causal relationships	Considered
Limited	Data feed	Multiple and distinct
Static/Outdated	Algorithms	Smart
Below industry average	Accuracy	Exemplary with simple controls
Little-to-no/Blackbox	User control	Operate with simple controls

4. Building a better forecasting engine

As against a traditional forecasting engine which ends up becoming a static black-box, a modern forecasting engine would help promote fact-based trade-offs and decision making taking into consideration several key data sources and decisional dimensions. Imagine not taking into consideration bulk buying discounts or promotions offer by suppliers.

It takes into considerations causal relationships such as increase in substitute product sales because of out of stock situations, decrement in the sales of the frequently bought products, corrections due to out-of-stock situations.

Model learns over time, adjusting to changes in demand and ordering behaviors and improves accuracy. Better forecasting drives higher inventory turns, lesser investments and hence higher working capital, eliminates waste and enables a dynamic and more responsive supply chain.

5. From theory to practice: Case study

About the client:

The client is a leading aftermarket auto parts retailer in the US, and offers a wide variety of branded and private label SKU's for a wide range of automobiles, LCV and large sized commercial vehicles. Their products are available on their own portal and are sold through other online marketplaces such as eBay, Amazon and so on.

Business case:

Typically, most retailers have a fixed formula whilst planning procurement. The age-old adage "if it isn't broken don't fix it" applies to this business process as most of the retailers are reluctant to move away from time tested practices. With consumers becoming more aware than ever before, retailers will have to adjust their buying processes to ensure that products are not out-of-stock, and dynamically reshuffle their buying patterns to be in tune with the current marked demands.

Given below are the main considerations for the client:
- Procurement process still relies on static factors or merchandising manager's intuition.
- Inability to glean critical analytics on market dynamics for a product.
- Risk of overstocking and forced price cuts due to inaccurate market demand forecast.
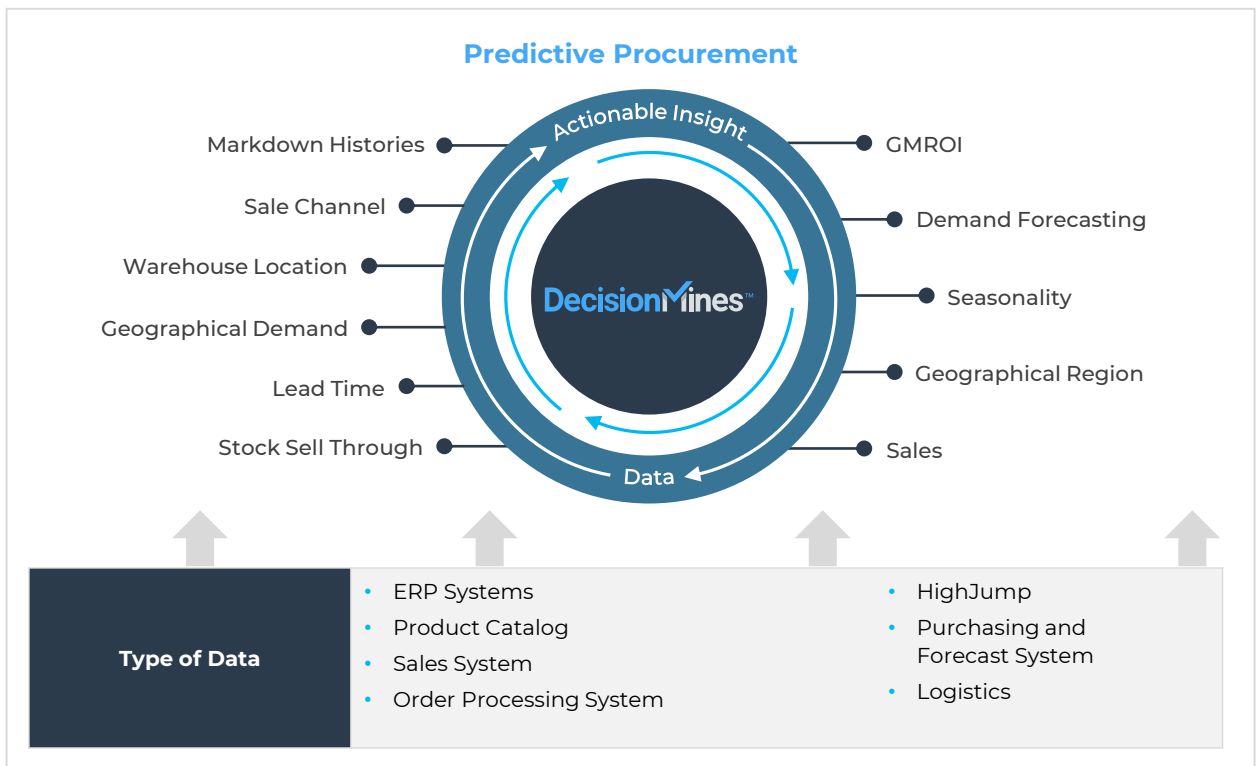- Inherent time-to-market delays require predicting product demand ahead of time.

DecisionMines™ Model: Inventory forecasting for improved GMRoI Business Framework

The model used a data-driven approach running on Cybage's DecisionMines™ prescriptive analytics platform to derive at actionable insights. Data from various business units like Product, Sales, Web analytics and more were combined to architect an actionable dashboard that ranks the product on their likelihood of being most profitable.
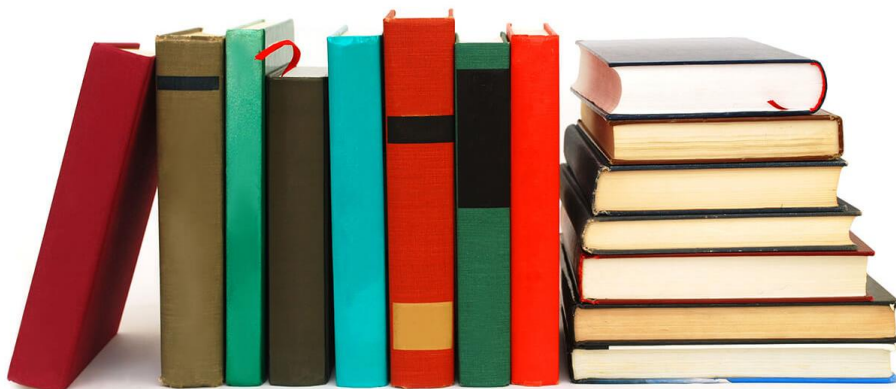
DecisionMines™ Goals:

- Recast buy file generation by considering the following factors:
  - GMROI
  - Stock Sell through
  - Markdown histories
- Ability to predict product interest by combing web analytics
- Re-rank SKUs and predict the most profitable SKU to buy rather instead of depending on static factors
- Ability to provide a rolled up or location specific view

The schematic of the model is given below.

Predictive Procurement

Markdown Histories
Sale Channel
Warehouse Location
Geographical Demand
Lead Time
Stock Sell Through

Actionable Insight

DecisionMines™

Data

GMROI
Demand Forecasting
Seasonality
Geographical Region
Sales

Type of Data	• ERP Systems • Product Catalog • Sales System • Order Processing System	• HighJump • Purchasing and Forecast System • Logistics

6. References

- [NRF-NRSS-Industry-Research-Survey-2018.pdf](#)

- [Deloitte: Global Powers of Retailing 2019](#)

- [List Of Retailers Closing Stores In 2018 With NC Ties](#)

About DecisionMines™

DecisionMines™ is a scientific, data-driven digital decision platform that leverages machine learning and predictive analytics to help organizations uncover the value hidden beneath massive layers of data. It empowers business leaders to make data-driven decisions by synthesizing the Art of Judgment and the Science of Data.

7. Authors

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