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Abstract

This work provides insights for marketing analytics professionals on how they could estimate the impact of new or modified customer loyalty programs. Brand managers are now relying heavily on sales promotion because its impact on sales is more direct, immediate, and quantifiable as compared to advertisement. The Fortune 500 retailer we collaborated with, until this study, had limited visibility into the impact of these promotions on the business, and more importantly lacked insights in how these promotions were affecting customer loyalty. The outcome of this study would be relevant to different companies to determine the various factors that influence the consumer's purchase decisions and adjust their sale promotion strategies accordingly.

Introduction

Our case study provides a novel way to classify promotional avenues that are promo-driven, coupon-driven, or just customers taking advantage of a poorly designed sale. We show how using these insights for future promotions can help drive strategic improvements to loyal-type customers while not losing unnecessary margin to those groups that are more price driven or would have purchased the product anyway had a sale not been ran.



Figure 1. Customer loyalty cycle

Our research questions were:

- What was the impact each of promotional campaigns individually on monthly sales revenue?
- What are the impacts of sales promotion on the consumer's buying behavior?
- Do loyalty programs offered to customers really create an impact on them?

Literature Review

The dynamic nature of sales promotion has inspired many researchers to turn their attention to study the various issues related to this element of promotion mix. Many studies have been conducted on the planning, implementation and evaluation aspect of sales promotion worldwide.

	Promotion Setup	Campaign Setup	Sales Forecast	Opportunity Finding	Revenue Optimization
(Germanmann, 2012)				✓	✓
(Jarvinen, 2013)		✓	✓		
(Fan, 2014)					✓
(Mayneni, 2016)	✓		✓		
Our Study	✓	✓	✓	✓	🔍

Table 1. Literature review summary by solution applications

Methodology

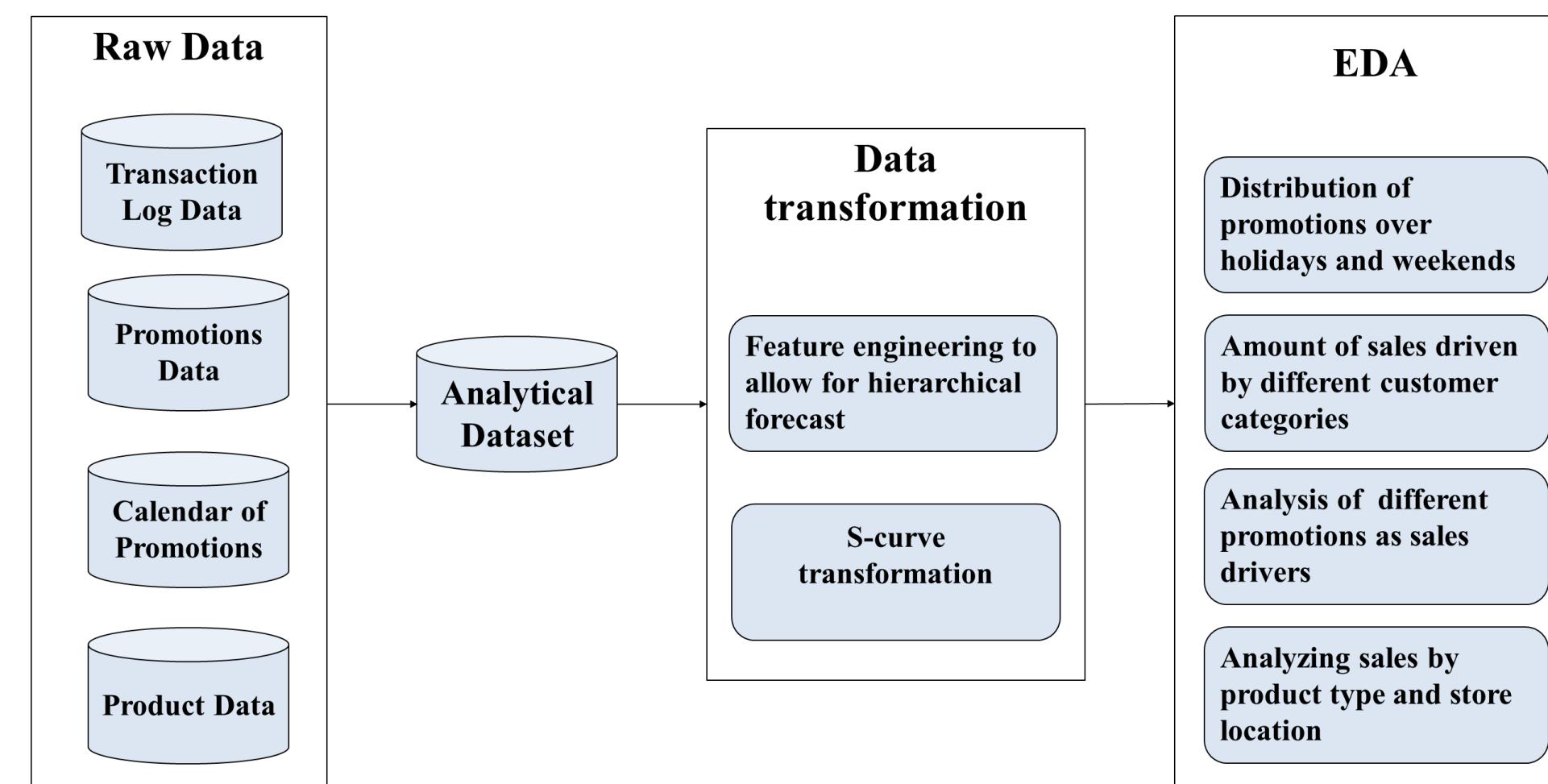
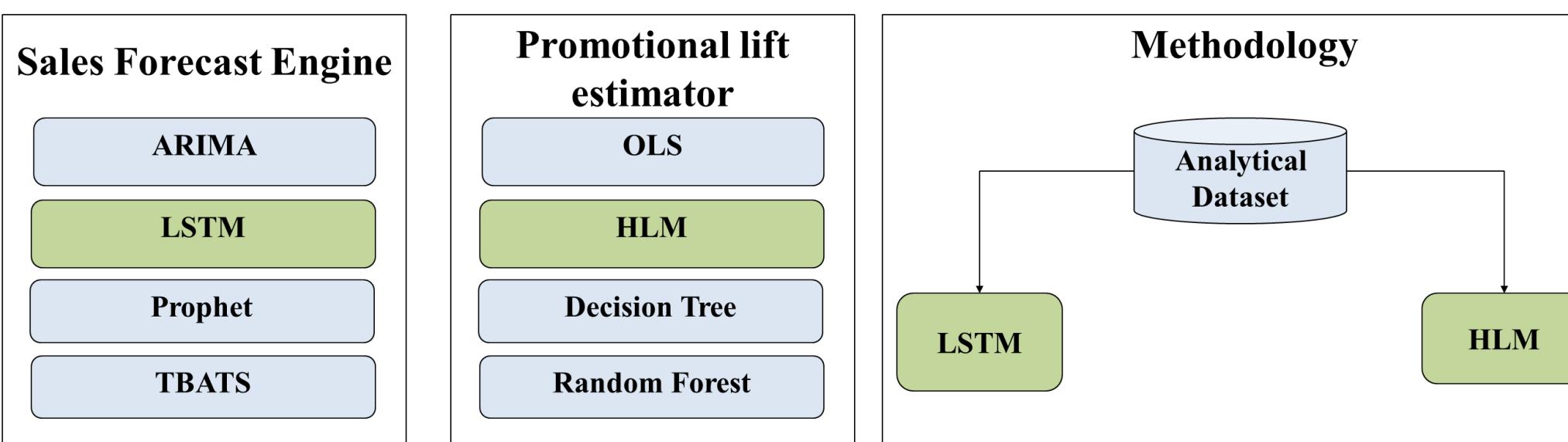


Figure 2. Methodology

Solution Design

- **Sales Forecast Engine** – we provided base sales forecasts at a category, subcategory and SKU level, using the **LSTM** networks.
- **The promotional lift estimator** – quantifies the incremental effect of discount on sales. We used a multilevel model to account for product hierarchy.



HLM simultaneously investigates relationships within and between hierarchical levels of grouped data, thereby making it more efficient at accounting for variance among variables at different levels than other existing analyses.

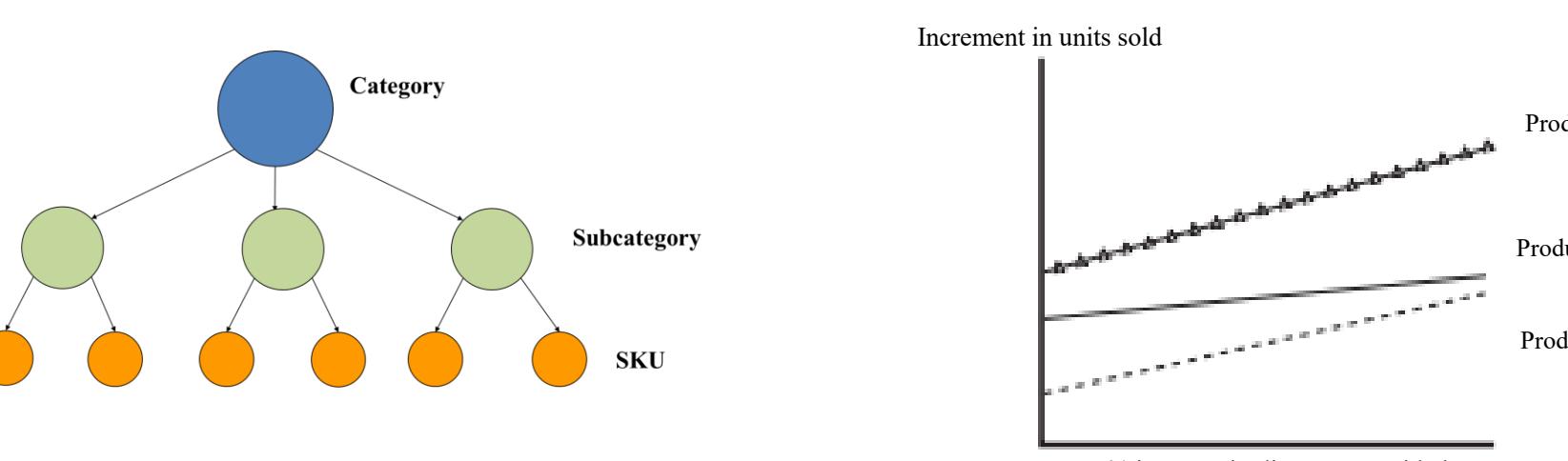


Figure 3. Understanding HLM

Model Evaluation

The business performance measure we consider is the adjusted R squared because it penalizes model complexity (to control for overfitting), HLM had an 87% adj R²

Results

Incremental lift estimating model	Adjusted R ²
Decision Trees	74%
Random Forest	80%
OLS	79%
Hierarchical Linear Model	87%

Figure 4. Model evaluation

Our model was able to correctly account for the variance in the dataset from different promotions.

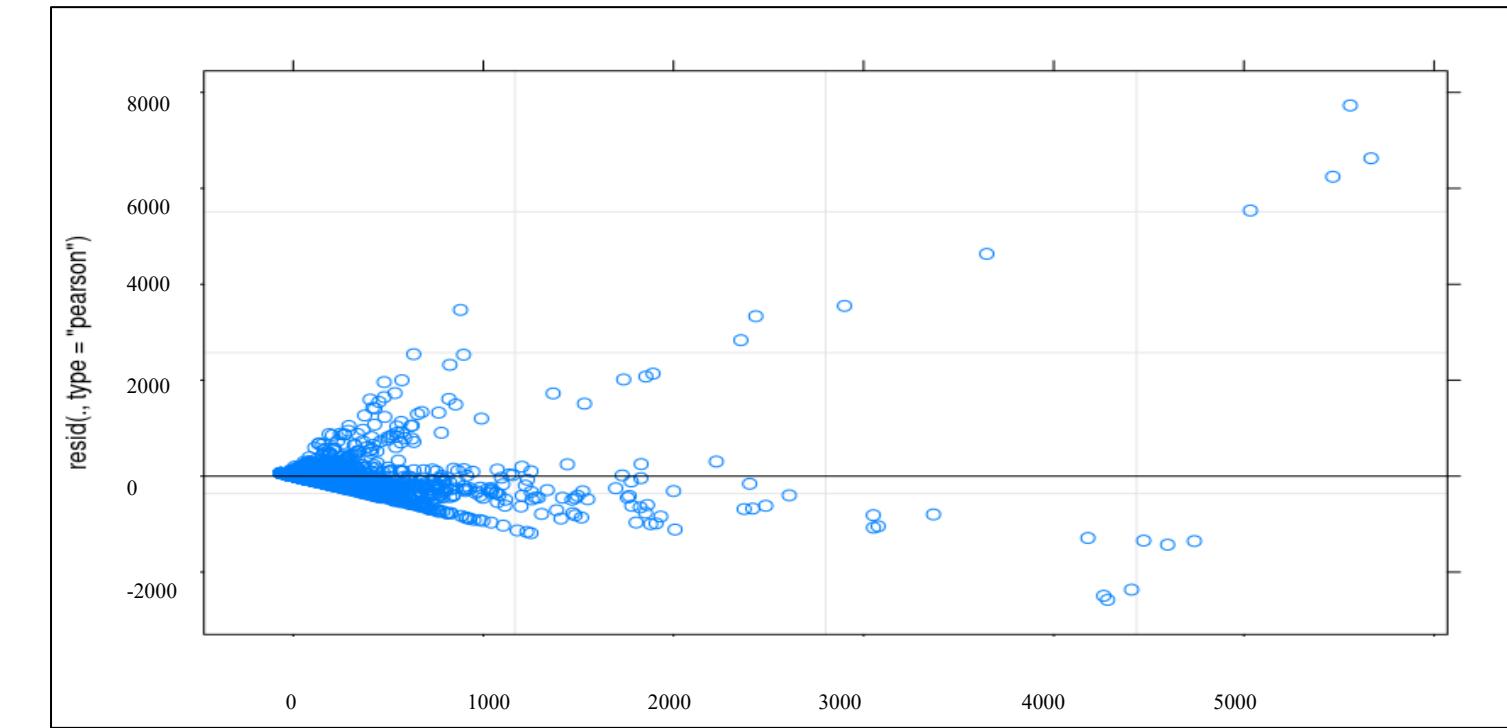


Figure 5. HLM residual plot

The multilevel model (HLM) adjusts for seasonality and pricing sensitivities at category, subcategory and SKU levels

Product Level 1	Annual lift in units sold	Lift in revenue
17	1275	\$ 26,288
23	1725	\$ 1,18,997
32	2400	\$ 2,05,784

Figure 6. Impact of a 25% discount on products

Conclusions

- We identified a potential lift of 17925 units, leading to ~\$350,000 of additional revenue for the retailer, by providing 25% discount on just 3 product codes.
- Impact of holiday season on general sales is 4 times the normal season.
- We see a lift for around 60 products for green category promotions when a minimum discount of 10 % is applied

Acknowledgements

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