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| New Product Simulator Tool | | December 9  2021 |
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|  |  |
|  | DO THE MATH |

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1. Project Overview

**Objective:**

To measure the impact of introducing new product using the attributes of existing product.

**New Product Simulation:**

1. Simulation: The effect of introducing a new product in the market by imitating an existing product with modifications in terms of price, discount, category, pack subtype, pack content & promotions is being referred to as a simulation in this document.
2. The New Product Simulation is carried out in jupyter notebook tool. Regarding running the tool, the instructions are provided in the first cell of the tool
3. Simulation is done using the features of existing product & store features in the data
4. User has the flexibility to change size, count, category, pack subtype, pack content, price, discount & promotions of the new product for specific region, channel & year quarter
5. Data contains all the history of the existing product (from 2019Q1 to 2019Q4 if it exists) except the changes provided by the user. Existing product can be selected as a single product or as multiple products as well (refer 2.3).
6. In case the user doesn’t want to use existing product features, user can upload the adcal data to simulate for new product (refer to 2.10).
7. Post simulation, the user can see the increase/decrease in Volume Retail Units & Revenue for new product and their details across region, channel, test period & holiday period
8. User can view the details of cannibalization for chosen region, channel & category of new product
9. User can view the % Net Gain due to promotions/discounts of new product, which basically gives an indication if giving promotion to the product helps in bringing more sales

**Revenue Calculation:**

1. ***Revenue*** = Volume Retail Unit \* POS discounted Price

**Use Case:**

1. Simulating the new product from TCCC CSD 8 X 300 ML BTTL to:
   1. New Product 1: TCCC CSD 8 X 340 ML BTTL
   2. New Product 2: TCCC CSD 8 X 250 ML BTTL
   3. For ONTARIO Regions & All Channels & All banners for promotion changes for year quarter 2019Q1 – 2019Q4
   4. New Product 1 changes:
      1. Category: CARBONATED SOFT DRINKS
      2. Pack Subtype: TRANSACTION
      3. Pack content: BOTTLE-PET
      4. Baseline Price: 10%
      5. Front Page: 0, Middle Page: 0, Back Page: 0
   5. New Product 2 changes:
      1. Category: CARBONATED SOFT DRINKS
      2. Pack Subtype: TRANSACTION
      3. Pack content: BOTTLE-PET
      4. Baseline Price: 5%
      5. Front Page: 3, Middle Page: 3, Back Page: 3
   6. New Product 1 Results: -10.61% decrease in Volume Retail Units, -0.84% decrease in Revenue, -20.94% Cannibalization Rate
   7. New Product 2 Results: -6.58% decrease in Volume Retail Units, -1.53% decrease in Revenue, -11.95% Cannibalization Rate

***Note:*** *Find the use case example in the below 2 sections*

2. New Product features for simulation

Simulator tool has following functionality:

1. The user needs to run the 2nd cell in the tool to see the “Import Data” button

Graphical user interface, text

Description automatically generated

1. Clicking on **Import Data** will import the required data & the tool would become ready to use
2. In the next section, the user can simulate for new product by choosing suitable existing product.
   1. **Single Product as existing product:** User can change the ***region, channel,*** ***category, pack subtype, pack content, size & count*** for the new product simulation. User can also filter for required quarters for simulation

Graphical user interface, table

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* 1. **Multiple Products as existing product:** In case the user wants to choose multiple products as existing product, the user can select Multiple Product option in the question mentioned above in the screenshot.
     1. Here the user would be required to choose ***region, channel, category, pack subtype, pack content, count, size, start & end quarter*** for simulation which would result in following:

Table

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* + 1. Here the user can select multiple products as existing products, either it can be selected as per
       1. **Similarity Score** would be calculated based on Category, pack subtype, pack content, count, size & total liters (count \* size) of new product w.r.t. the existing products. Find the similarity score calculation file in the appendix (Similarity\_Score\_Calculation)
       2. **Manually** – the user can select 3 products manually as existing products. Further the user can carry out changes in price, discount, promotions & simulate for the new product

Graphical user interface

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1. In case where the user is selecting Single Product as existing product, user would get the flexibility to simulate for one more product, the user can simply click on ***Yes*** in the below screenshot

Table

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Else, user can select ***No*** and simulate for just 1 product.

1. After selecting the new product attributes, the user needs to click on ***“Get Existing Price & Discounts”***

Table

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Now the user can see the prices & discounts given for the existing product at year quarter level

1. User has the flexibility to change the above features for the required year quarters

Graphical user interface, text, application

Description automatically generated

* 1. Baseline Price Change: Changes the EDV Price of the product
  2. Discount Change: Changes the discount provided for the product

1. Post this, the user needs to click on

Graphical user interface, application

Description automatically generated

to get the updated baseline price, discount & promotion values

1. Promotional Changes
   1. Here the user can view the existing promotions across banners & will be provided with options of changing the promotions (if required):
      1. All Banners: In this case the promotions will be distributed across all banners equally
      2. Specific Banners: In this case the promotions will be distributed across selected banners
      3. No: In case the user doesn’t want to change promotions, user can click on No & Simulate New Product Results

Table

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In case the user selects Yes (Specific Banners), user would be asked to enter select the Specific Banners.

Graphical user interface

Description automatically generated with medium confidence

In case the user wants to change promotion for all banners:

Graphical user interface, text, application

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* 1. Select number of promotion changes for the New Product as shown above, here user can increase or decrease the number of promotions
     1. In case the user wants to increase promotion for banners which have never given promotions in the past, one question would pop up asking if user want to increase promotions for such banners, user can select Yes in the above question else No and can proceed with applying changes
  2. Click on Apply Changes to proceed with changing promotions

Graphical user interface, application

Description automatically generated

* 1. Approach for Promotional Changes:
     1. **Approach:** Using simulation of banner-week & finding the highest difference weeks to change promotions
        1. Get raw promotions data

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Store Chains** | **Banner** | **Week** | **Front Page** | **Middle Page** | **Back Page** |
| LCL | NF ON | 2019-05 | 0 | 0 | 0 |
| LCL | NF ON | 2019-02 | 0 | 0 | 0 |
| LCL | NF ON | 2019-01 | 0 | 0 | 0 |
| LCL | NF ON | 2019-03 | 0 | 0 | 0 |
| LCL | NF ON | 2019-06 | 0 | 0 | 0 |
| LCL | NF ON | 2019-12 | 0 | 0 | 0 |
| LCL | NF ON | 2019-04 | 0 | 0 | 0 |

* + - 1. Increase Front Page promotions wherever there is no front, middle & back page promotions present

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Store Chains** | **Banner** | **Week** | **Front Page** | **Middle Page** | **Back Page** |
| LCL | NF ON | 2019-05 | 1 | 0 | 0 |
| LCL | NF ON | 2019-02 | 1 | 0 | 0 |
| LCL | NF ON | 2019-01 | 1 | 0 | 0 |
| LCL | NF ON | 2019-03 | 1 | 0 | 0 |
| LCL | NF ON | 2019-06 | 1 | 0 | 0 |
| LCL | NF ON | 2019-12 | 1 | 0 | 0 |
| LCL | NF ON | 2019-04 | 1 | 0 | 0 |

* + - 1. Simulate & find the Baseline (raw promotion data) vs Simulated prediction difference

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Store Chains** | **Banner** | **Week** | **Front Page** | **Middle Page** | **Back Page** | **Baseline Prediction** | **Predictions RF** | **Difference** |
| LCL | NF ON | 2019-05 | LCL | NF ON | 2019-05 | 8,582 | 94,906 | 86,324 |
| LCL | NF ON | 2019-02 | LCL | NF ON | 2019-02 | 9,878 | 96,133 | 86,255 |
| LCL | NF ON | 2019-01 | LCL | NF ON | 2019-01 | 8,691 | 94,888 | 86,197 |
| LCL | NF ON | 2019-03 | LCL | NF ON | 2019-03 | 9,590 | 95,131 | 85,541 |
| LCL | NF ON | 2019-06 | LCL | NF ON | 2019-06 | 9,980 | 95,027 | 85,047 |
| LCL | NF ON | 2019-12 | LCL | NF ON | 2019-12 | 10,105 | 95,027 | 84,923 |
| LCL | NF ON | 2019-04 | LCL | NF ON | 2019-04 | 10,227 | 95,131 | 84,905 |

* + - 1. For decreasing promotions, we decrease the available promotions for banner-week to zero & simulate to get the highest difference banner-week combination.
      2. Pick the banner-week combination with highest difference for increase/decrease in promotions

1. When the user is done with changing the required attributes in the tool, can click on “**Simulate New Product Results**” to measure the impact of introducing new product. See the results in ***Section 3: Simulated Results***
2. In case the user doesn’t want to use the existing product features, there is additional feature given where user can ***“Upload Adcal Data of New Product”*** which basically would be futuristic looking data.

Graphical user interface

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**Upload Adcal Data of New Product:** Considers that the data user would be uploading will contain the new product data for future say 2022 data & will help in making the comparison & find out effectiveness of the new product with the chosen existing product for 2019 year.

**Note:** Only csv file can be imported otherwise it would throw an error.

Post uploading this, the user can simulate the for new product result

3. Simulated Results

The tool view helps the user in decision making whether having new product would yield better Volume Retail Units, Revenue in the market

**View1:** *Overall Volume Retail Units & Revenue for Existing vs New Product*

Chart, bar chart

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Here the user can view the incremental units & the cannibalized units for New Product

**View2:** *Region wise Retail Units & Revenue*. Here the user has the flexibility to filter for the required region for the views below View2

Chart, bar chart

Description automatically generated

**View3:** *Channel wise Retail Units & Revenue*

*Chart, bar chart

Description automatically generated*

**View4:** *Year-quarter wise Retail Units & Revenue*

*Chart, bar chart

Description automatically generated*

**View5:** *Pre, during, post, non- holiday Retail Units & Revenue*

**Chart, bar chart

Description automatically generated**

**View6:** *Distribution of cannibalization rate across the affected products for New Product 1*

Chart, line chart

Description automatically generated

**View7:** *Distribution of cannibalization rate across the affected products for New Product 2*

Chart

Description automatically generated

**Interpretation of cannibalization Rate:** For New Product2, Out of -11.95% Cannibalization rate, TCCC CSD 8 X 300 ML BTTL is cannibalized by 2.8% of its own units & cannibalized units is 11k

Cannibalization calculation is done live in the tool using the cannibalization approach attached at the bottom of the document.

**View8:** *Cannibalization view across Region & Channel.* Here the user has flexibility to filter for region & channel to see the cannibalization rate

Chart, waterfall chart

Description automatically generated

**View9:** *Net Gain across Months for New Product 1 and New Product 2*

Chart, line chart

Description automatically generated

**Interpretation of Net Gain:** For New Product2, Overall Net Gain is 5% which means after providing the Page Promotions and Discounts and the New Product facing Cannibalization loss, we see 5% increase in the Retail Units due to the Promotions provided

Net Gain calculation is done live in the tool using the Net Gain due to promotions approach attached at the bottom of the document (18\_11\_2021\_File\_3\_New\_Product\_Net\_Gain\_due\_to\_Promotions)

**View10:** *Promo Gain breakdown across Months for New Product 1 and New Product 2*

Promo Gain is broken down into Page Promo Gain % and Price (Discount) Promo Gain % as shown in the below figure

Chart, bar chart

Description automatically generated

**Interpretation of Promo Gain breakdown:** For New Product2, In the Year Month 2019-06, we see Page Promo Gain contributing 26% to the total Promo Gain in Year Month 2019-06 and Price Promo Gain contributing 74% to the total Promo Gain in Year Month 2019-06

Promo Gain breakdown calculation is done live in the tool using the Promo Gain due to promotions breakdown approach attached at the bottom of the document (18\_11\_2021\_File\_3\_New\_Product\_Net\_Gain\_due\_to\_Promotions)

**View11:** *Cannibalization loss due to Affecting Products Promotions for New Product 1 and New Product 2*

Visual provides Top 10 Affecting Products Contribution % for New Product 1 and New Product 2 as shown below

Chart, bar chart, histogram, waterfall chart

Description automatically generated

*Cannibalization loss due to Affecting Products Promotions*: For New Product2, TCCC CSD 6 X 222 ML GLASS is highest contributor for the Cannibalization loss of the New Product 2 which is 8.7%

**Note:** Cannibalization loss is measured due to Affecting Products Promotions

Cannibalization loss calculation is done live in the tool using the Promo Gain due to promotions breakdown approach attached at the bottom of the document (18\_11\_2021\_File\_3\_New\_Product\_Net\_Gain\_due\_to\_Promotions)

4. Model Details

The data used in the modeling is firstly treated from the base data. Find the treatment file here



Further modification is done while modeling as below:

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| **Model Details** | |
| Model Description | All Products in training + Category column grouped +size ml + count + pack subtype + content + discount depth + page promotions + POS discounted price + product introduction stages + UPC columns |
| Model Level | Region-Quarter |
| Training Data | 2017Q1 – 2018Q4 |
| Test Data | 2019Q1 – 2019Q4 |
| Cross Validation | 4 quarters (2019) |
| Model used | Random Forest |

**Model Details:**

* 1. *Files required:*
     1. *ADS File:* The file created post the data treatment steps
     2. *Seasonality index file:* Used for obtaining seasonality index at Region Category Pack subtype level
     3. *Covid stages file:* Used for capturing covid effect with different stages on a Region week level
     4. *Product cluster mapping:* Used for implementing product cluster level models
     5. *Innovation products file:* Used for implementing new product models
     6. *Product features file:* Used for adding new product features – Size ML, Count, Pack content
     7. *New Product files:* Used for adding New Product stages (intro, growth, stabilization), initial week columns
     8. *Cannibalization file:* To get cannibalization rate across region channel category
  2. The following categorical columns are one hot encoded before being used in the model:
     1. Category
     2. Pack subtype
     3. Pack content
     4. Product Stages
     5. Banner
  3. Category column is grouped in the following way:

|  |  |
| --- | --- |
| **Category ungrouped** | **Category grouped** |
| ALTERNATIVE BEVERAGES | ALTERNATIVE BEVERAGES |
| DROPS |
| ENERGY |
| ISOTONICS |
| NON-CARBONATED BEVERAGES |
| CARBONATED SOFT DRINKS | CARBONATED SOFT DRINKS |
| JUICE – CHILLED | JUICE – CHILLED |
| JUICE – FROZEN | JUICE – FROZEN |
| JUICE - SHELF STABLE | JUICE - SHELF STABLE |
| WATER | WATER |

1. Discount depth columns:
   * 1. Discount depth 1: Discount between 10% & 25%
     2. Discount depth 2: Discount greater than 25%
     3. Discounts less than 10% are not considered as promotions and the price is replaced with EDV price
     4. These 2 columns are one hot encoded before being used in the model
2. Product Introduction Stages
   * 1. For ALTERNATIVE BEVERAGES category, Stabilization period is 13 week onwards
     2. For WATER category, Stabilization period is 9 week onwards
     3. For CARBONATED SOFT DRINKS category, Stabilization period is 7 week onwards
3. UPC column details
   * 1. Number of Brands: Unique count of Brands summarized at Banner Product level
     2. Number of Flavors: Unique count of Flavors summarized at Banner Product level
     3. Number of Sweeteners: Unique count of Sweeteners summarized at Banner Product level
     4. Number of Types: Unique count of Types summarized at Banner Product level
4. Changes in size, count, prices, discounts & promotions are done in test data for the prediction

5. Appendix

***Similarity Score Calculation***

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***Cannibalization Approach***

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***New Product Simulator tool***



***Net Gain due to Promotions Approach***

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