**Step 2.2 - Model walkthrough (Response curves & Simulation)**

Now that we have run a few iterations and arrived at a result that makes both statistical and business sense, we can build a response curve for each of the media tactics and use that as a building block to run various budget optimization scenarios.

Before we can look at how we build a response curve, we shall first discuss what a response curve is and what are the key results we infer from it.

**Response curve (Show them the response curve slide created)**

1. It is a mechanism used to measure responsiveness (increase in revenue) per unit spend increase (*help to understand the current spend vs return level & also provides an optimal range of spend to obtain an optimal returns before diminishing return sets in*)
2. It provides an optimal range of expenditure within which maximum profit is obtained
3. It has 3 key points of results
   1. **Point of current spending -** The current level of expenditure of a given tactic and its associated performance
   2. **Point of marginal peak –** The point at which the response (increase in revenue) per unit spend increase is maximum
   3. **Point of max ROI –** The point of expenditure at which maximum profit is attained
4. Point B to C is referred to as the optimal zone, which is the recommended zone of spending for a given tactic

**S-Curve transformation**

1. The Gamma transformation applied so far captures only the lag/ carry over effect that is observed in a media tactic
2. However, to consider the non-linearity and saturation aspects of the media tactics, the S-Curve transformation is applied on top of the previously existing gamma transformation.
   1. **Non-Linearity -**
   2. **Saturation -**
3. The S-Curve transformation could be applied like any other transformation, where we reach the model setup page and select the transformation type and measure of interest in “**Create transform measure**,” In this case its S-Curve & the gamma transformed media variable, respectively
4. A S-Curve transformation has 2 parameters alpha (shape) & beta (scale). To arrive at anchor points for both the parameters we make use of an excel template
5. Please click on “Model Export” & “Data Export” on the top right corner of Model output window and then show them the template.

**S-Curve template**

1. The template requires one inputs from a user, which could be obtained from the model output page in the platform
   1. **Transformed media data –** This could be obtained from the data export feature. Which exports an excel document contains the raw and transformed data information used in the project
2. Inputting the data mentioned would provide a default value for alpha & beta, which we shall use as an anchor point for options of S-curve transformation for a given media variable
   1. Alpha - (Mean/ SD) ^2 *(Mean and Standard Deviation of the transformed media data)*
   2. Beta - (SD^2)/Mean

\*\*use **(DigitalImp\_Google\_UAC1\_0\_Sep\_Oct\_K2)** data\*\*

1. We test for **different levels of saturation at the average current spend level** (25%, 50%, 75%) by changing alpha and beta individually for each of the saturation levels
   1. \*\*use **50% saturation level by changing alpha** in the model\*\*(**H column**)

\*\*use **(DigitalImp\_FB\_AEO\_Sep\_Oct\_0713)** data\*\* take **default values Dth Column**

1. We shall test each of these alpha and beta for the given variable and keep the transformation which provides the best fit
2. Similarly, each of the media tactics should be tested for the various options of alpha and beta
3. The measure properties for each of those variables should be updated as well

**ROI**

1. Before building the response curves, the user is first required to generate the ROI for media tactics, which could be done in the ROI tab in the model output page
2. Where the initial step would be to upload spend information
3. We have the option of selecting the granularity at which we want to upload the spend data in (dimension & time granularity)
4. Then we shall click on “Save” in Update ROI parameter to generate the ROI for each of the media variables
5. This will display charts and a consolidated table of raw support, spend, Raw CPP, spend, efficiency & ROI

**Response curves**

1. Now we shall generate the response curves in the “Response curves” tab of the model output page
2. We have the option of generating response curves at both measure level and aggregate level
   1. Measure level is when we need curves at an individual variable level
   2. Aggregated option is used when we require a single response curve for a group of variables aggregated together
      1. This aggregation could be done in the classification section, where a group of variables, where we need an aggregated response curve for, shall be classified within a single folder
3. Final we shall click on the “Generate” button to generate the response curves
4. Post which we shall save the iteration containing the response curves

**Simulation Module**

The simulation module is targeted at the marketing function within an organization. Marketing planners can use the simulation module to optimize the return on marketing investment. Although the Marketing Mix model also includes non-marketing drivers, the simulation module focuses only on the marketing drivers, assuming the base drivers remain unchanged.

The user can run multiple what-if scenario simulations or algorithm-driven budget optimizations to arrive at an optimum recommendation regarding allocation of the available marketing budget across the different available marketing levers. These recommendations are made for a specific user-defined period, i.e., for the next number of days, or weeks, or months. For instance, if the marketing budget for the next 30 days is USD 1 million and there are 10 available marketing tactics, this module will recommend how to optimally allocate the USD 1 million across all 10 levers such that a specific KPI (like revenue or profit or installs or volume) is maximized.

Once the finalized MM model is published to be available to the Simulation module, the first step for the user is to create a Session.

The user clicks the New Session link. They must then provide the following details that will apply to every scenario that is run within this session

1. A unique session name,
2. If multiple models are published to Simulation, they must select the model to be used to power the scenarios for this session
3. The base scenario period – Every scenario will be compared vs. this base scenario. This period is any subset of the last one year of modelling duration
4. If the dataset is multi-dimensional and the response curves for certain media drivers vary by dimension value, then the user must specify which dimension the response curves for this session should be generated at. For single-dimensional datasets this is a default selection
5. If the dataset includes multiple campaigns for a given media tactic, the user can decide whether to create response curves at the individual campaign level or at the aggregate media tactic level for this session

This way, the user may create multiple sessions each having their own attributes. Every scenario within a session will adhere to the session attributes selected. While we can compare scenarios within a session, you cannot compare scenarios across sessions.

Once a session is successfully created, the user is re-directed to the session landing page.

By default, there are 4 KPIs that are generated. These include

Spend – This KPI indicates the total spend in currency terms across all the marketing tactics for the base scenario period defined in the session

The dependent KPI – This is the value of the dependent KPI for the base scenario period

Revenue – If the dependent KPI is not revenue and the user has provided a revenue multiplier while configuring the model outputs in the modelling module, then this KPI value is calculated as the Dependent KPI times the Revenue Multiplier

Profit – This KPI is calculated as the Revenue KPI times a Gross Margin multiplier less Spend for the base scenario period

In some instances, the user may not wish to display the Revenue or Profit KPIs in the Simulation module. In this case, the user needs to navigate to the Simulation settings screen under the Project Settings and de-select or uncheck the Revenue and Profit KPI options

Similarly, if the dataset does not include any non-media incremental tactics, the user needs to de-select the BTL and ATL+BTL options in the Simulation Settings screen under the Project Settings. ATL refers to Above the line tactics such as media tactics, while BTL refers to Below the line tactics.

Coming back to this demo instance, we see that the base scenario period is from Jun to Dec 2020. The base period spend is 4.632 million USD and the base period revenue is 39.089 million USD.

To run a simulation, the user must first click the Add a New Scenario button. This re-directs the user to the Simulation dashboard screen.

There are several visual elements in the dashboard screen. These include the following:

1. RoI chart – This chart includes 2 RoI bars for each marketing driver. The blue bar represents the base period RoI, while the red bar represents the simulated RoI. Initially, both the bars are at the same level. When the user runs a simulation or optimization, the heights of the red bars change to reflect the simulated RoIs. To see the measure names, the user needs to either hover over the bars or click on the Expand icon on the top right of the chart element
2. Response Curves – This chart represents the average returns curve for all the media tactics present in the model. The y-axis represents the average return, while the x-axis represents the percentage spend scale in 1% increments from 0% to a maximum of 300%. The dotted vertical blue line indicates the 100% spend marker. This marker represents the actual historical spend in currency terms for each media tactic across the base scenario period. To view the response curve details for each media tactic, the user must first click on the expand icon on the chart element and then click on the tactic name in the legend in the expanded view.

This redirects the user to the drill-down view of the specific media tactic. The chart includes the dependent KPI curve from 0% to 300% of the base scenario period spend. It also includes the Average Returns and Marginal Returns curves. This chart provides a general guideline regarding the optimal range of spending for that tactic. The optimal range is defined as the area on the chart between the peak of the MR curve and the peak of the AR curve.

In the Apple Search Ads example, in % spend terms, the optimal range is between 67% and 118% of the base period spend. The table below the chart indicates the average daily spend, and average daily revenue for that media tactic.

It is important to note that while the response curves provide an indicative optimal spend range, the user must also consider the relative RoIs, base period spend levels for a more holistic view on budget allocation decisions

1. Marketing Spend share – This pie chart represents the spend share across the different media and non-media tactics for the base and simulated scenarios
2. Marketing Contribution share – This pie chart represents the contribution share across the different media and non-media tactics for the base and simulated scenarios
3. The Spend, Contribution and RoI bubble chart – This chart represents the 4 quadrants (Shift, Optimize, Expand and Sustain) that indicate the high-level investment strategy guideline that the marketing planner may adopt for each media and non-media tactic. The size of the bubble represents the spend level for that tactic.
4. The Simulate and Optimize slider levers – In the Simulate tab, the user can use the slider dragging option or the current spend % input field to manually create what-if scenarios. The user can enter spend % at the individual driver level or at an aggregate level. If applied at the aggregate level, the same spend% is applied all tactics within that group, where the groups are determined during the data classification step in the Input module. The default value initially is 100% which reflects the amount spent during the base period. The min value that the user may enter is 0% indicating that they do not wish to spend any of the available marketing budget on that tactic. The max value that the user may enter is 300%. Currently, the platform does not permit the user to spend more than 3 times the amount spent during the base period.

As the user modifies the current spend%, they can observe the change in the green KPI buttons at the top of the dashboard screen, the corresponding red RoI bar in the RoI chart, the marketing spends and contribution pie charts and the bubble chart. Also, the blue dot on the response curve indicates the position of the simulated spend on the corresponding average returns curve.

At any time, while running the simulations, the user may click on the View Marketing Summary link. This redirects the user to a table that contains the Spend, Dependent KPI and RoI values for each marketing tactic for both the base and current scenarios. The user can download an Excel file if they wish to run any further analyses on the what-if scenarios.

If the user wishes to see the absolute value impact on spend and the dependent KPI for each tactic in real-time as they provide the spend % inputs, they need to click on the expand icon to the right of the slider toggle option on the slider visual element. The expanded overlay pane reveals the spend difference and contribution difference for each tactic at the current % spend levels.

If the user wishes to use the algorithm-driven optimization functionality, they need to click on the Optimize tab on the slider visual element.

Here the user needs to specify the following details:

1. The optimization objective – Do they wish to maximize revenue or profit?
2. Specify min and max constraints at the total marketing budget level. If the user wishes to run an optimization keeping the overall spend identical to the base period, they can click the lock icon for the total marketing budget with min and max at 100%.
3. They can specify min and max spend constraints at the individual tactic level or at an aggregated group level or both. They can also lock the spend levels for individual tactics or groups by keeping the min and max constraints the same and clicking the lock icon.

For multi-dimensional datasets, the user must click on the info icon to the right of the measure. This opens an overlay with multiple sliders for each dimension value for that tactic. The user may set min and max constraints at each dimension value level.

Unlike in the case of manual simulations, to run an optimization, the user must provide all the input constraints and then click on the Run Scenario button to execute the optimization.

To view the spend allocation recommendation after running an optimization, the user must click on the Simulate tab. The user may save the scenario by providing a name and description. The user may then proceed to run additional scenarios by either editing a current scenario or starting from the base scenario version. To go back to a previously saved scenario, the user may click on the Reset Scenario button.

In this demo instance let us see how the optimization feature works. We will try to run a scenario where we lock the total marketing budget at the same amount as the base period.

We will leave all the individual tactics unconstrained, i.e., not apply any constraints. Although, it indicates min and max as 100%, it implies min = 0% and max = 300%.

When we click on Run Scenario, we find that while the total budget remains at 4.632 million USD, which is the same as the base period spend, implying a 0% change, the total revenue, which is the dependent KPI here, increases by 7.28% to 41.933 million USD.

When we click on the Simulate tab, we find the recommended spends by tactic. In this example, the optimizer recommends pulling out entirely from Google App Engine Optimization campaigns and Moloco, and reducing investment in Snapchat to 19% of base spend, while increasing spends across all other tactics by 3 times the base spend.

We can repeat this exercise, but this time we set min constraints across all tactics at 50% of base spend and max constraint at 150% of base spend and lock the total marketing budget at the base period budget.

This time we see a revenue increase of 3.96% to USD 40.637 million.

It is important to note that the optimizer does not guarantee the best possible outcome. It does, however, provide a result that is superior to the base scenario. The user may then use their understanding of the relative RoIs, relative spends and saturation limits to further improve upon the algorithm recommendation by manually simulating the spends.

With this, we conclude the detailed review of the simulation module. In the next video, we will review the planning module in detail.