Value Focused Thinking Modeling Tool

User Manual

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Overview

In value-focused thinking (Keeney, 1992), hierarchies are detailed representations of decision situations. They show the main objective, sub-objectives, and supporting sub-objectives until the point where objectives can be evaluated by appropriate measures. At this point, evaluation measures are created and converted to a common scale through a value function. Value hierarchies consist of tiers and branches and can be simple (one tier) or complex (two or more tiers). Tiers can be defined as the layers or levels of the hierarchical value structure (Chambal & Weir, 2011).

The Value Focused Thinking (VFT) Modeling Tool provides a dynamic environment for creating logical frameworks to help analysts and decision makers choose between multiple alternatives. The framework is based on expressed objectives and their associated values or metrics. In other words, the VFT Model enables the user make the best decision based on a summation of their weighted values.

While the end result of a VFT Model is often displayed as prioritized list of alternatives, the tool does not rate an alternative purely against other alternatives. Rather than choosing an alternative based on a one to one comparison (a time consuming and inconsistent process), the VFT Modeling Tool allows the user to evaluate a trade space that contains a multitude of possible alternatives using a prioritized set of objectives and their associated values.

Objectives, Metrics and Value Functions

Objectives should be solicited early in the hierarchy building process. Using a car purchasing decision as an example, important aspects in making your decision could be the two objectives of Performance and Utility. The Performance objective can then be comprised of sub-objectives such as Acceleration and Range and the Utility objective could be supported by sub-objectives of Reliability and Safety. In order to evaluate these sub-objectives, supporting metrics must be identified. For instance, Range could be assessed through fuel efficiency metrics of MPG City and MPG Highway.

Figure 1. Example of a Car Buying Hierarchy

Combining the objectives and corresponding metrics creates the hierarchy view displayed in Figure 1. A single dimension value function (SDVF) is commonly used in multi-objective decision analysis to convert the metrics into a common unit. A value function is used to describe the degree of satisfaction stakeholders perceive at each point along the measure scale. In addition to weighting, each metric has its own value function, used as a scoring system. This value function could be a continuous function or discrete categories. Some value function examples are shown in Figure 2. Here 'Crash Test' is an increasing continuous function where the higher value score is given for greater crash test ratings. The Roadside Assistance value function is categorical where discrete assistance options correspond to associated values.

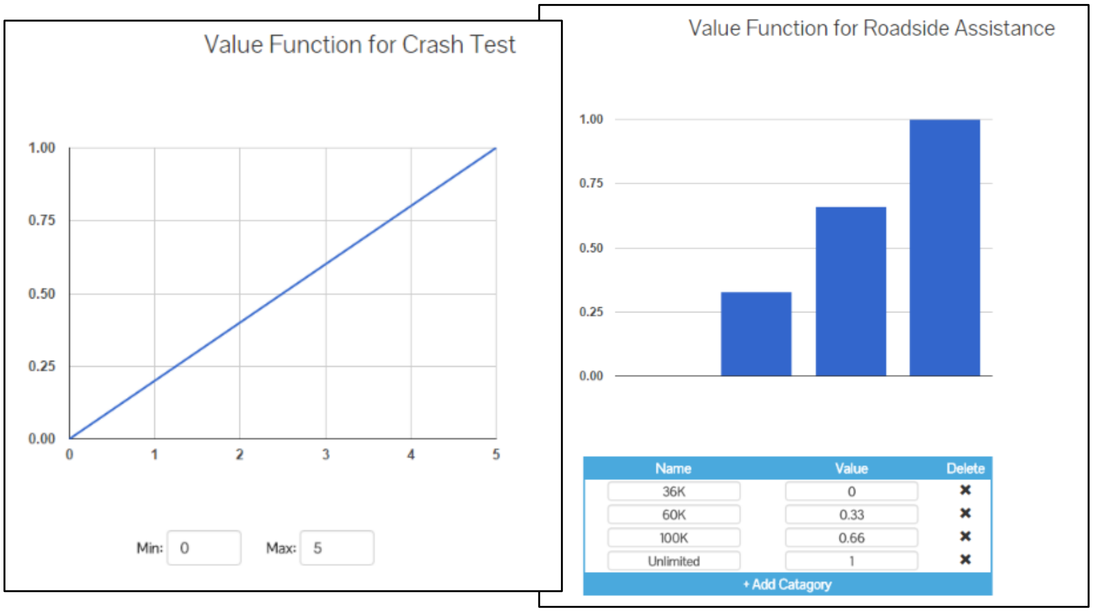


Figure 2. Value Functions for Crash Test (Continuous) and Roadside Assistance (Categorical)

Alternative Scoring

Once the Metrics and Value Functions are complete it is time to score alternatives across all metrics. An example of the data entry window is shown below in Figure 3.

Name	Cost	Owner Satisfaction	Warranty (Basic)	Roadside Assistance	Crash Test	Power/Weight Ratio	0-60 Time (seconds)	MPG City	MPG Highway	Del
Civic	21000	High	Average	N/A	N/A	30	10-13	27	34	✖
Focus	19000	Medium	Great	N/A	N/A	30	10-13	28	35	✖
Mirage	22000	Medium	Poor	Has	Tested	31	7-10	24	33	✖

Figure 3. Alternatives Defined across Metrics

Weighting

Weights can be assessed both locally and globally. When a value hierarchy is initially built, the weights are automatically distributed uniformly across all objectives and subsequently, their measures. These weights and default weighting application is illustrated in Figure 4, as the local weights are represented in red and the global weights in gray. Local weights are assessed at a particular branch level, whereas global weights are a product of the local weights above them in the hierarchy. Note that the global weights sum to one overall and the local weights sum to one in their local region, regardless of the weighting process used (Chambal & Weir, 2011).

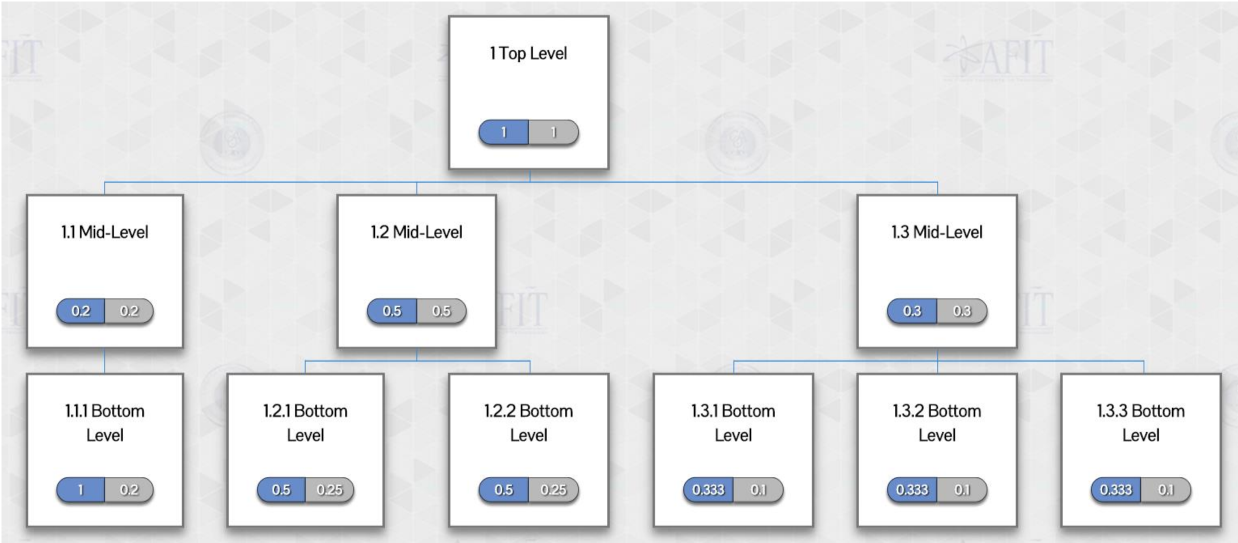


Figure 4. Local and Global Weights

Specified weightings are necessary because all values are not necessarily equal. For instance, in the car example, the buyer or user might value 'Utility' as more important than 'Performance.' In this instance, 'Utility' would be allocated a higher weight. Likewise, for the subordinate metrics, a higher weight might be applied to 'Crash Test' compared to 'Roadside Assistance.'

There are several weighting strategies for rank-ordering or soliciting weight information besides incrementally applying weights manually throughout the hierarchy. These methods can be valuable in eliciting subject matter inputs and representing the underlying importance of supporting metrics.

Rank Order Centroid (ROC)

This method is helpful for ordering weights for a number of measures according to their importance. It is usually conceptually easier to rank items than give weight to them. This method takes those ranks as inputs and converts them to weights for each of the items. The conversion is based on the following formula, where *M* is the total number of metrics and W_i is the weight for i^{th} metric.

$$W_i = \frac{1}{M} \sum_{n=i}^{M} \frac{1}{n}$$

Equation 1. Rank Order Centroid Calculation

A four-item example is calculated below with the results summarized in Table 1.

- the item ranked first will be weighted: $(\frac{1}{4})$ x $(1 + \frac{1}{2} + \frac{1}{3} + \frac{1}{4})$ = 0.521,
- the second item will be weighted: $(\frac{1}{4})$ x $(\frac{1}{2} + \frac{1}{3} + \frac{1}{4})$ = 0.271,
- the third item: $(\frac{1}{4})$ x $(\frac{1}{3} + \frac{1}{4})$ = 0.146,
- and finally, the last item: $(\frac{1}{4})$ x $(\frac{1}{4})$ = 0.063.

Number of Total Items	*1st Weight*	*2nd Weight*	*3rd Weight*	*4th Weight*

2	0.75	0.25		
3	0.611	0.278	0.111	
4	0.521	0.271	0.146	0.063

Table 1. Rank Order Centroid Weights

Pairwise Comparison

For this method, the decision-maker compares each item with the rest of the group and gives a preferential level to one item in each pairwise comparison. For example, if the item in hand is as important as another, the preferential level would be one. If it is much more important, its level would be set to 10. This comparison scale is shown in Table 2.

Extremely Favor	Very Strongly Favor	Strongly Favor	Slightly Favor	Equal	Slightly Favor	Strongly Favor	Very Strongly Favor	Extremely Favor
10	7.5	5	2.5	1	2.5	5	7.5	10

Table 2. Scoring Guide for Pairwise Comparison

When applied across a set of metrics for a production example, the final pairwise weighting matrix looks the table shown below (see Table 3), as reciprocal relationships and inverse scale is automatically populated.

	Shorten Schedule	Project Cost	Agency Control	Competi-tion	Weight	Total	Weight Calculation
Shorten Schedule	1	5	2.5	8	0.60	16.5	16.5/27.225=0.60
Project Cost	0.2	1	0.5	1	0.10	2.7	2.7/27.225=0.10
Agency Control	0.4	2	1	2	0.20	5.4	5.4/27.225=0.20
Competition	0.125	1	0.5	1	0.10	2.625	2.625/27.225=0.10
				Total	1.00	27.225	

Table 3. Pairwise Comparison - Production Example

Swing Weights

The swing-weighting approach can be used in virtually any weight assessment situation. It requires a thought experiment in which the decision maker compares individual attributes directly by assessing hypothetical outcomes in the steps shown below. (Clemen, 1996) An example of the swing assessment for a car purchase may look like the example shown in Table 4.

1. Rank outcomes.
2. Fill in the “Rate” column in the table.
3. With these assessments, the table can be completed and the weights calculated. The weights are normalized ratings.

Attribute Swung (Worst to Best)	Consequences to Compare	Rank	Rate	Weight	Weight Calculation
Benchmark	6 yrs, $17K, Red	4	0	0	(0/185)
Color	6 yrs, $17K, Yellow	3	10	0.054	(10/185)
Life Span	12 yrs, $17K, Red	2	75	0.405	(75/185)
Price	6 yrs, $8K, Red	1	100	0.541	(100/185)
		Total	*185*	*1.000*	

Table 4. Swing-Weight Assessment for Car Purchase Example

Swing Weight Matrix

A useful tool for determining weightings is the swing weight matrix. (Parnell, Understanding Decision Management) For each measure, consider its importance by determining if the measure corresponds to a defining capability, a critical capability, or an enabling capability. Also, consider the variation measure range by considering the gap between the current capability and the desired capability. Swing weights are then assigned to each measure according to the required relationship rules described below and shown Table 5.

- *Any measure in cell A must be weighted greater than measures in all other cells.*
- *Any measure in cell B1 must be weighted greater than measures in cells C1, C2, D1, D2, and E.*
- *Any measure in cell B2 must be weighted greater than measures in cells C2, C3, D1, D2, and E.*
- *Any measure in cell C1 must be weighted greater than measures in cells D1 and E.*
- *Any measure in cell C2 must be weighted greater than measures in cells D1, D2, and E.*
- *Any measure in cell C3 must be weighted greater than measures in cells D2 and E.*
- *Any measure in cell D1 must be weighted greater than measures in cell E.*
- *Any measure in cell D2 must be weighted greater than measures in cell E.*

Level of Importance of Value Measure

Variation in Measure Range	Defining Capability	Critical Capability	Enabling/Enhancing Capability
High Differentiation	**A**	**B2**	**C3**
Moderate Differentiation	**B1**	**C2**	**D2**
Low Differentiation	**C1**	**D1**	**E**

Table 5. Swing Weight Matrix

Swing Weight Matrix technique places all measures into a matrix according to importance and variation. The stakeholders then assign swing weights to all measures. A completed swing weight matrix (with expanded dimensionality) may look like the example shown in Table 6.

Level of Importance of Value Measure

Variation in Measure Range		Extremely Important	Very Important	Important	Less Important
	Very High	1000	440	230	100
	High	750	380	210	90
	Medium	500	300	170	70
	Low	250	170	100	50

Table 6. Swing Weight Matrix - Input Table

Selected swing weights are then normalized and applied to the hierarchy.

Registering and Logging In

To register for a new account, simply click the "Register" link in the black ribbon at the top of the screen. A new screen opens in which you need to input your name, email, password, and confirmation of your password (Figure 5).

Figure 5 To register an account, click "Register" and then provide your name, email address and password

To login, click the "Log In" link next to the "Register" link and input your email address and password that you set when you registered the account (Figure 6).

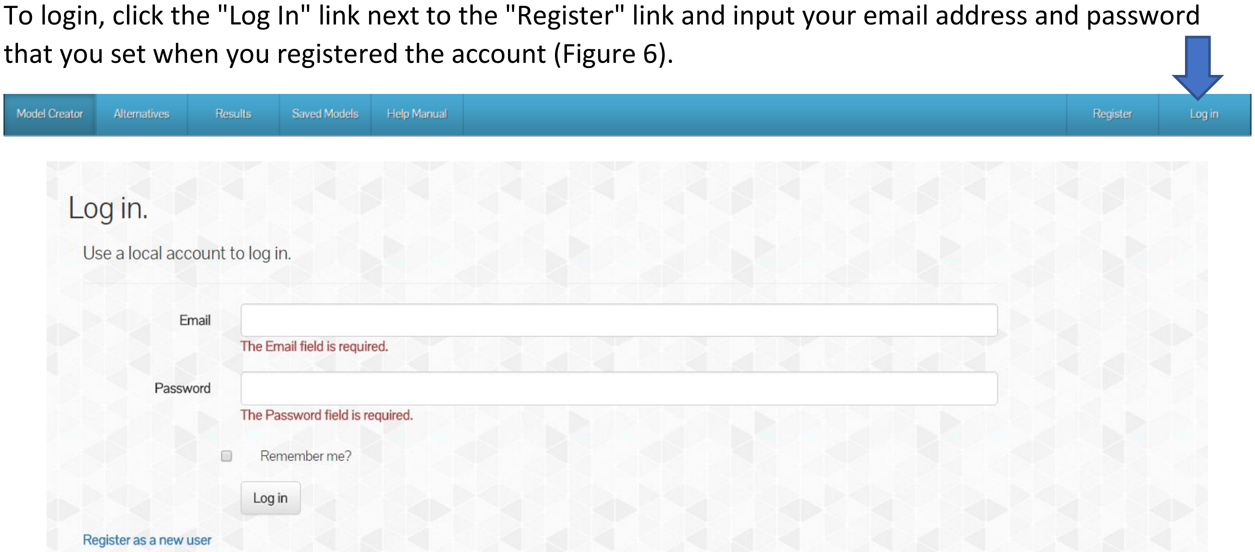


Figure 6. Login by clicking the "Log In" button, then putting in the user's registered credentials

Creating a Model

In order to create a model from scratch, start on the Home or Model Creator screen. A root node is automatically displayed on the screen (Figure 7).

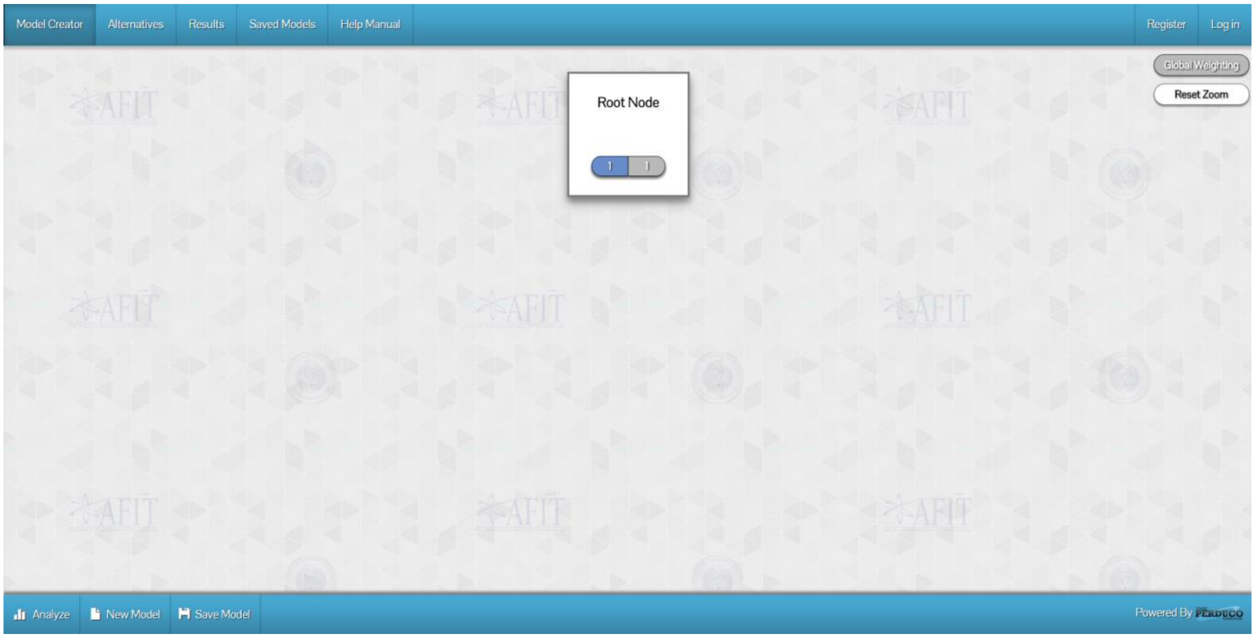


Figure 7. Creating a Model

Nodes and the hierarchy you create can be dragged around to get a better view of your tree. Clicking on a node a second time will let you access and edit the information for that node. From this pop up menu that appears on the left-hand side of the screen you can change the name of the node by editing the name in the text box. To add children to this root node, click on the node and Select "+ Child" from the same window (Figure 8).

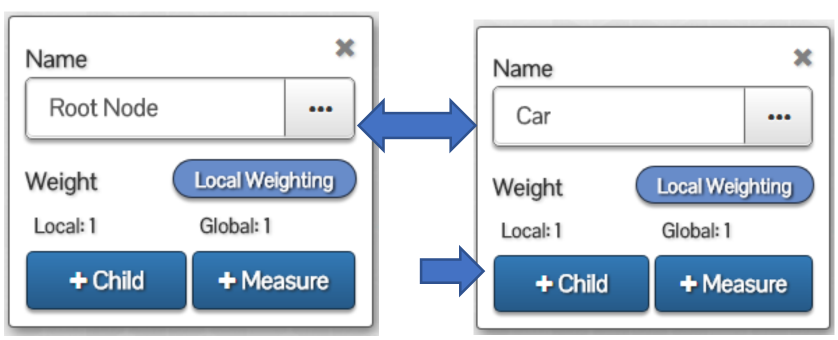


Figure 8. Editing Node Name and Adding a Child to the Model

Once all of the children have been added (Figure 9), you can now add Measures to the model. To do this, click on the bottom-most child and select "+ Measure" from the window on the left-hand side of the screen. Note that you can delete the child node from this menu as well. (Figure 10).

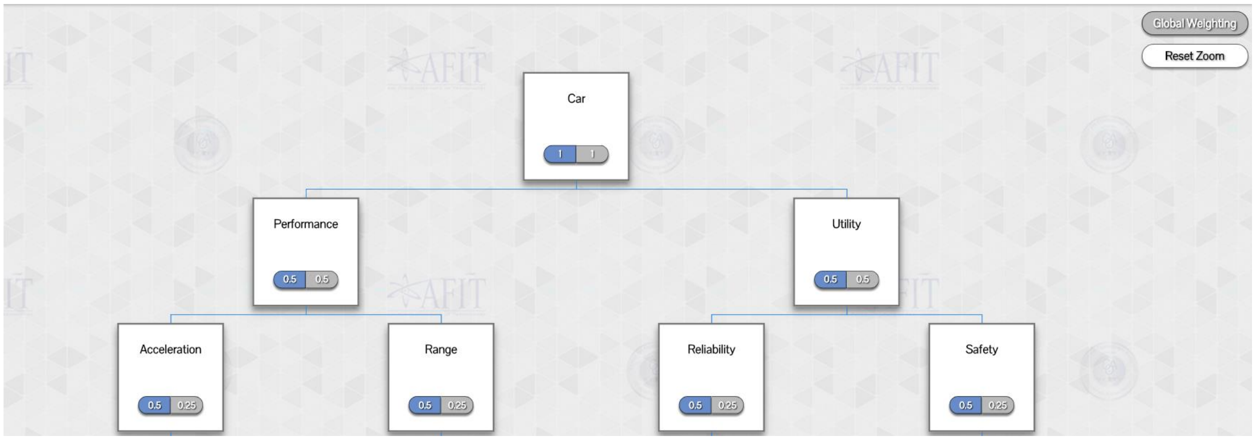


Figure 9. Children Added to the Model

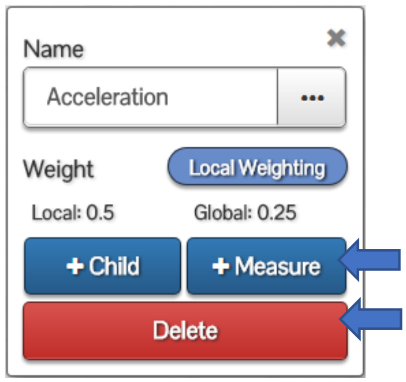


Figure 10. Adding a Measure

Now that we have added all of the measures to the model, the structure of our model is complete (Figure 11), but each measure still needs a value function. To set the value function, click on the measure and select "Set Value Function" from the window that pops up (Figure 12).

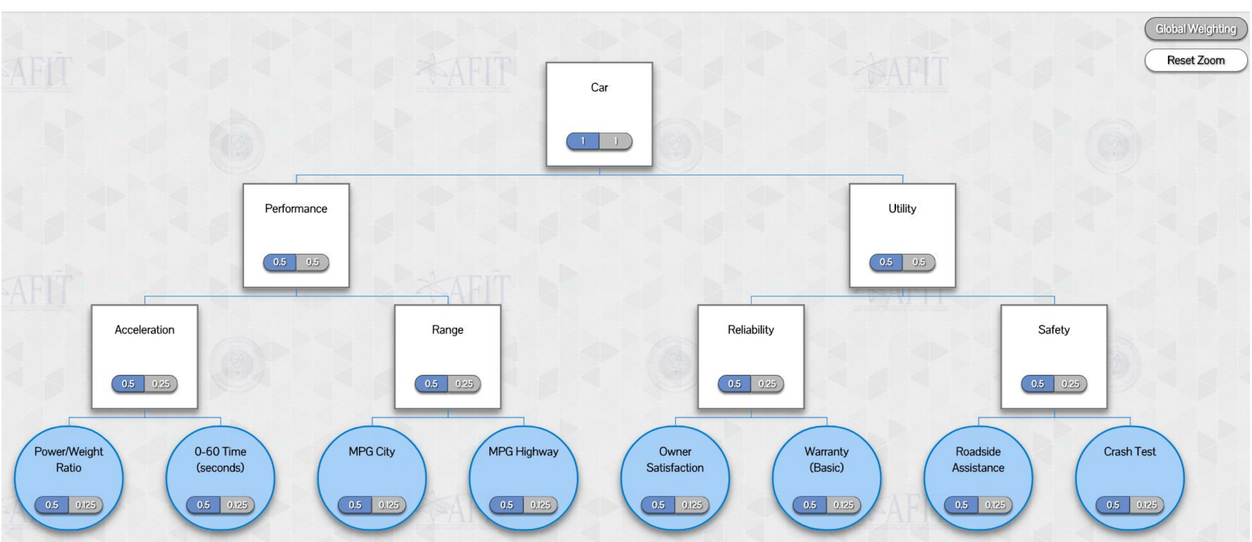


Figure 11. Complete Model Structure

Figure 12. Set the Value Function by selecting the "Set Value Function" button

Now you can choose the type of value function: Continuous Linear; Categorical; Exponential; S-Curve; Piecewise Linear; or Trendline. In Figure 13 we see the continuous linear value function.

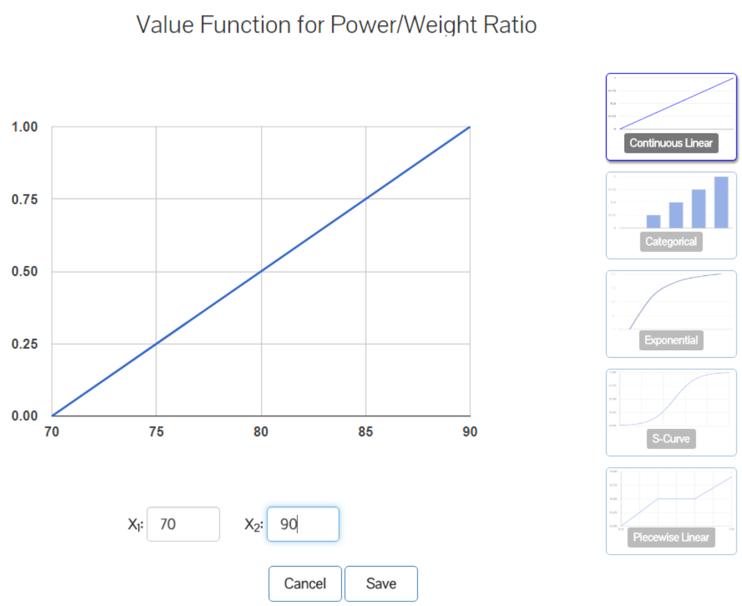


Figure 13. Setting the Value Functions for the measures

Alternatively, we could input a categorical value function (Figure 14). Here we've named the categories Category 1 and Category 2, and given them values of .5 and 1 respectively.

Figure 14. Categorical Value Function

Another alternative is to apply a 2-dimensional categorical value function in which discrete values can be assigned based on two distinct categories (Figure 15).

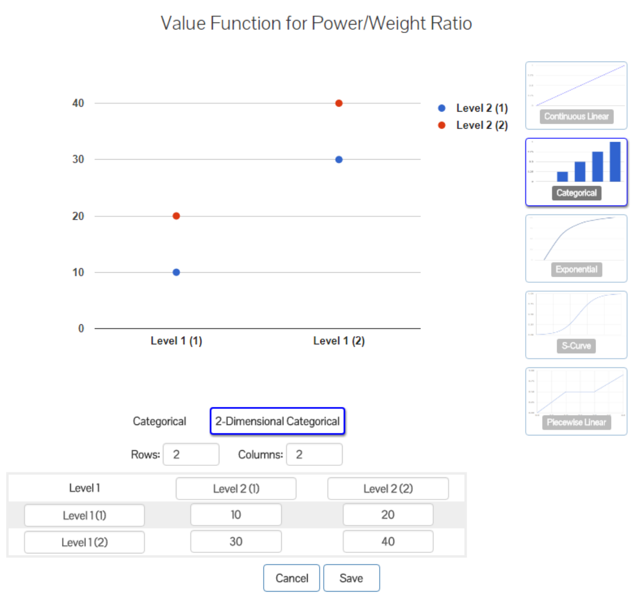


Figure 15. 2-dimensional Categorical Value Function

Next, you could apply an Exponential curve to the value function (Figure 16). Here you need to set the upper and lower limits along with a value for rho. Alternatively, you can select the Rho toggle and change it to a mid-point method.

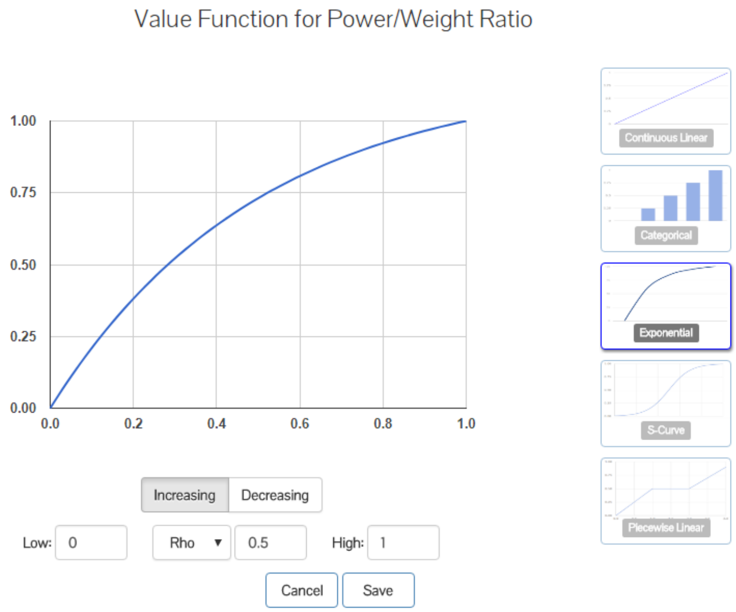


Figure 16. Exponential Value Function

Another alternative is to choose an S-curve model (Figure 17). In this case, you can set the upper and lower limits and then choose whether you want the model to be increasing or decreasing by selecting the "Flip" checkbox.

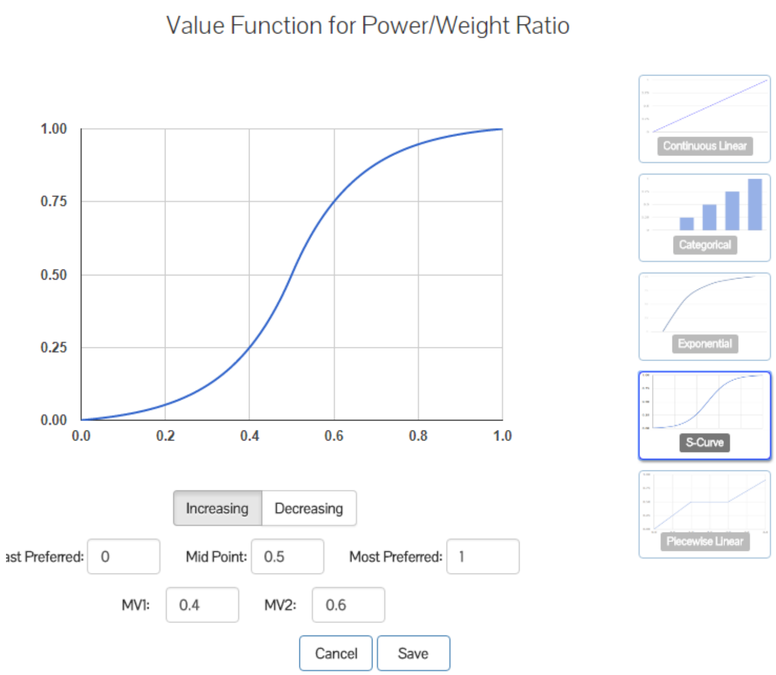


Figure 17. S-Curve Value Function

The next value function available is the Piecewise Linear, where a series of points are entered to identify the linear segments (Figure 18).

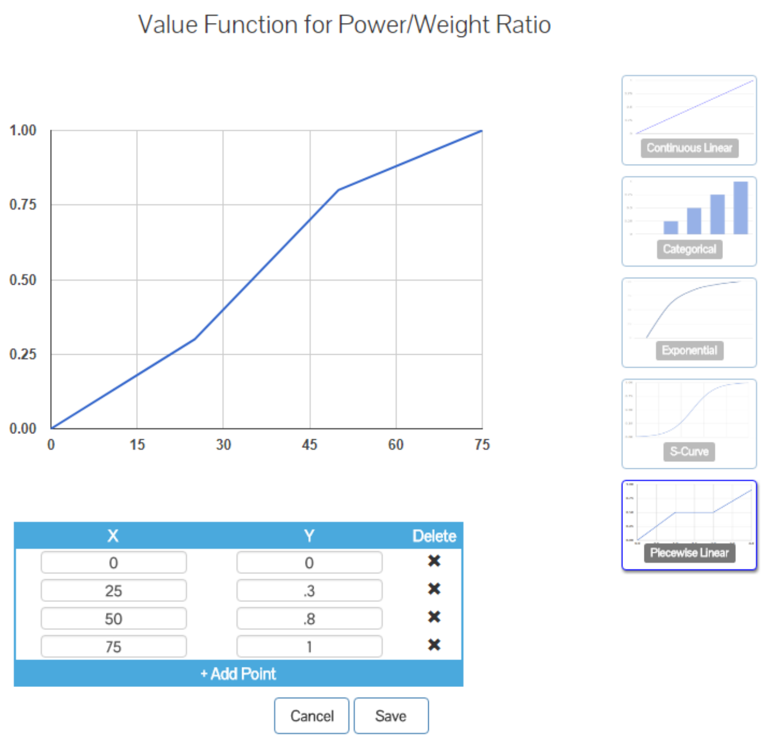


Figure 18. Piecewise Linear Value Function

Weighting the Model

Local Weights

Now that the structure of the model is complete, the next step in the process is to add weights to the nodes in the model. It is possible to change the local weights in each node, as well as the global weights of the entire model. First, we will start with editing the local weights. To do this, click on a node and select "Change Weights" from the window that appears (Figure 19).

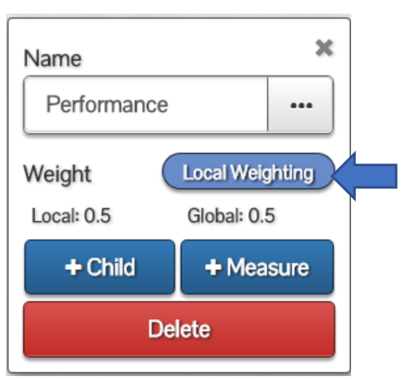


Figure 19. Select "Change Weights" to Change local weights

Now you can choose one of five weighting methods described earlier.

Manual

The first technique is to manually assess the weights. Here, simply assign weights to each of the listed nodes (Figure 20) If the weights do not sum to one, you will be prevented from confirming (saving) your inputs.

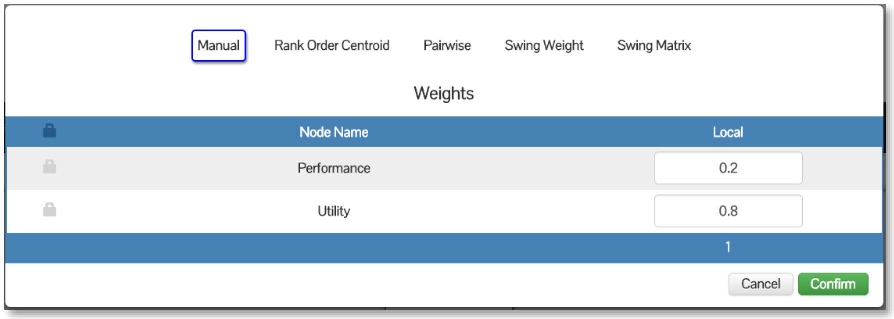


Figure 20. Assign Weights using the Manual Method

Rank Order Centroid (ROC)

Choosing the ROC option from the top of the screen, you can click and drag the options in order to rank-order them. The weights will automatically adjust based on their rank ordering (Figure 21).

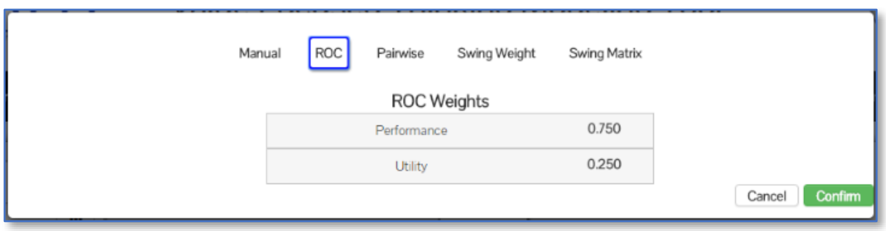


Figure 21. Rank Order Centroid (ROC) Method

Pairwise Comparison

After selecting Pairwise from the top of the screen, changing one value will automatically update other values to ensure that the weights always sum to 1 (Figure 22).

Figure 22. Pairwise Comparison method for weighting nodes

Swing Weight

Now select "Swing Weight" from the top of the screen. Optionally you can first rank order the nodes. This does not affect the calculations of the weights, but simply makes it easier to assess the rates if the nodes are in rank order. Next, apply rates to the nodes. Once the rates have been applied, the weight is automatically calculated and appears to the right of the rank text box (Figure 23).

Figure 23. Swing Weight method for weighting nodes

Swing Weight Matrix

Finally, choose the Swing Matrix selection from the top of the screen (see Figure 24). From (Parnell & Trainor, Using the Swing Weight Matrix to Weight Multiple Objectives, 2009), "Since many individuals may participate in the assessment of weights, it is important to insure consistency of the weights assigned. It is easy to understand that a very important measure with a high variation in its range should be weighted more than a very important measure with a medium variation in its range. It is harder to trade off the weights between a very important measure with a low variation in its range and an important measure with a high variation in its range. Weights should descend in magnitude as we move on the diagonal from the top left to the bottom right of the swing weight matrix."

In this application, you first need to assign values to each box in the matrix. These values reflect what it means, for instance, when you say something represents a very important (high) measure and a high variation in its range ("High, High"). Next, choose how to bin each measure using the drop-down menus beneath the matrix. In the instance of the example below, we have set the Utility measure to High, High and the Performance measure to Low, Low.

Figure 24. Swing Weight Matrix method for weighting nodes

Once you have completed weighting the nodes, click “Confirm” to save your data.

Global Weights

In order to access the Global Weights, select “Global Weighting” at the top right of the Model Creator screen (Figure 25). To see the weights on the model, click the “Show Global” check box.

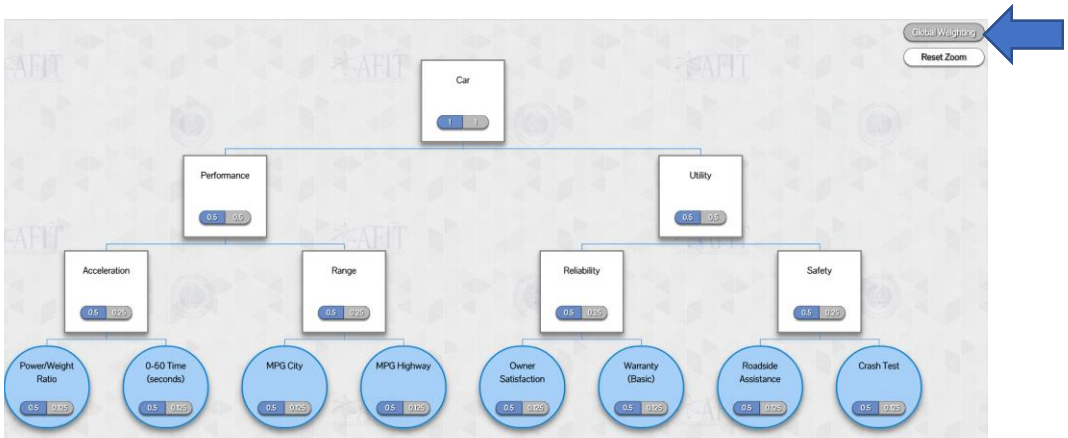


Figure 25. In order to change the global weights, select "Global Weighting"

Just as in the local weighting options, the global weights also offer five options to apply weights. The difference here is that the weights apply to all nodes in the network, whereas the local weights only apply to the subordinate nodes of the selected node.

Manual

The first technique for applying weights is the manual approach, as pictured in Figure 26.

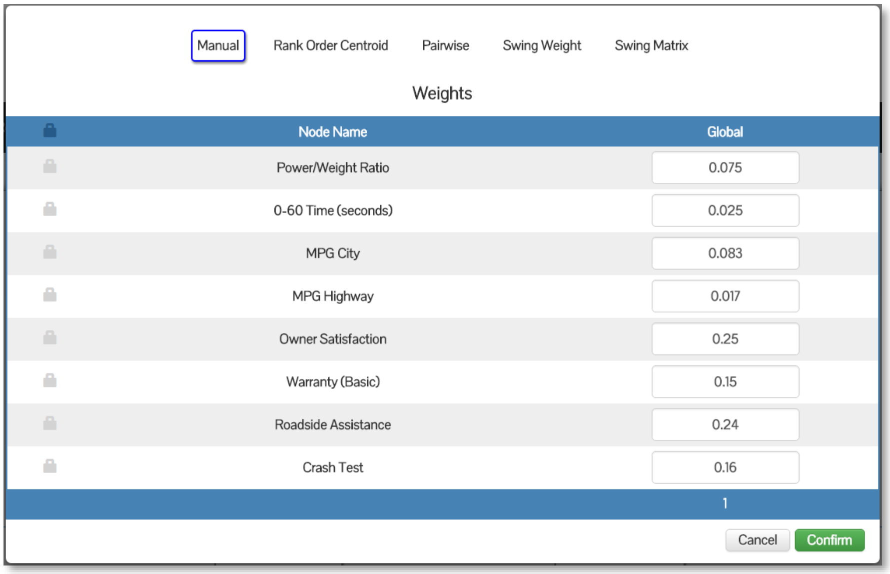


Figure 26. Apply weights directly using the Manual approach to global weighting

Rank Order Centroid (ROC)

Next, the Rank Order Centroid method allows you to drag and drop the nodes in order of importance to your decision. The weights are automatically calculated based on the rank order (Figure 27).

Figure 27. Apply global weights by rank ordering the nodes

Pairwise Comparison

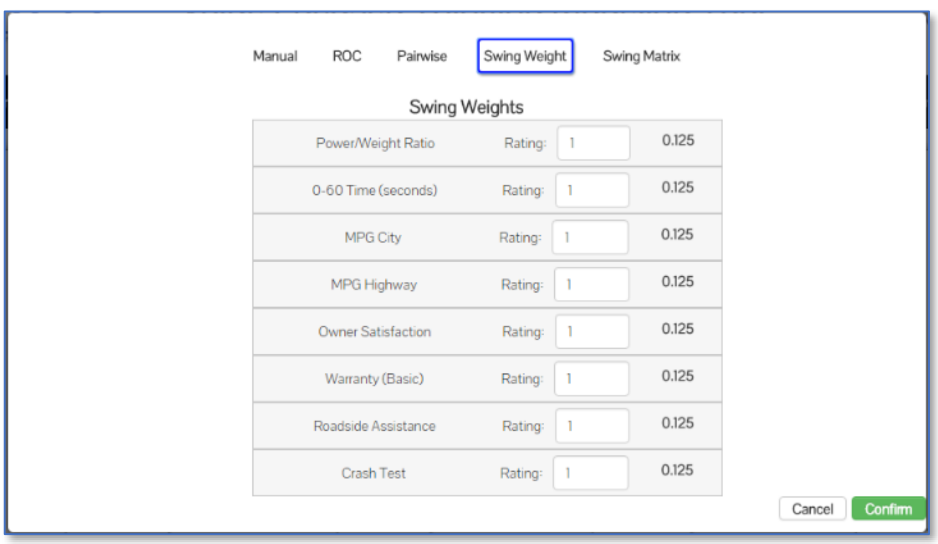
Next, select “Pairwise” from the top of the screen. Changing one value will automatically update other values to ensure that the weights always sum to 1 (Figure 28).

	Power/Weight Ratio	0-60 Time (seconds)	MPG City	MPG Highway	Owner Satisfaction	Warranty (Basic)	Roadside Assistance	Crash Test	
Power/Weight Ratio	1	1	.5	.5	.01	.05	.05	0.00333	0.002
0-60 Time (seconds)	1	1	.5	.5	1	1	1	0.00333	0.005
MPG City	2	2	1	1	1	1	1	0.005	0.007
MPG Highway	2	2	1	1	1	1	1	0.005	0.007
Owner Satisfaction	100	1	1	1	1	1	1	0.01	0.081
Warranty (Basic)	20	1	1	1	1	1	1	0.1	0.020
Roadside Assistance	20	1	1	1	1	1	1	0.1	0.020
Crash Test	300	300	200	200	100	10	10	1	0.858

Figure 28. Apply global weights by using the Pairwise Comparison function

Swing Weight

Now select “Swing Weight” from the top of the screen. Optionally you can first rank order the nodes. This does not affect the calculations of the weights, but simply makes it easier to assess the rates if the nodes are in rank order. Next, apply rates to the nodes. Once the rates have been applied, the weight is automatically calculated and appears to the right of the rank text box (Figure 29).



Power/Weight Ratio	Rating:	1	0.125
0-60 Time (seconds)	Rating:	1	0.125
MPG City	Rating:	1	0.125
MPG Highway	Rating:	1	0.125
Owner Satisfaction	Rating:	1	0.125
Warranty (Basic)	Rating:	1	0.125
Roadside Assistance	Rating:	1	0.125
Crash Test	Rating:	1	0.125

Figure 29. Apply global weights using the Swing Weight technique

Swing Weight Matrix

From (Parnell & Trainor, Using the Swing Weight Matrix to Weight Multiple Objectives, 2009), "Since many individuals may participate in the assessment of weights, it is important to insure consistency of the weights assigned. It is easy to understand that a very important measure with a high variation in its range should be weighted more than a very important measure with a medium variation in its range. It is harder to trade off the weights between a very important measure with a low variation in its range and an important measure with a high variation in its range. Weights should descend in magnitude as we move on the diagonal from the top left to the bottom right of the swing weight matrix."

In this application, you first need to assign values to each box in the matrix. These values reflect what it means, for instance, when you say something represents a very important (high) measure and a high variation in its range ("High, High"). Next, you choose how to bin each measure using the drop-down menus beneath the matrix. In the instance of the example below, we have set the Crash Test measure to High, High and the Power/Weight Ratio to Low, Low. (Figure 30)

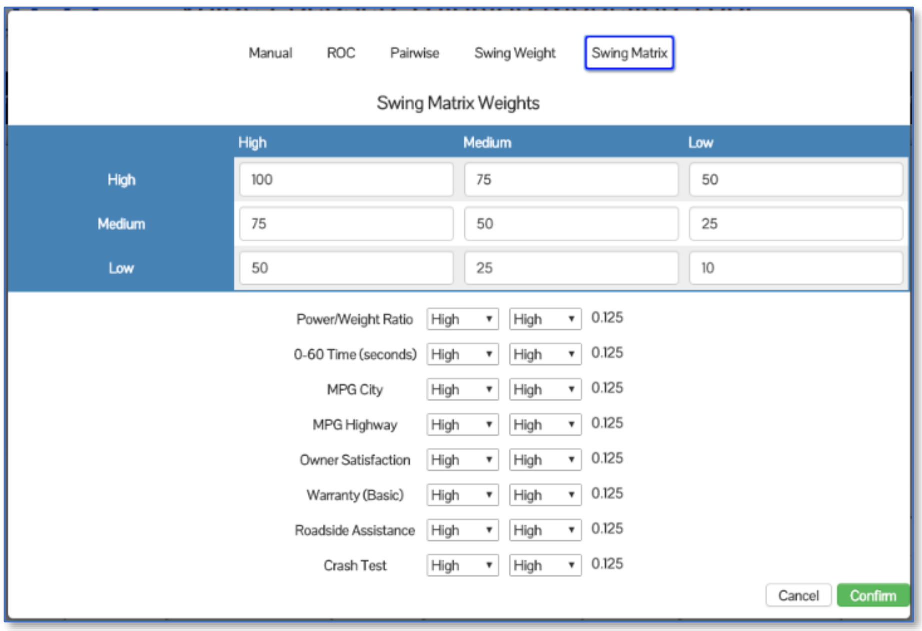


Figure 30. Apply global weights using the Swing Weight Matrix technique

Once you have completed weighting the nodes, click "Confirm" to save your data.

Saving the Model

At any point during the model creation you can choose to save your model by selecting the "Save Model" button below the Model (Figure 31).

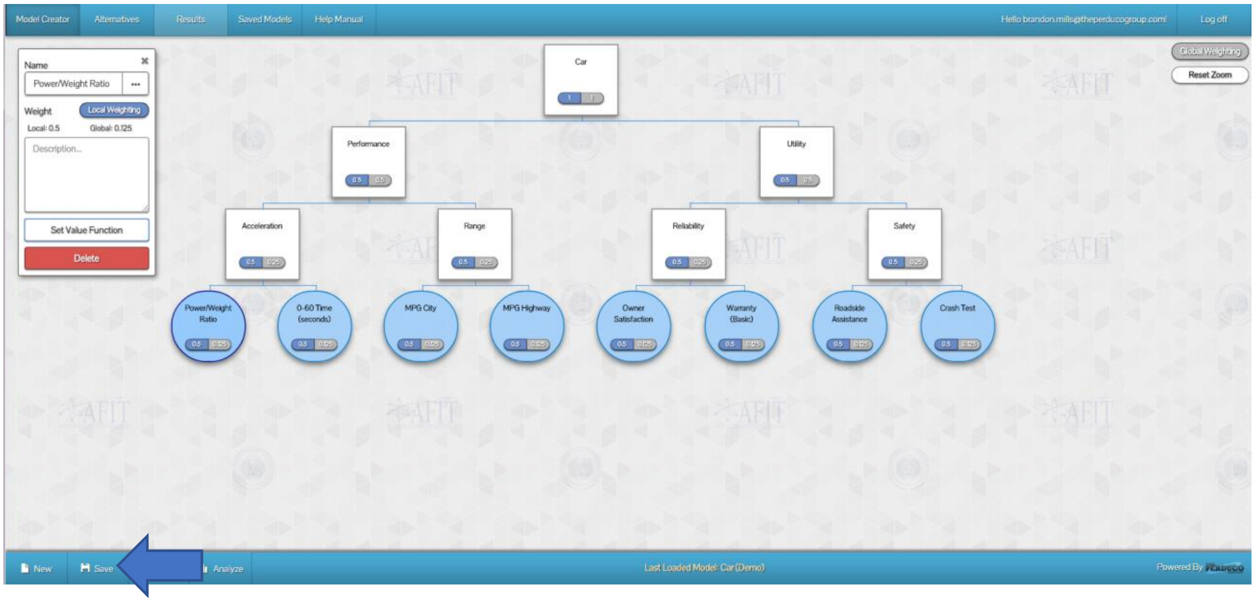


Figure 31. Save the model by selecting "Save Model"

Once you click this button, a new window appears that enables you to name the model and provide a description, as well as choose whether or not to make the model publicly available (Figure 32). NOTE: If you are not the original owner of the model, a copy of the model will be created with the save. In order to avoid confusion, it is best if you change the name of the model to something unique.

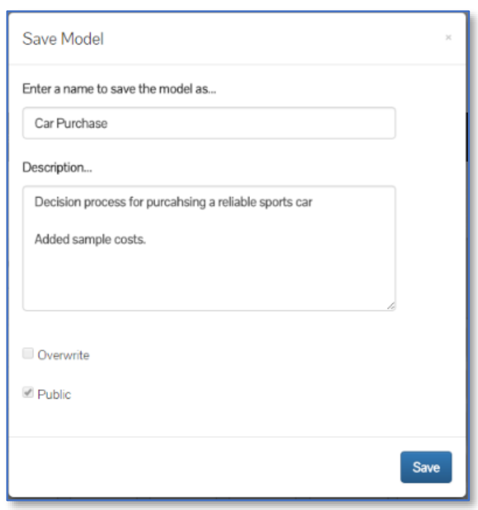


Figure 32. Save Model dialog box

If you are logged in while saving you will have the option of sharing your model with other users who have registered on the VFT application. Simly select their name on the dropdown and click the Share button to add them to the list. Clicking an X on the row of an added name will remove that person from receiving a shared copy (Figure 33). Sharing models on the VFT application creates a copy for them under their account that they can change without influencing your original model.

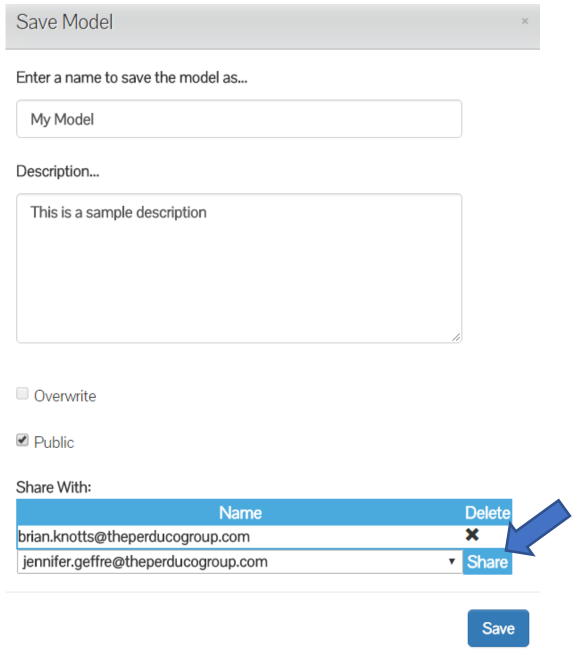


Figure 33. Sharing the Model controls

Alternatives

Now we will evaluate the different alternatives in our decision space. Evaluating alternatives allows the decision maker to input information about the various metrics in the network for each alternative being evaluated. In this case, we are evaluating four different car models based on the metrics identified in our network. Select 'Alternatives' from the black ribbon at the top of the screen to view these 4 alternatives (Figure 34).

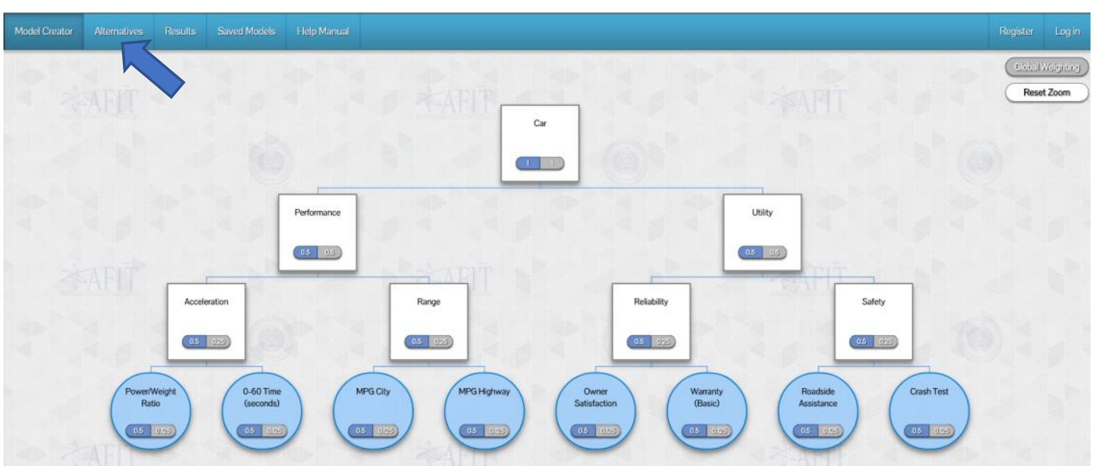


Figure 34. Select "Alternatives" from the black ribbon at the top of the screen

Add Alternatives

Alternatives can be added by selecting the "Add Alternative" button below the black ribbon at the top of the screen (Figure 35).

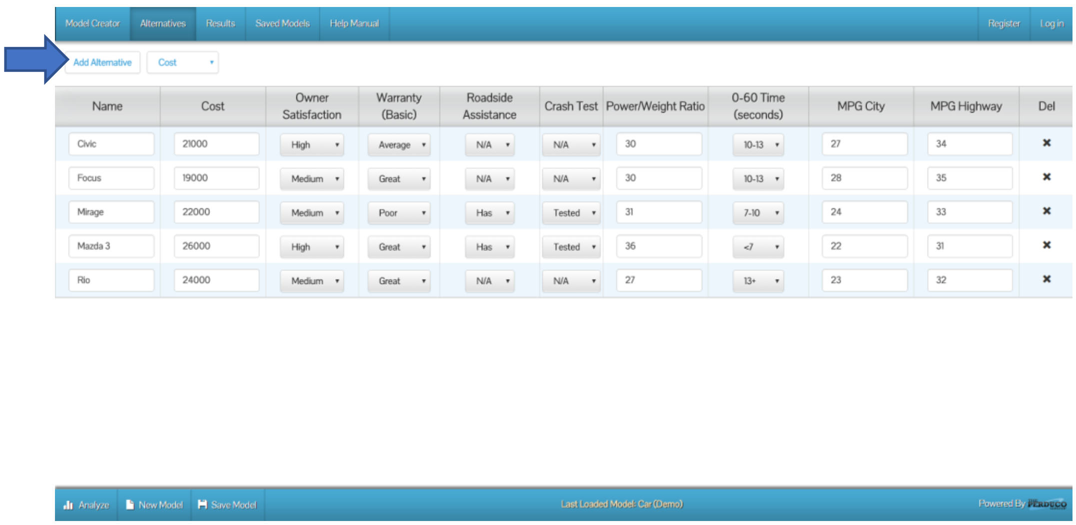


Figure 35. Select "Add Alternative" to add an alternative to the list

Delete Alternatives

Once an alternative has been added, it can be deleted by clicking the black X at the right of the alternative row (Figure 36).

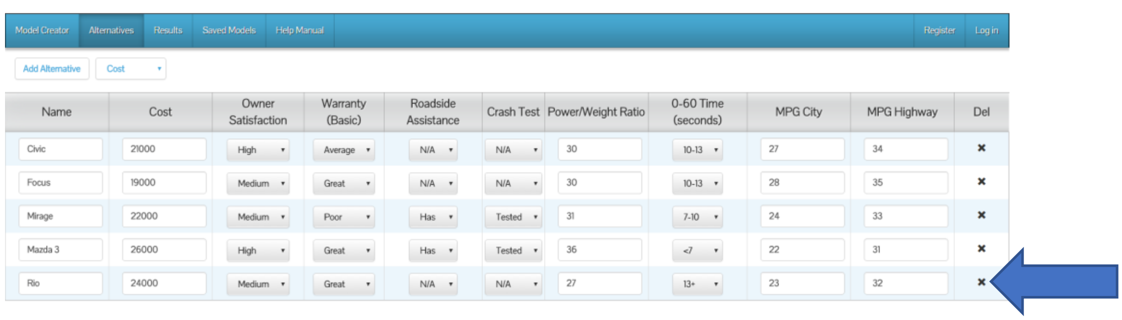
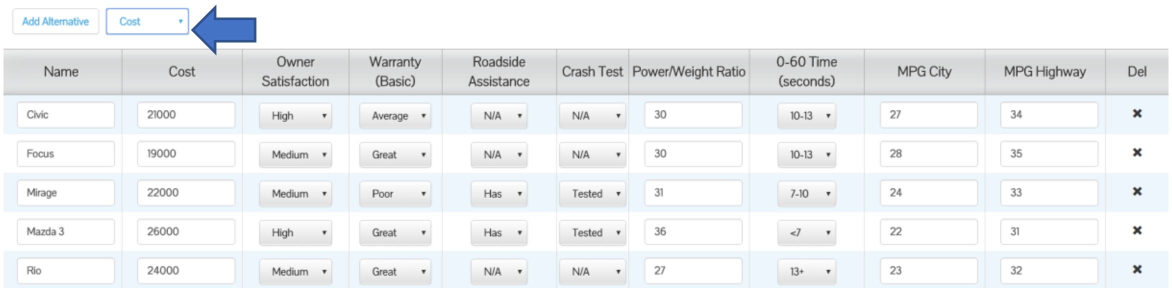


Figure 36. Delete an alternative by selecting the black X

Note that Warranty and Roadside Assistance are changed via drop down menus, whereas the remaining categories are values that can be typed in. This is because the Warranty and Roadside Assistance nodes were created as discrete categories, and the others were created as continuous categories.

Costs

It is possible to add cost or profit information by changing this select box. The default is "No Metric" (Figure 37).



Name	Cost	Owner Satisfaction	Warranty (Basic)	Roadside Assistance	Crash Test	Power/Weight Ratio	0-60 Time (seconds)	MPG City	MPG Highway	Del
Civic	21000	High	Average	N/A	N/A	30	10-13	27	34	✖
Focus	19000	Medium	Great	N/A	N/A	30	10-13	28	35	✖
Mirage	22000	Medium	Poor	Has	Tested	31	7-10	24	33	✖
Mazda 3	26000	High	Great	Has	Tested	36	<7	22	31	✖
Rio	24000	Medium	Great	N/A	N/A	27	13+	23	32	✖

Figure 37. Add cost information to the alternatives by selecting "Cost"

Results

There are three ways to access the Results section of the tool. First, you can choose “Results” from the black ribbon at the top of the screen (Figure 38).

Figure 38. Select "Results" from the black ribbon at the top of the screen to see the results graphs

Next, from either the Model Creator screen or the Alternatives screen, choose the “Analyze” button from the bottom of the screen (Figure 39).

Figure 39. Another way to access the Results page is from the bottom of the Model Creator or Alternatives screen

The default chart is shown below (Figure 40). This chart shows the ideal or perfect alternative by metric value gap at the top, and each alternative beneath as a percentage of the ideal. The Alternatives are plotted on the Y axis, and the Values are plotted on the X axis. This chart can be tailored in a number of ways. First, it can be sorted in ascending or descending order by selecting either the “Ascending” or “Descending” radio button. Next, it can be viewed as a floating bar chart by selecting “Show As Floating”. It can also be viewed as a stop light chart by selecting “Show As Stop Light” and finally it can be shown as a quartile by selecting “Show As Quartile”. Mouse over the bars to show additional information such as the value, potential, and percent of potential for each option.

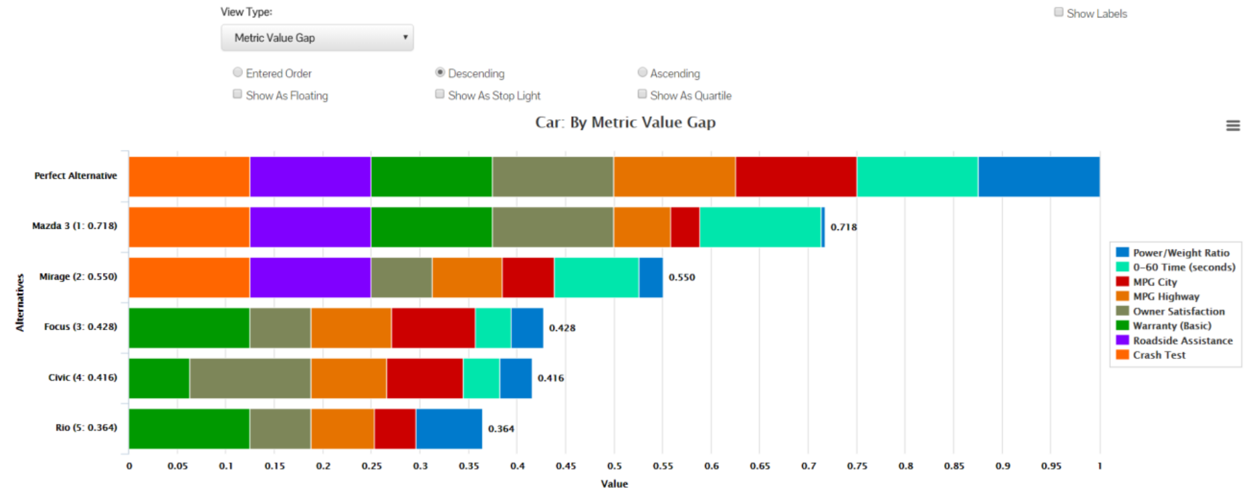


Figure 40. The default chart on the analysis page represents the ideal and percentage of ideal

From the drop-down menu at the top left of the screen, you can change the type of chart. This enables you to slice and dice the data and view the decision space in a variety of ways, including: By Metric Value Gap; By Objective Value Gap; Tornado Diagram; Alternative Radar Comparison; Cost Capability; Waterfall Alternative Comparison; Tornado Alternative Comparison; Local Proportional Sensitivity; and Global Proportional Sensitivity. Below, we walk through each of these charts.

In the Objective Value Gap chart (Figure 41) we can select which objective to evaluate. In this example, we are evaluating the top most objective, called "Car". The top-most bar represents the perfect alternative and each bar beneath shows the potential and percent of potential for each sub-objective below the objective being assessed.

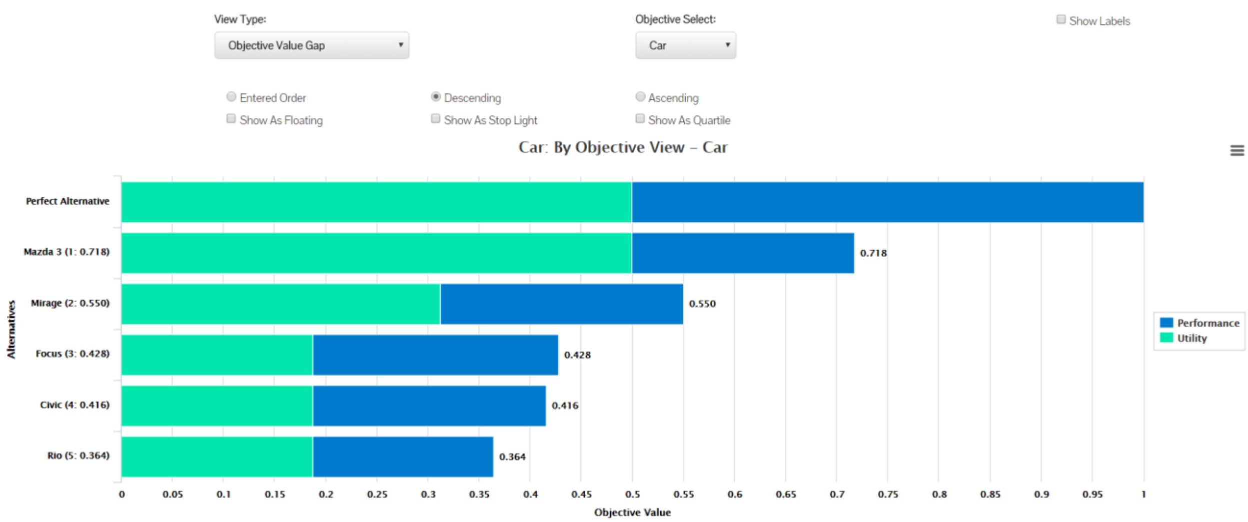


Figure 41. Evaluating the model by Objective Value Gap

The next analysis type is Tornado Diagram (Figure 42). Here you can select which alternative to analyze from the "Alternative Select" drop down menu. Once you've selected the alternative, you can view each metric’s potential value and percent of potential that has been realized.

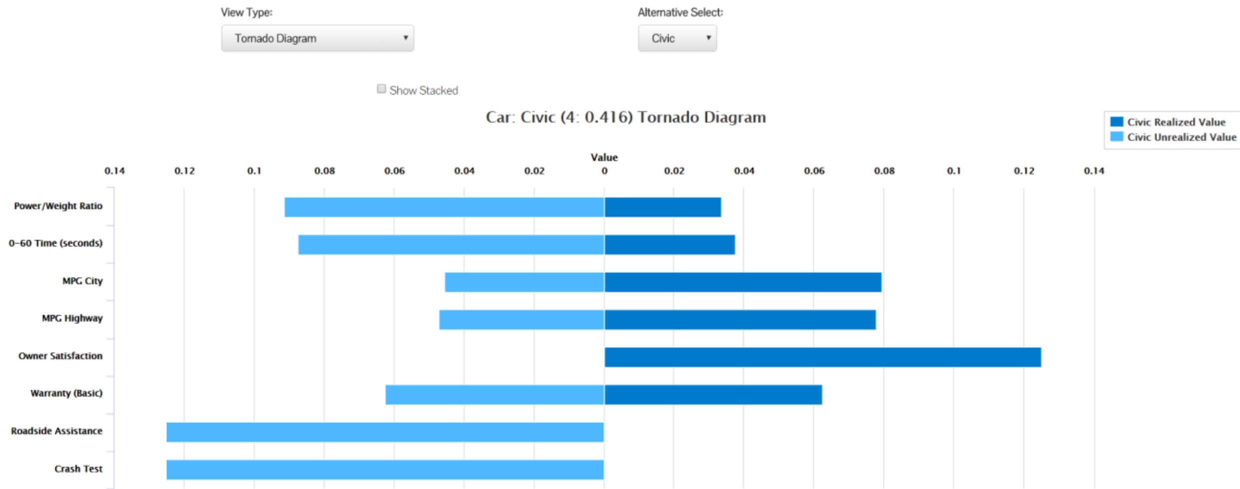


Figure 42. Evaluating the model by Tornado Diagram

Next, we will view the Alternative Radar Comparison chart (Figure 43). For this chart, we have switched models to show a more interesting result. In this instance, we are evaluating which bird to buy. As in the other charts, you can choose which objective to evaluate by selecting an objective from the "Objective Select" drop down menu at the top of the screen. In this case, we have chosen the top-most objective, called "1 Technology Innovation". The radar chart shows all valuations in all dimensions for selected alternatives simultaneously. To remove undesired alternatives, click on the legend to remove it from the chart.

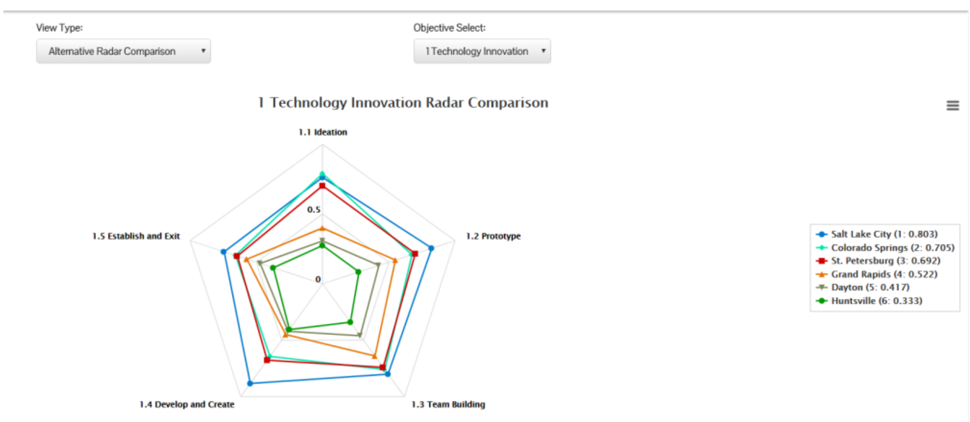


Figure 43. Evaluating the model using the Radar chart

In the next chart, we examine Cost Capability (Figure 44). Here, we see each of the different Alternatives represented by a different color and shape on the chart. Clicking the "Show Capability Thresholds" check box allows you to edit the thresholds you want to see on the chart (Figure 45). In this case, we can see that the Mazda and Mirage appears to have the best values and the Rio is near the red, and therefore has the worst value, in terms of cost capability.

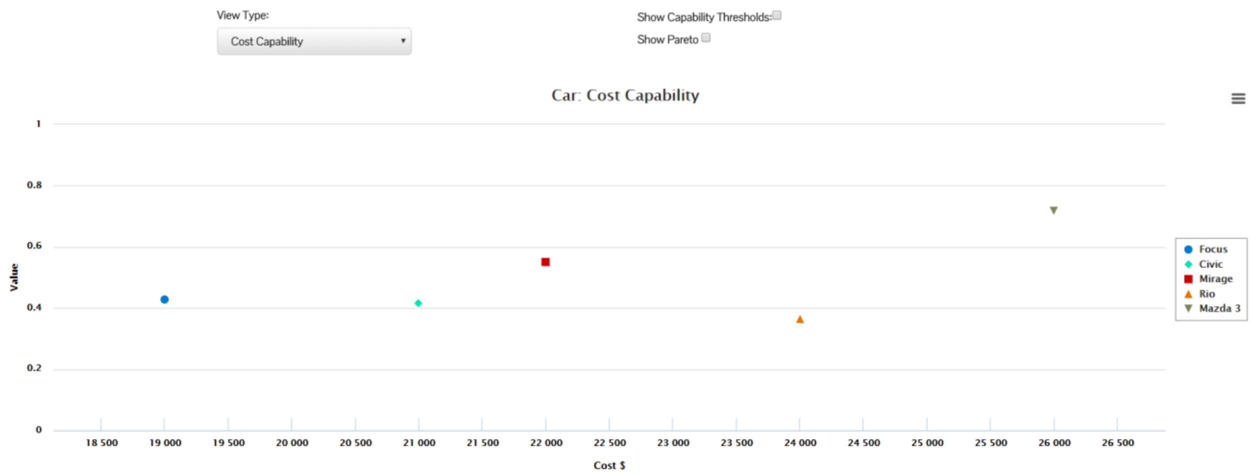


Figure 44. Evaluating the model using Cost Capability analysis

Figure 45. Evaluating cost capability using capability thresholds

The focus was still a strong contender being much less costly. We saw that both Focus and the Mirage performed well and are much cheaper than the Mazda. Let's now evaluate those two against one another in the Waterfall Alternative Comparison chart (Figure 46). This chart allows a quick comparison moving between two selected alternatives, displaying drops (red) and gains (green) in the relative measures.

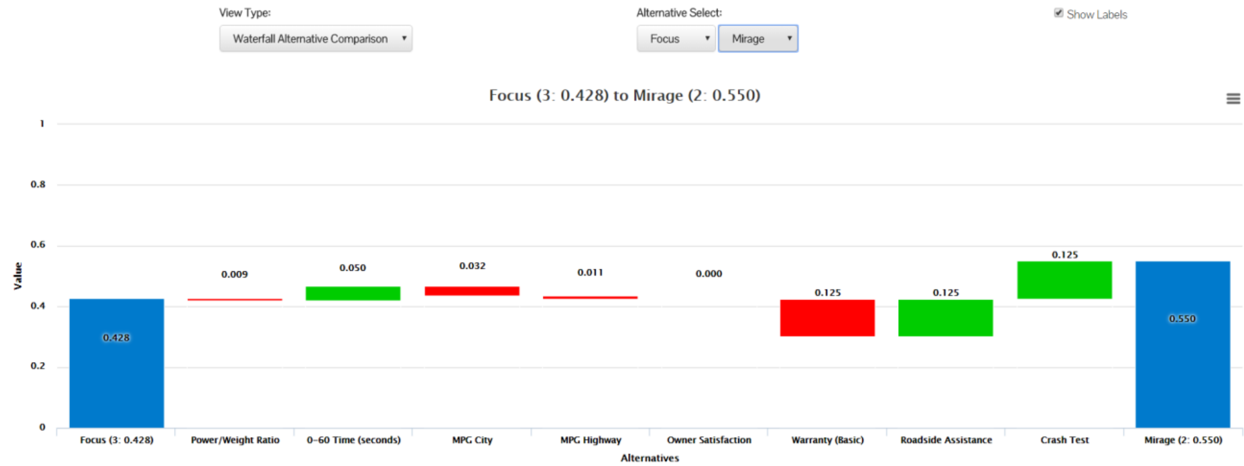


Figure 46. Evaluating the model using the Waterfall Alternative Comparison chart

Next, we will continue to compare the Focus and the Mirage in the Tornado Alternative Comparison chart (Figure 47). Here we see the Alternative Select options at the top of the screen, and have chosen the Focus and Mirage alternatives. The Y axis shows the different measures by which these alternatives are evaluated and the X axis shows the value.

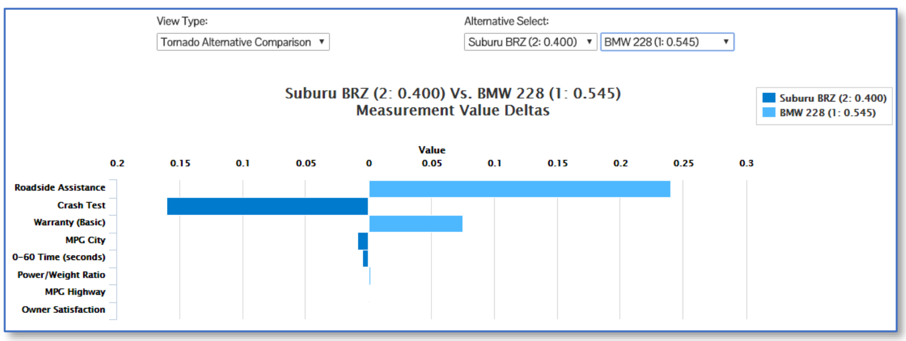


Figure 47. Evaluating the Model using the Tornado Alternative Comparison Chart

Now we can evaluate the sensitivity of each node locally through the Local Proportional Sensitivity chart (Figure 48). Here, we have chosen the Safety node from the "Objective Select" drop down menu. We see that the Mazda outperforms all other alternatives at the current weight, but if the local weight measurement were to increase, the Mirage starts to outperform all alternatives.

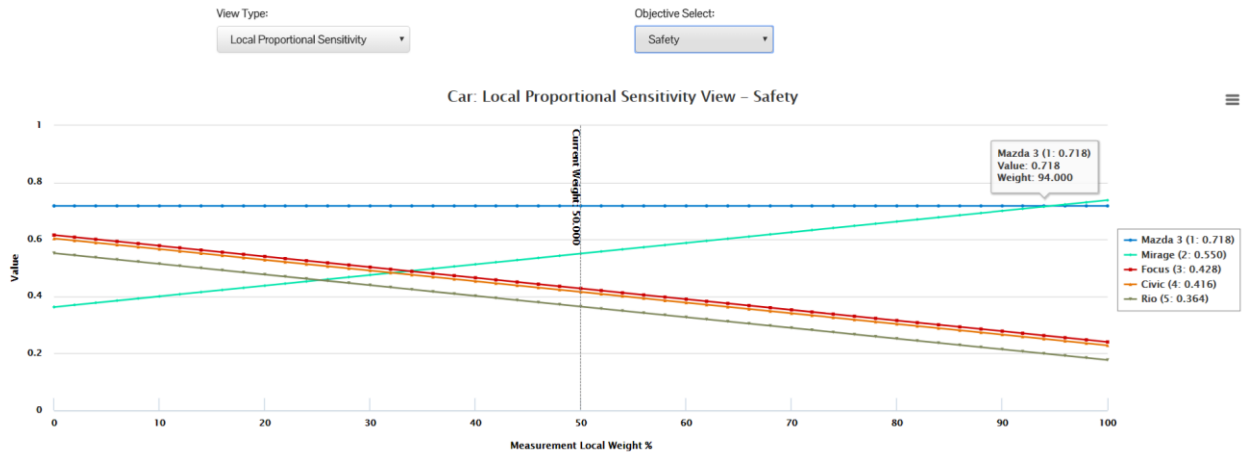


Figure 48. Evaluating local proportional sensitivity of the Crash Test node

We see a similar pattern when we look at the Global Proportional Sensitivity chart for the Owner Satisfaction node (Figure 49). Only this time, the Civic starts an upward trend quickly to ultimately tie with the Mazda. Note that in both the local and global proportional sensitivity charts, you can mouse over the chart to see the value for the weight your mouse pointer is hovering over.

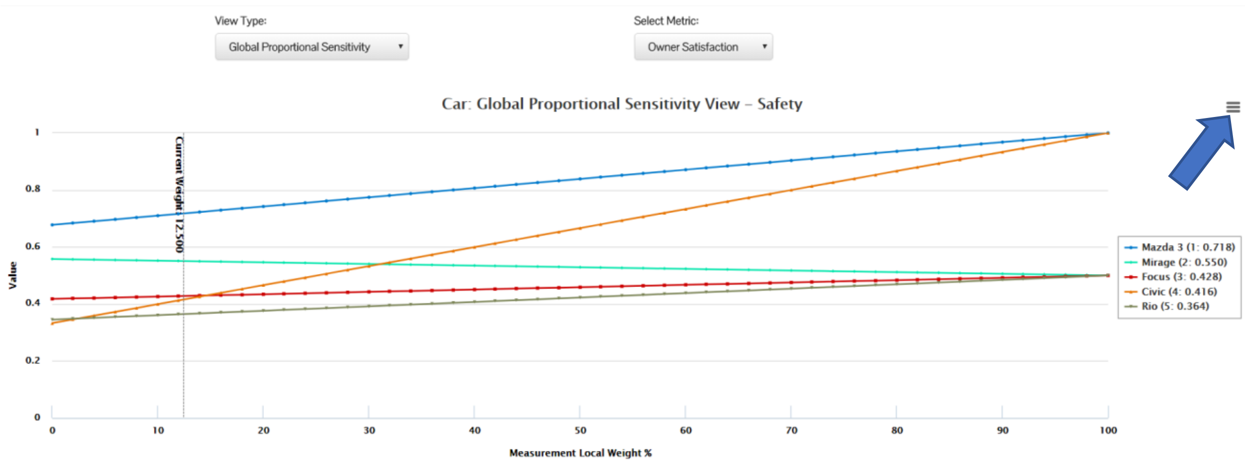


Figure 49. Evaluating the global proportional sensitivity of the Owner Satisfaction node

Exporting Charts

To export any given chart to PNG, JPEG, SVG, CSV, or XLS, simply click on the three lines in the upper right hand side of the graph and choose the file type from the drop down menu by clicking where the blue arrow is pointing to in Figure 50.

Loading and Deleting Saved Models

Once models are saved, either locally or publicly, you can load them from the "Saved Models" menu. Select "Saved Models" from the black ribbon at the top of the screen. Once this menu opens, you can either load or delete models by selecting "Load" or "Delete". (Figure 51)

Search:

Updated	Name	Description	Created By		
8/23/17 5:02:44 PM	SVT TOY PROBLEM (DEMO)	Demo problem to assist with portfolio planning	dave.ryer	Delete	Load
8/23/17 4:28:29 PM	Tech Incubators (Demo)	Valuation of Technology Innovation and Startup Ecosystem	brian.knotts	Delete	Load
8/17/17 8:19:59 PM	Tech Incubators (Demo)	Valuation of Technology Innovation and Startup Ecosystem	dave.ryer	Delete	Load
8/17/17 1:02:15 PM	Car (Demo)	A New Car Model to show off the changes	brandon.mills	Delete	Load
8/15/17 7:11:08 PM	Small Unmanned Aerial Vehicle (Demo)	sUAV Study - Ref: Parnell, Decision Management	Public	Delete	Load
8/15/17 5:09:44 PM	Bomber Radar (Demo)	Notional evaluation of radar upgrades	Public	Delete	Load

Figure 50. Load or delete saved models from the Saved Models screen

Public and Private Saved Models

When you save your model, you may choose to have it publicly available or keep it private. If a model is set to public, it is visible by anyone using the tool. If it is set to private, it is viewable only by the owner of the model. NOTE: Be sure you're logged in if you want to view your private models.

Search

Additionally, you may search for models using the search box in the upper right-hand corner of this screen (Figure 51).

Search:

Updated	Name	Description	Created By		
8/23/17 5:02:44 PM	SVT TOY PROBLEM (DEMO)	Demo problem to assist with portfolio planning	dave.ryer	Delete	Load
8/23/17 4:28:29 PM	Tech Incubators (Demo)	Valuation of Technology Innovation and Startup Ecosystem	brian.knotts	Delete	Load
8/17/17 8:19:59 PM	Tech Incubators (Demo)	Valuation of Technology Innovation and Startup Ecosystem	dave.ryer	Delete	Load
8/17/17 1:02:15 PM	Car (Demo)	A New Car Model to show off the changes	brandon.mills	Delete	Load
8/15/17 7:11:08 PM	Small Unmanned Aerial Vehicle (Demo)	sUAV Study - Ref: Parnell, Decision Management	Public	Delete	Load
8/15/17 5:09:44 PM	Bomber Radar (Demo)	Notional evaluation of radar upgrades	Public	Delete	Load

Figure 51. Searching Saved Models

Sort

By clicking on the headings in the gray ribbon at the top of the screen, you can sort the files - by Date, Name, Description, Creator. Simply click on the column header to sort. Click on it again to sort in the opposite order (A-Z then Z-A for instance).

References

Chambal, S. Weir, J., Kahraman, Y., Gutman, A., A Practical Procedure for Customizable One-Way Sensitivity Analysis in Additive Value Models. *Decision Analysis*, Decision Analysis 8 (4), 303-321, 2011.

Clemen, R., Making Hard Decisions: An Introduction to Decision Analysis, Second Edition, Duxbury Press, Belmont, California, 1996

Keeney, R., Value-Focused Thinking: A Path to Creative Decisionmaking, Harvard University Press, Cambridge, Massachusetts, 1992.Parnell. (n.d.). Understanding Decision Management. In *Decision Management* (p. Chapter 5).

Kirkwood, C. Strategic Decision Making, Duxbury Press, Belmont, California, 1997

Parnell, G. and Trainor, T., "Using the Swing Weight Matrix to Weight Multiple Objectives." *Proceedings of the INCOSE International Symposium, Singapore, July 19-23, 2009*.