Decision Making in a Complex Environment

Final Project By:

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Topic

Complex Decision Model to Determine where to Buy a Season Ski Pass

Summary

We decided to develop a complex decision model to determine where to buy a season ski pass, because it is something that many people ponder from ski season to ski season. We decided to focus on ski resorts within approximately a 200 mile radius of Pittsburgh, because any farther than that was determined to be too far to travel frequently enough for a season pass. We had seven alternatives in our model, four of which are some what local to the Pittsburgh area, and three of which are out of the area. We developed the criteria in which to compare each alternative to, researched the alternatives, and developed the model. The model is described in further detail below.

Alternatives

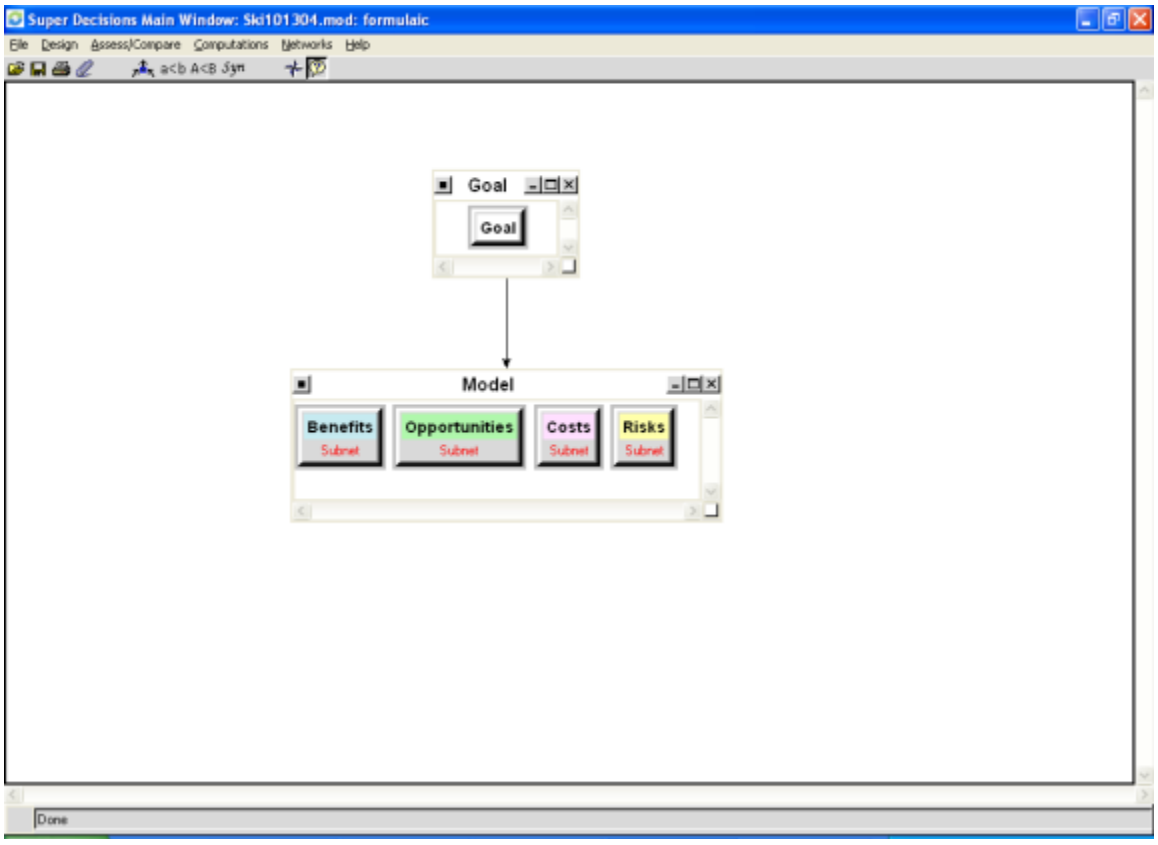
The seven ski resorts we chose as our alternatives include Blue Know, Canaan Valley, Hidden Valley, Peak 'N Peak, Seven Springs, Snow Shoe, and Wisp. As a group, we have been to all but one of the resorts, so between our own personal experiences and all of the research done by the team, mostly on the Internet, we felt that we had substantial knowledge to build a successful model. They have many similarities, as well as differences, so we decided to build a complex model to rank and prioritize each alternative according to criteria that our team decided was most useful in determining where to purchase a season ski pass for the upcoming 2004 ski season. As skiers, we felt that we had a good understanding of what a consumer would look for in a ski resort.

Criteria

The criteria we decided to use in our model included factors pertaining to the quality of the skiing at the resorts along with other available amenities. Examples of such criteria include the number of slopes, the number of ski lifts, the types of slopes, the lift capacity, and whether they offered other items such as a snowboard park, night skiing, and tubing. Besides for looking at the benefits and opportunities of each ski resort, we also had to look at the costs and risks associated with each ski resort. Some of the costs are monetary, such as the price of the season ski pass. Other costs some were also based on time, such as the distance to travel to each of the ski resorts. We compared each positive and negative criterion in our model to each alternative, and then rated and prioritized each to determine our result.

Model – Top Level

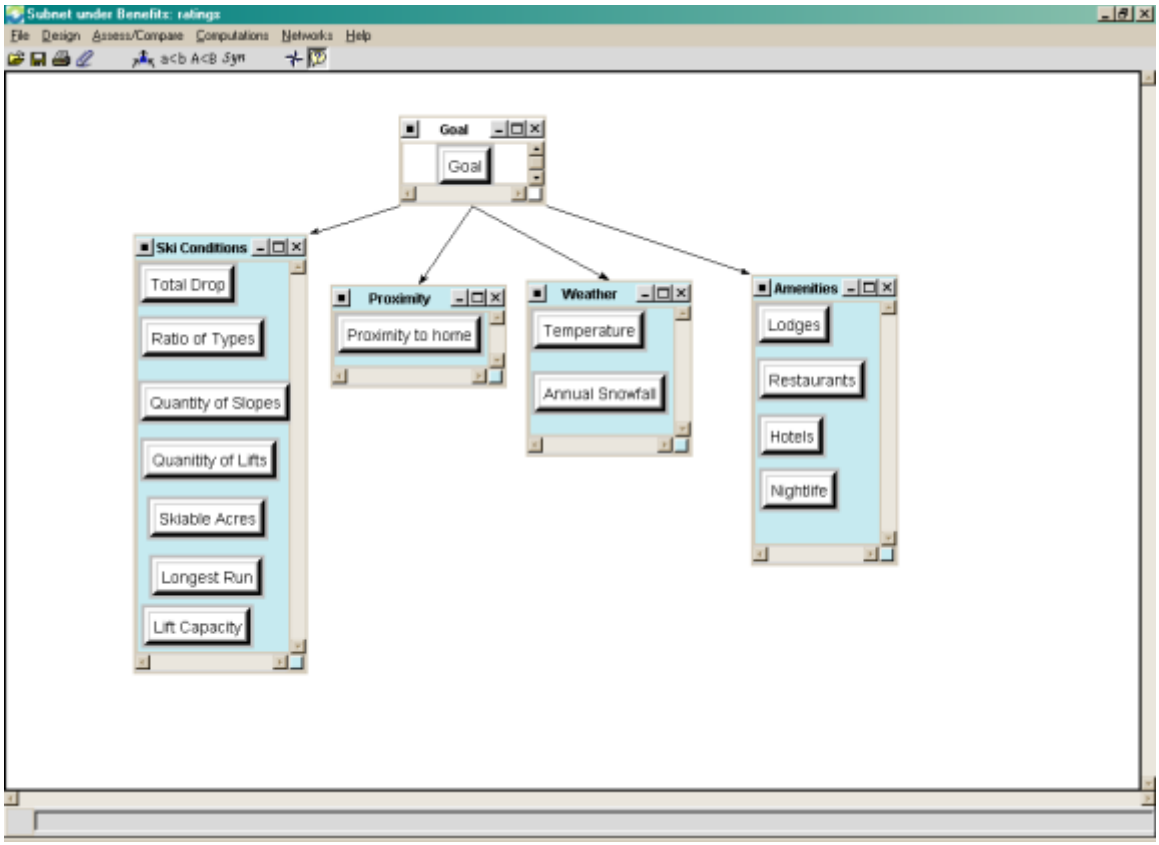
The complex model our team developed included one overall goal, to determine where to purchase a season ski pass, and four subnet networks. The four subnets include Benefits, Opportunities, Costs, and Risks. The top level of the model appears as follows:



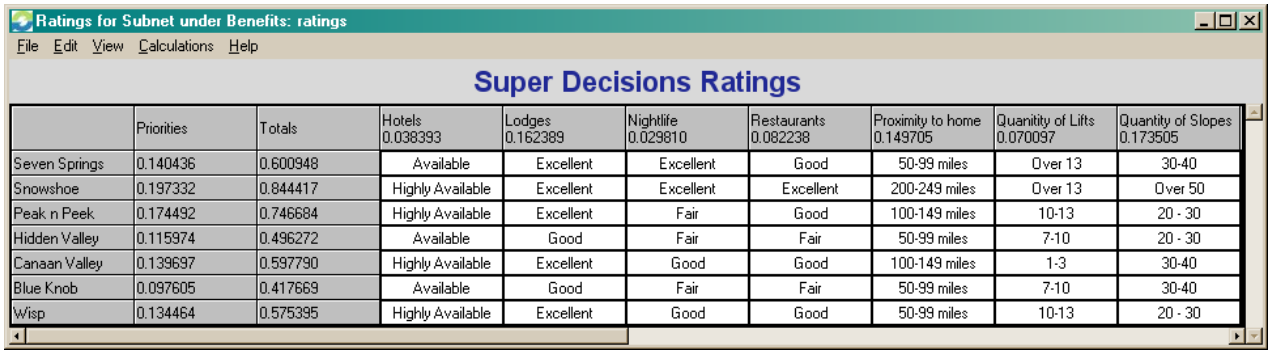
We can look at each of the subnets individually to determine the criteria used within each.

Model – Benefits Subnet

The Benefits subnet includes all of the features that we would look for in a ski resort. The clusters included under Benefits include Ski Conditions, Proximity, Weather, and Amenities. Each cluster contains nodes that we decided to rate the ski resorts with. The Benefits subnet appears as follows:



The ratings of the nodes appear as follows:

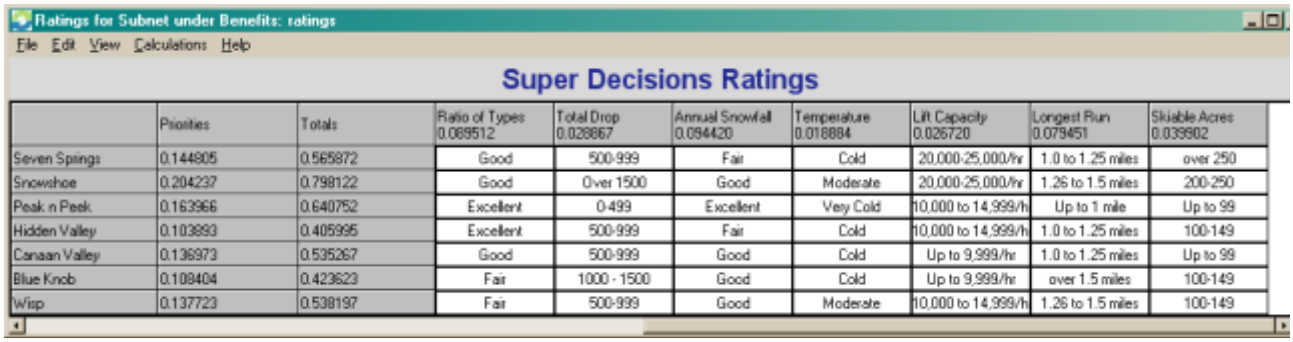


Ratings for Subnet under Benefits: ratings

File Edit View Calculations Help

Super Decisions Ratings

	Priorities	Totals	Hotels 0.038393	Lodges 0.162389	Nightlife 0.029810	Restaurants 0.082238	Proximity to home 0.149705	Quanitity of Lifts 0.070097	Quantity of Slopes 0.173505
Seven Springs	0.140436	0.600948	Available	Excellent	Excellent	Good	50-99 miles	Over 13	30-40
Snowshoe	0.197332	0.844417	Highly Available	Excellent	Excellent	Excellent	200-249 miles	Over 13	Over 50
Peak n Peek	0.174492	0.746684	Highly Available	Excellent	Fair	Good	100-149 miles	10-13	20 - 30
Hidden Valley	0.115974	0.496272	Available	Good	Fair	Fair	50-99 miles	7-10	20 - 30
Canaan Valley	0.139697	0.597790	Highly Available	Excellent	Good	Good	100-149 miles	1-3	30-40
Blue Knob	0.097605	0.417669	Available	Good	Fair	Fair	50-99 miles	7-10	30-40
Wisp	0.134464	0.575395	Highly Available	Excellent	Good	Good	50-99 miles	10-13	20 - 30



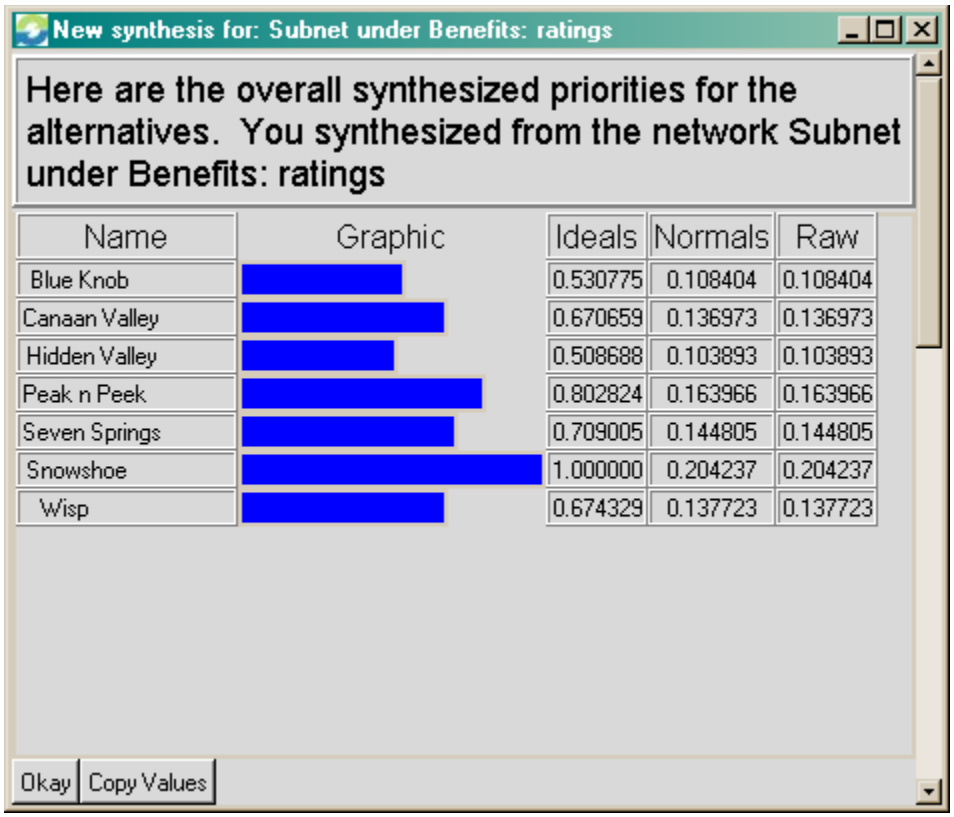
Ratings for Subnet under Benefits: ratings

File Edit View Calculations Help

Super Decisions Ratings

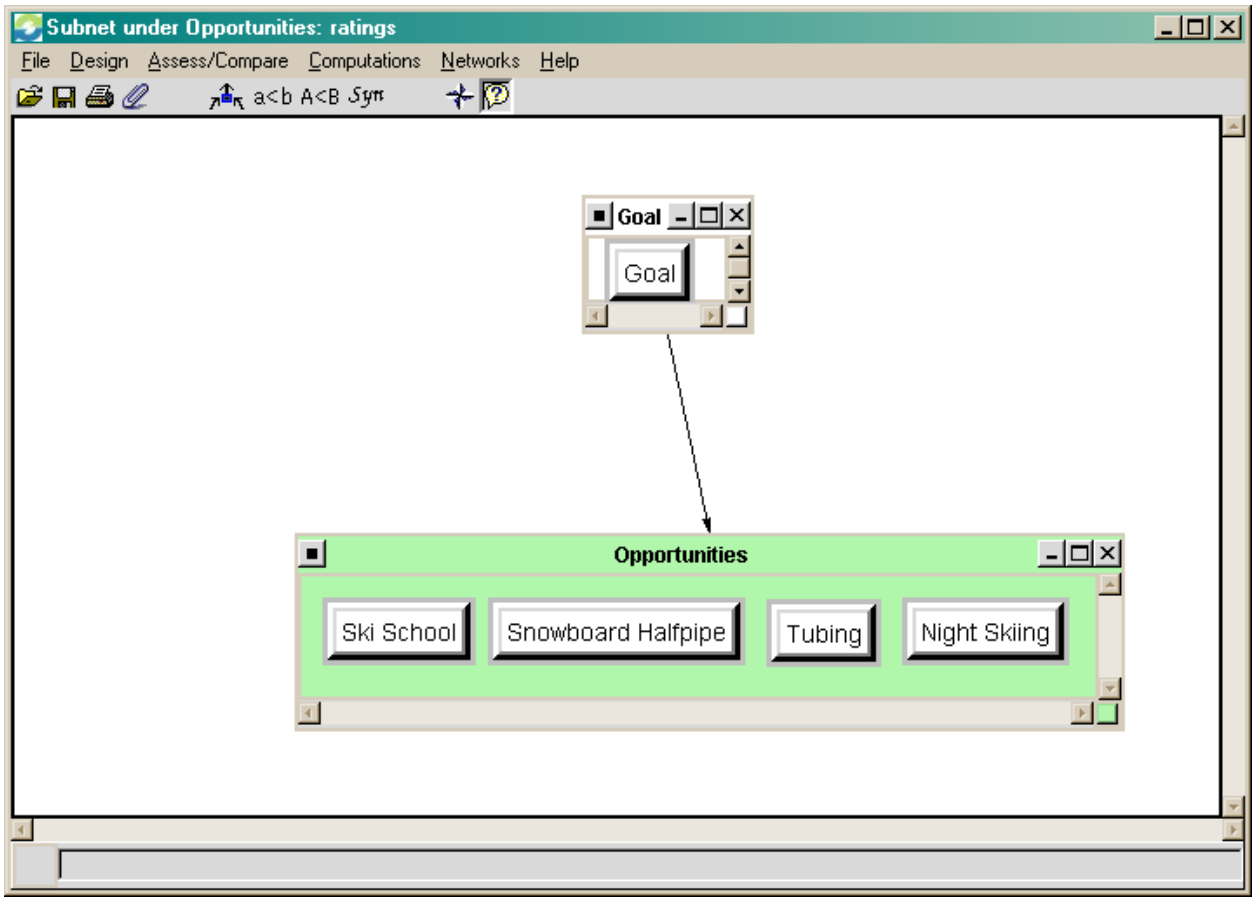
	Priorities	Totals	Ratio of Types 0.089512	Total Drop 0.028867	Annual Snowfall 0.094420	Temperature 0.018884	Lift Capacity 0.026720	Longest Run 0.079451	Skiable Acres 0.039902
Seven Springs	0.144805	0.565872	Good	500-999	Fair	Cold	20,000-25,000/hr	1.0 to 1.25 miles	over 250
Snowshoe	0.204237	0.798122	Good	Over 1500	Good	Moderate	20,000-25,000/hr	1.26 to 1.5 miles	200-250
Peak n Peek	0.163966	0.640752	Excellent	0-499	Excellent	Very Cold	10,000 to 14,999/h	Up to 1 mile	Up to 99
Hidden Valley	0.103893	0.405995	Excellent	500-999	Fair	Cold	10,000 to 14,999/h	1.0 to 1.25 miles	100-149
Canaan Valley	0.136973	0.535267	Good	500-999	Good	Cold	Up to 9,999/hr	1.0 to 1.25 miles	Up to 99
Blue Knob	0.108404	0.423623	Fair	1000 - 1500	Good	Cold	Up to 9,999/hr	over 1.5 miles	100-149
Wisp	0.137723	0.538197	Fair	500-999	Good	Moderate	10,000 to 14,999/h	1.26 to 1.5 miles	100-149

By synthesizing the Benefits subnet we determined that Snowshoe has the greatest benefit, but by a very slim margin, closely followed by Peak n Peek, Hidden Valley and Seven Springs. The synthesis appears as follows:



Model – Opportunities Subnet

We found that there were less opportunities than there were benefits, but they were still of great importance. The Opportunities subnet includes things such as a ski school, snow boarding, tubing, and night skiing. The Opportunities subnet appears as follows:



The ratings of the nodes appear as follows:

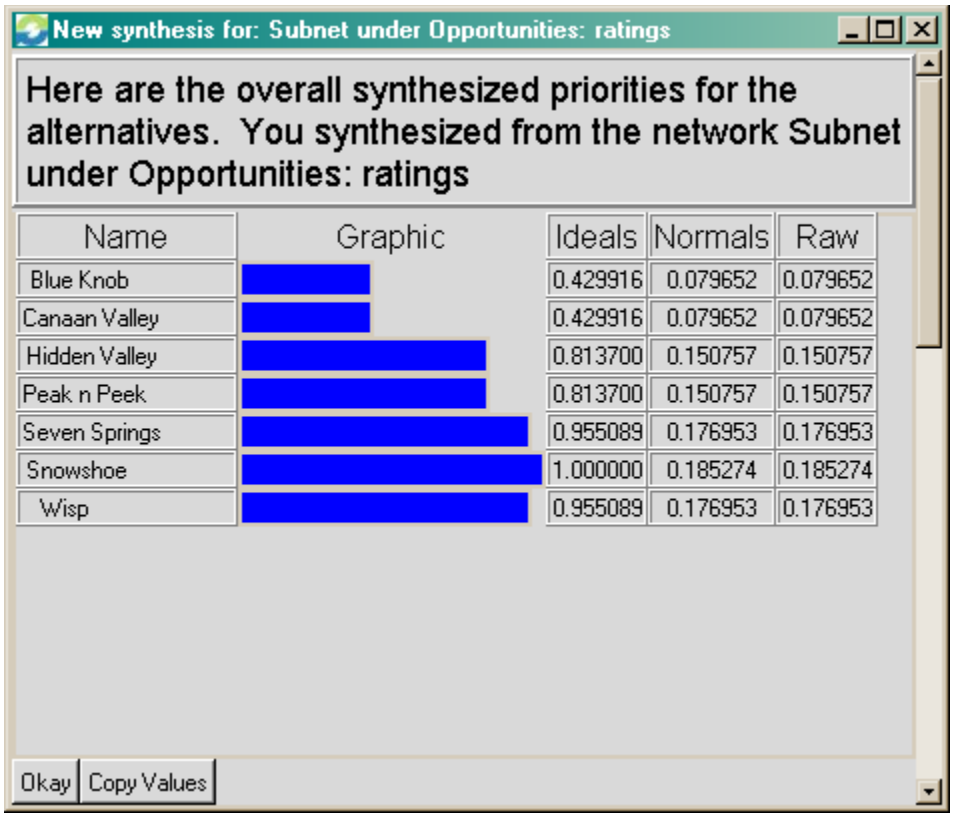
Ratings for Subnet under Opportunities: ratings

File Edit View Calculations Help

Super Decisions Ratings

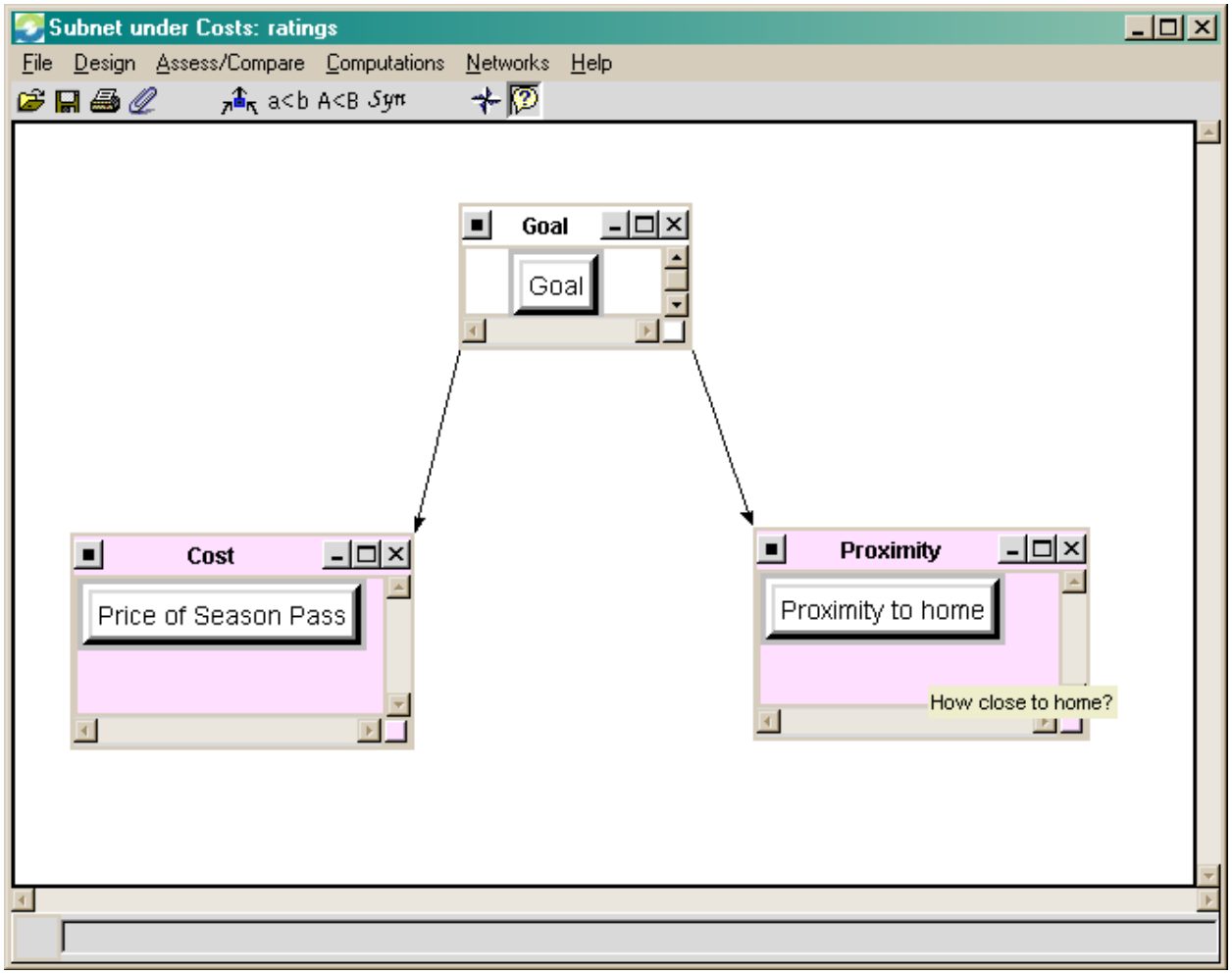
	Priorities	Totals	Ski School 0.272241	Snowboard Halfpip 0.081679	Tubing 0.165963	Night Skiing 0.480117
Seven Springs	0.176953	0.838141	Better	Yes	Yes	90-100%
Snowshoe	0.185274	0.877553	Best	Yes	Yes	70-79%
Peak n Peek	0.150758	0.714065	Better	Yes	Yes	80-89%
Hidden Valley	0.150758	0.714065	Better	Yes	Yes	80-89%
Canaan Valley	0.079652	0.377274	Better	No	Yes	Less than 50%
Blue Knob	0.079652	0.377274	Better	No	Yes	Less than 50%
Wisp	0.176953	0.838141	Better	Yes	Yes	90-100%

By synthesizing the Opportunities subnet we determined that Snowshoe has the greatest opportunities, again by a very slim margin. The synthesis appears as follows:

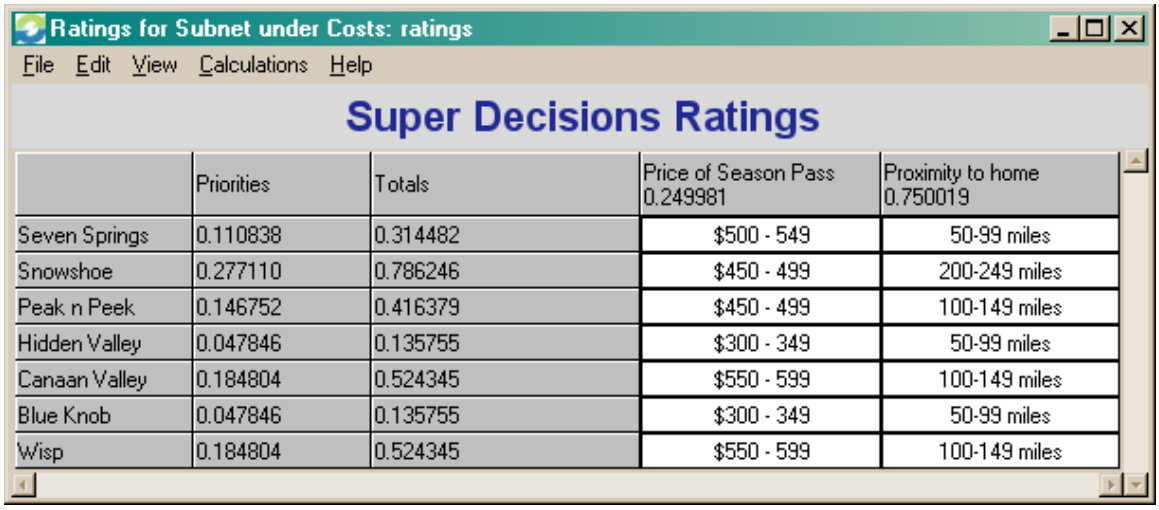


Model – Costs Subnet

We found that there were two main costs associated with the purchase of a season ski pass. They were the price of the pass, and the proximity of the ski resort from home, so the distance to travel to the ski resorts was built in to the costs. The Costs subnet appears as follows:

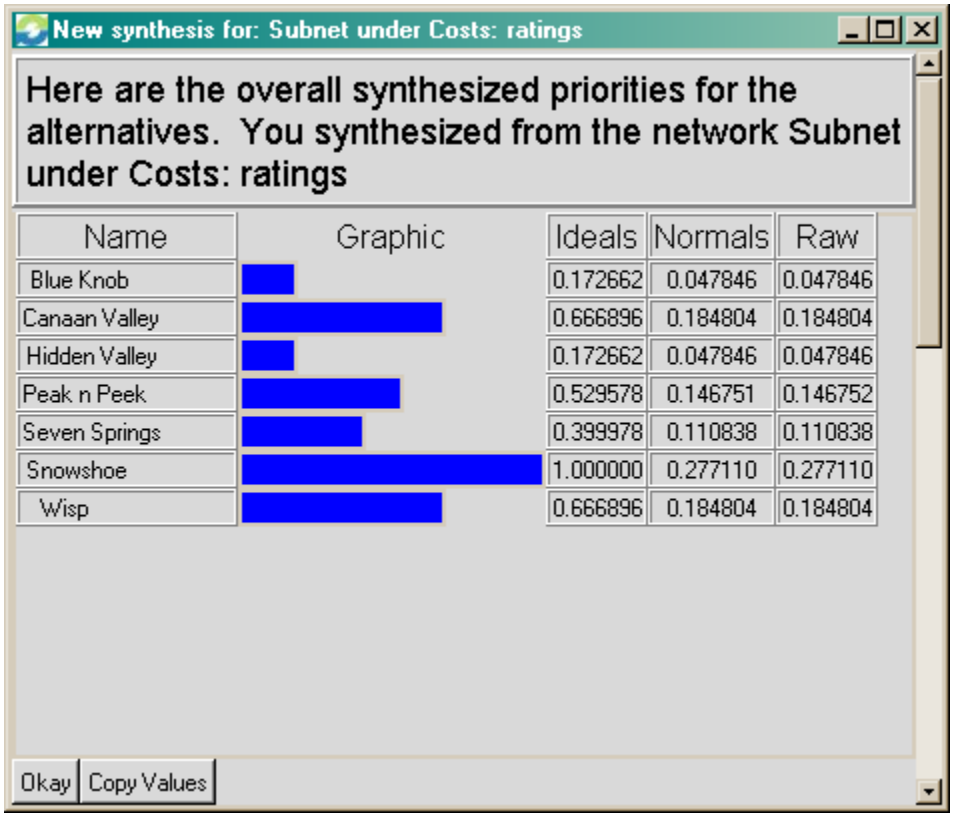


The ratings of the nodes appear as follows:

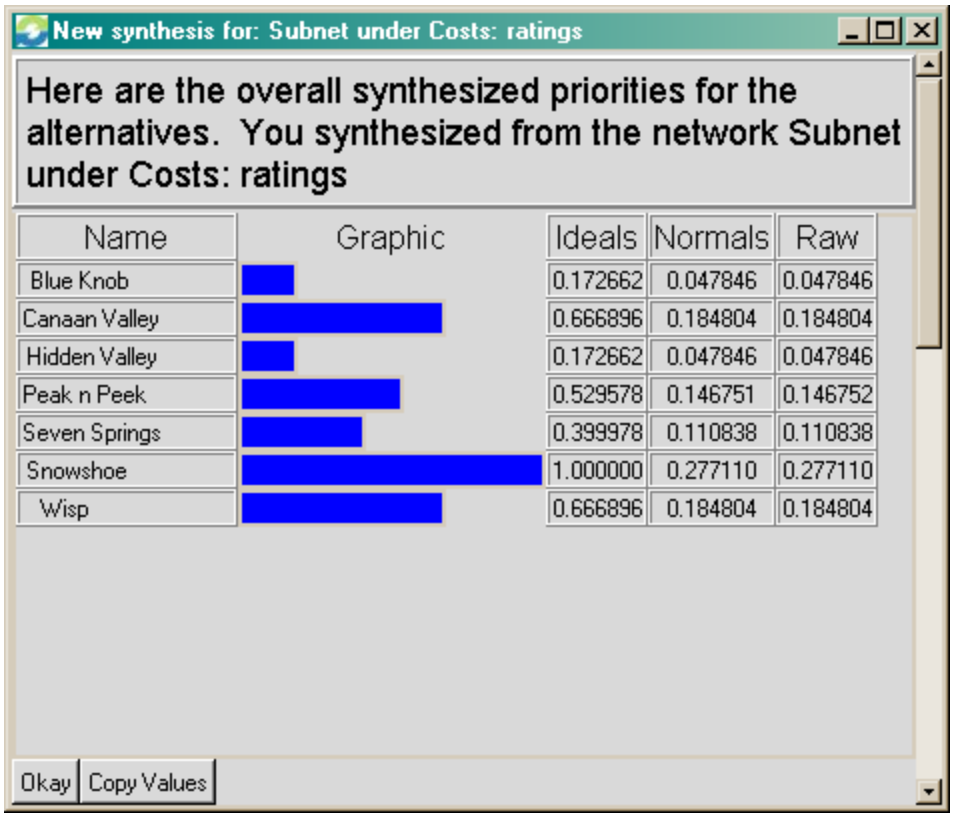


	Priorities	Totals	Price of Season Pass 0.249981	Proximity to home 0.750019
Seven Springs	0.110838	0.314482	$500 - 549	50-99 miles
Snowshoe	0.277110	0.786246	$450 - 499	200-249 miles
Peak n Peek	0.146752	0.416379	$450 - 499	100-149 miles
Hidden Valley	0.047846	0.135755	$300 - 349	50-99 miles
Canaan Valley	0.184804	0.524345	$550 - 599	100-149 miles
Blue Knob	0.047846	0.135755	$300 - 349	50-99 miles
Wisp	0.184804	0.524345	$550 - 599	100-149 miles

By synthesizing the Costs subnet we determined that Snowshoe has the greatest cost, followed closely by a tie between Canaan Valley and Wisp. The synthesis appears as follows:

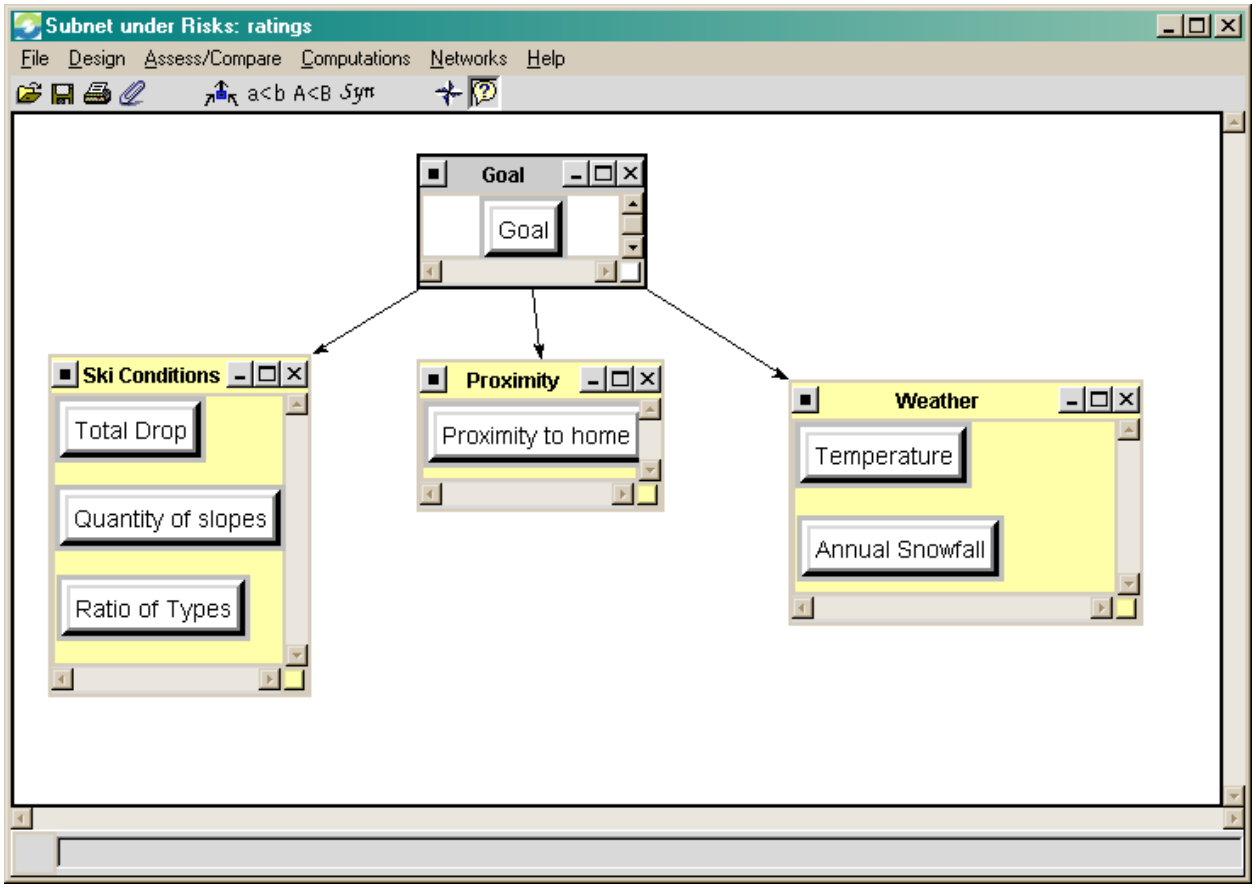


Name	Graphic	Ideals	Normals	Raw
Blue Knob		0.172662	0.047846	0.047846
Canaan Valley		0.666896	0.184804	0.184804
Hidden Valley		0.172662	0.047846	0.047846
Peak n Peek		0.529578	0.146751	0.146752
Seven Springs		0.399978	0.110838	0.110838
Snowshoe		1.000000	0.277110	0.277110
Wisp		0.666896	0.184804	0.184804


New synthesis for: Subnet under Costs: ratings
Here are the overall synthesized priorities for the alternatives. You synthesized from the network Subnet under Costs: ratings
Name
Graphic
Ideals
Normals
Raw
Blue Knob
0.172662
0.047846
0.047846
Canaan Valley
0.666896
0.184804
0.184804
Hidden Valley
0.172662
0.047846
0.047846
Peak n Peek
0.529578
0.146751
0.146752
Seven Springs
0.399978
0.110838
0.110838
Snowshoe
1.000000
0.277110
0.277110
Wisp
0.666896
0.184804
0.184804
Okay
Copy Values

Model – Risks Subnet

We found that there were three main areas of risk that we separated into individual clusters. They were ski conditions, proximity, and weather. The Risks subnet appears as follows:



The ratings of the nodes appear as follows:

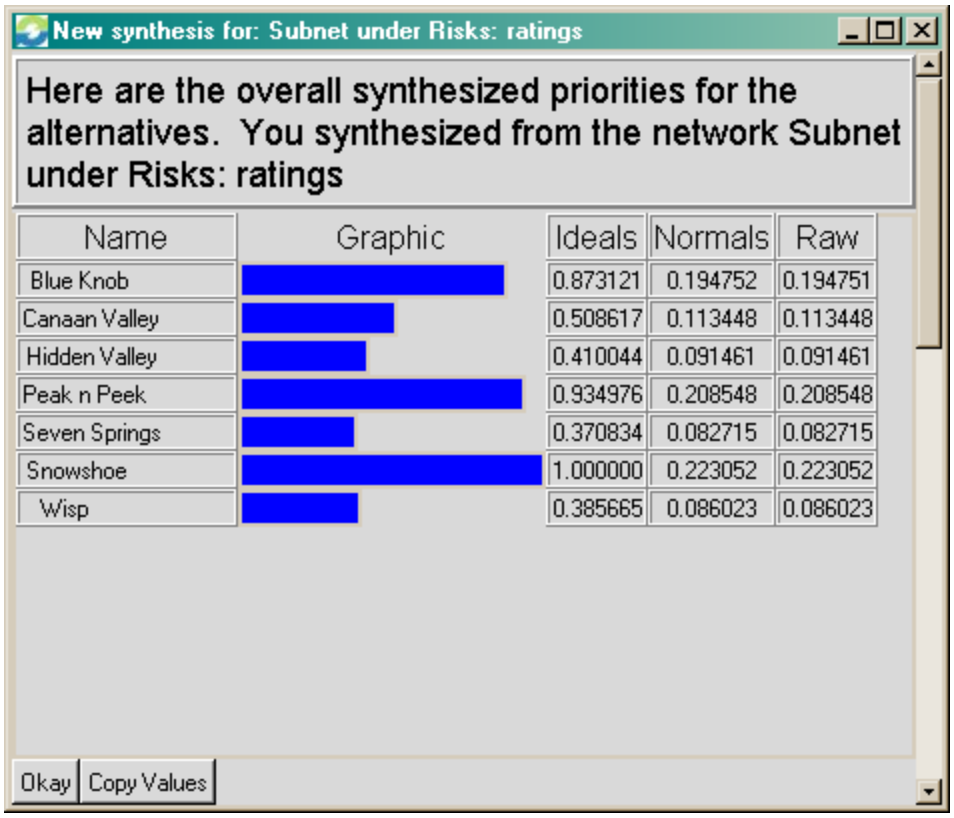
Ratings for Subnet under Risks: ratings

File Edit View Calculations Help

Super Decisions Ratings

	Priorities	Totals	Proximity to home 0.163417	Ratio of Types 0.049057	Total Drop 0.245284	Annual Snowfall 0.197972	Temperature 0.098986	Quantity of slopes 0.245284
Seven Springs	0.082715	0.180515	50-99 miles	Easy	Moderate	Light	Cold	30-40
Snowshoe	0.223052	0.486780	200-249 miles	Moderate	High	Moderate	Moderate	Over 50
Hidden Valley	0.091461	0.199601	50-99 miles	Difficult	Low	Light	Cold	20-30
Peak n Peek	0.208548	0.455128	100-149 miles	Moderate	Low	Heavy	Very cold	20-30
Canaan Valley	0.113448	0.247585	100-149 miles	Moderate	Moderate	Moderate	Moderate	30-40
Blue Knob	0.194751	0.425018	50-99 miles	Difficult	High	Moderate	Cold	30-40
Wisp	0.086023	0.187734	50-99 miles	Moderate	Low	Moderate	Moderate	20-30

By synthesizing the Risks subnet we determined that Snowshoe has the greatest risk, because of the high vertical drop and the number of difficult slopes. The synthesis appears as follows:


New synthesis for: Subnet under Risks: ratings
Here are the overall synthesized priorities for the alternatives. You synthesized from the network Subnet under Risks: ratings
Name
Graphic
Ideals
Normals
Raw
Blue Knob
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0.194752
0.194751
Canaan Valley
0.508617
0.113448
0.113448
Hidden Valley
0.410044
0.091461
0.091461
Peak n Peek
0.934976
0.208548
0.208548
Seven Springs
0.370834
0.082715
0.082715
Snowshoe
1.000000
0.223052
0.223052
Wisp
0.385665
0.086023
0.086023
Okay
Copy Values

Sensitivity Analysis

Lastly we conducted a Sensitivity Analysis for each subnet. The BOCR nodes had their priorities determined outside this model (by rating them against Strategic Criteria in the usual way that is done for complex BOCR models). The values for the BOCR nodes were directly input into the model by comparing them with respect to the Goal and using direct data input. These priorities are shown below:

Benefits:	47.7
Costs:	15.4
Opportunities:	28.8
Risks:	8.1

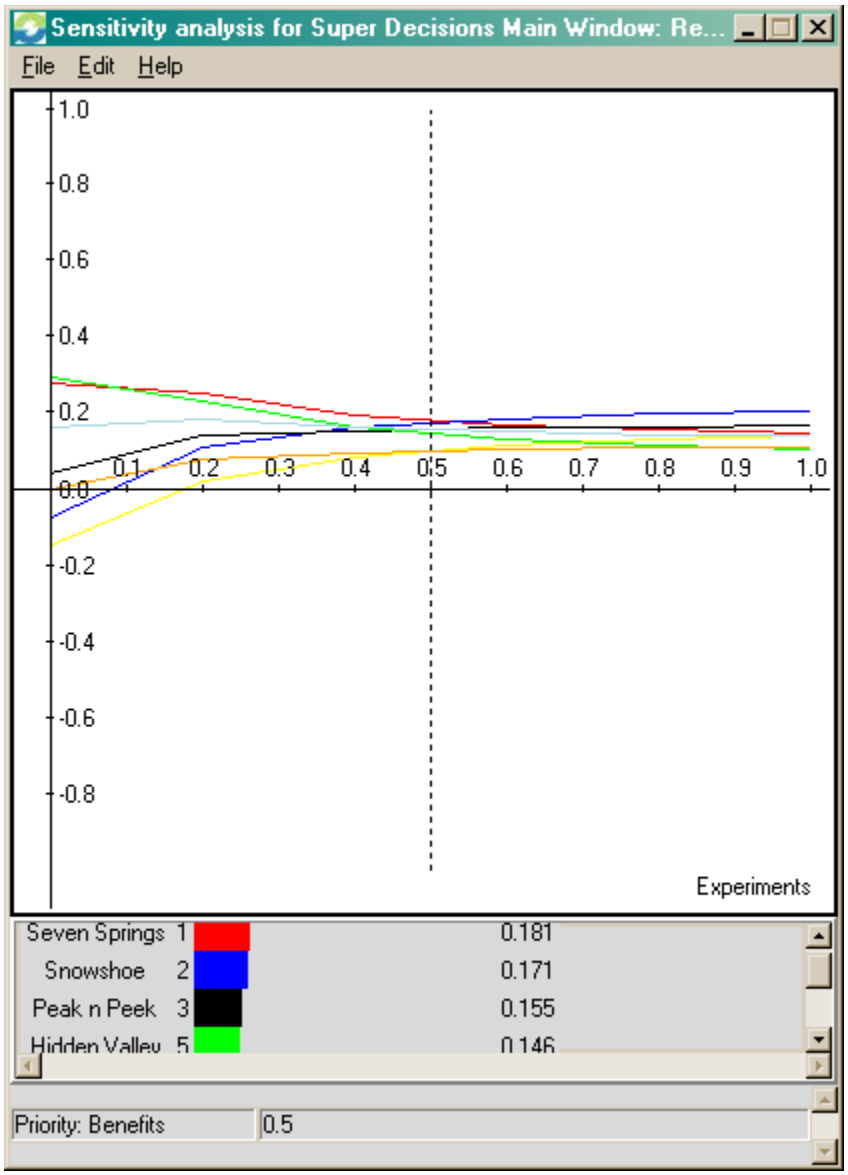
These priorities are used to weight the outcomes in the BOCR subnets and combine them. The Additive(negative) formula was used:

$bB + oO - cC - rR$

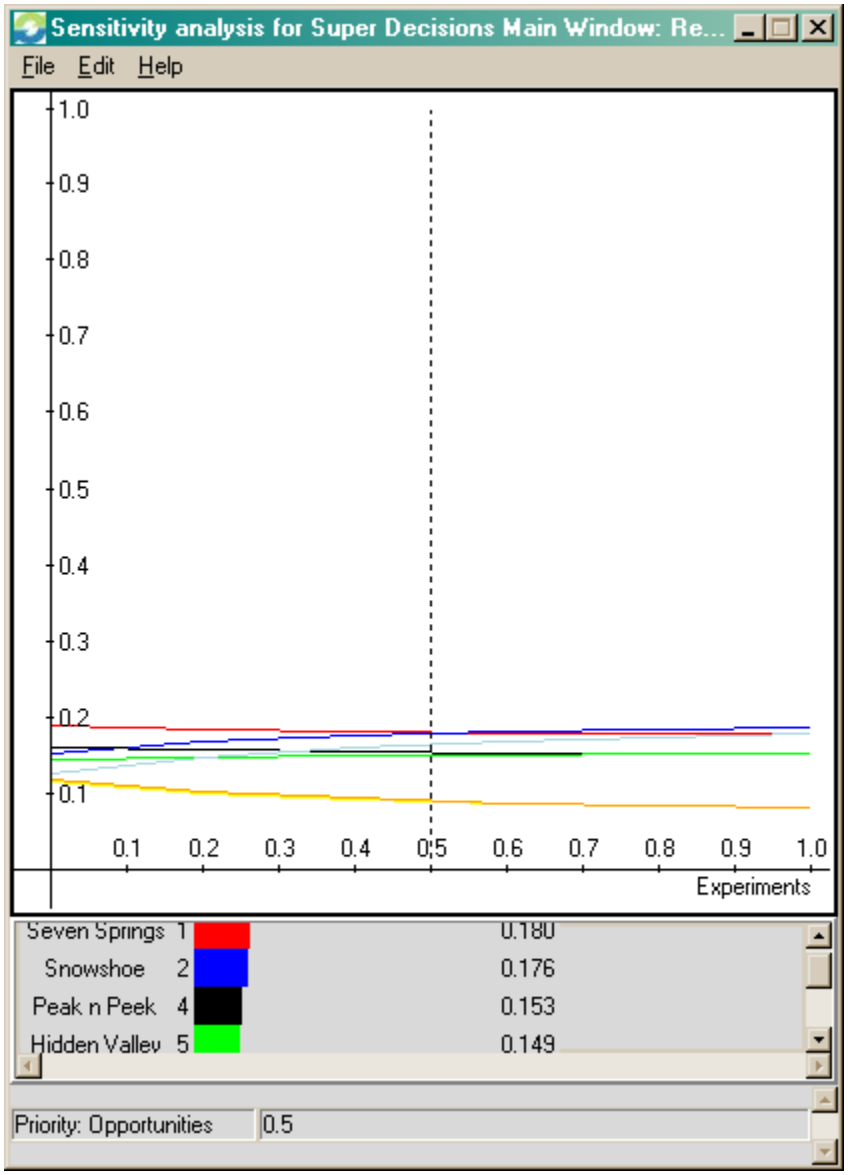
in which b, o, c and r are the priorities of the Benefits, Opportunities, Costs and Risks nodes in the top-level subnet and B, O, C and R are the vectors of outcomes in the respective subnets.

The formula above makes it possible to do sensitivity analysis by varying the priorities from 0 to 1 for one of the parameters, for example, b, while proportionately adjusting the priorities of the other three parameters

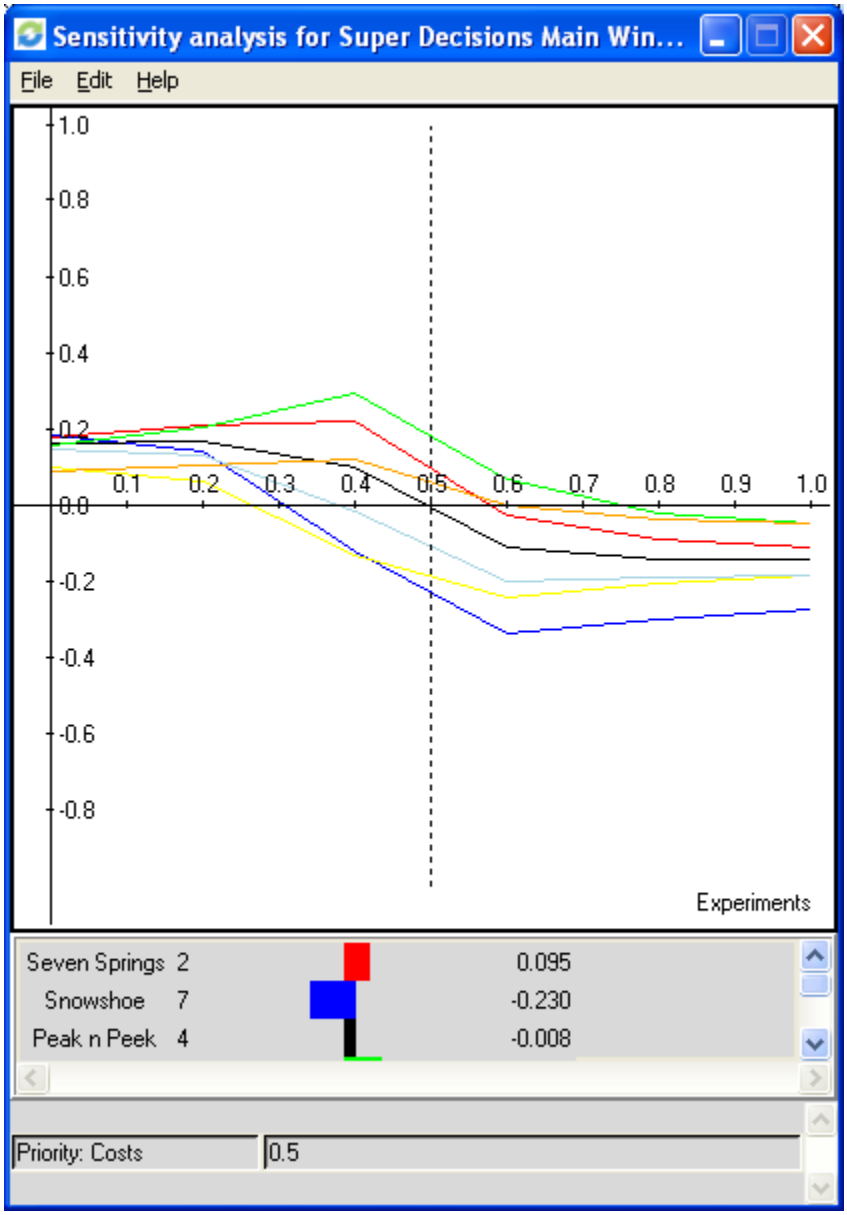
The analysis below for Benefits shows that when the priority of Benefits is less than 50% Seven Springs (red line) is the preferred choice and when Benefits is less than about 10% of the concern, Hidden Valley is best. The more the emphasis placed on Benefits, the more Snowshoe (blue line) becomes the best choice.



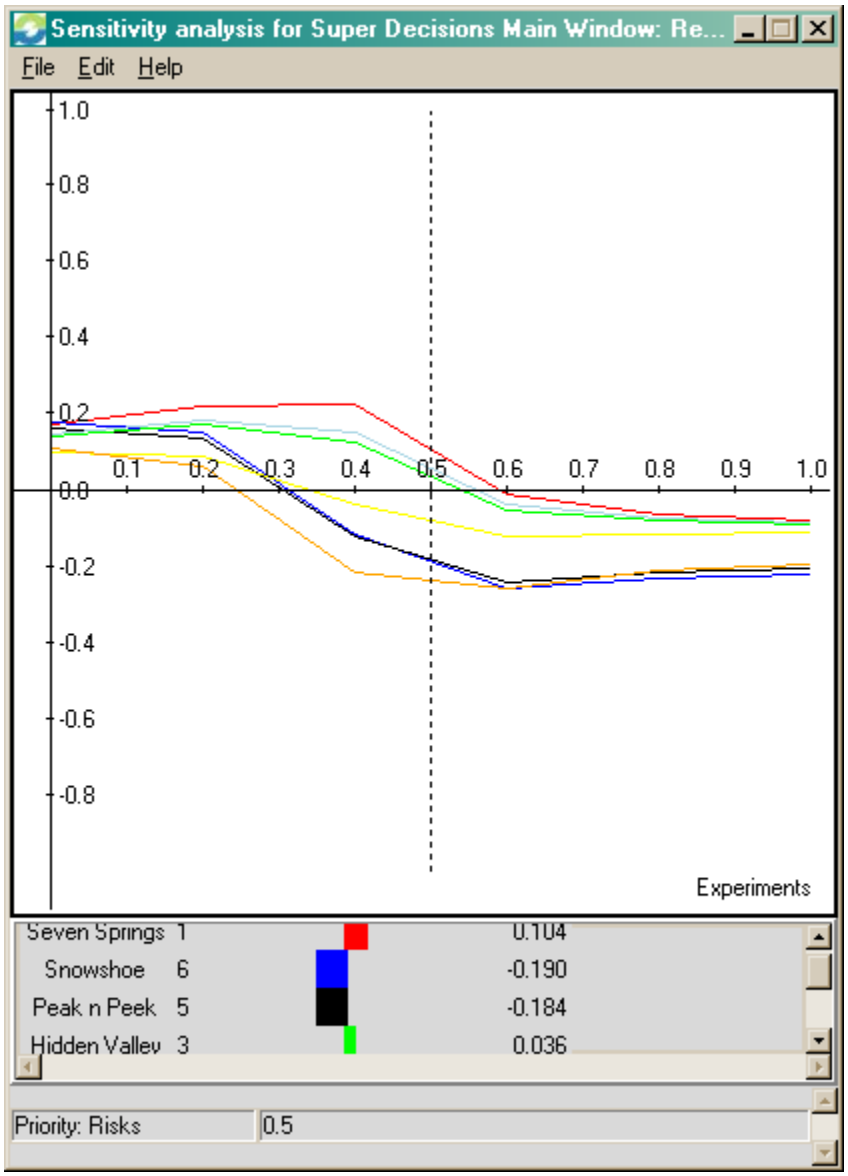
The analysis for Opportunities shows that Seven Springs and Snowshoe are pretty close, but Seven Springs is best when the priority of Opportunities is less than about 50%. The sensitivity graph for Opportunities is as follows:



For Costs the sensitivity analysis shows that Hidden Valley has a clear advantage as follows:



The sensitivity analysis for Risks shows that Seven Springs for all priorities for risk is the best choice and the least risky:



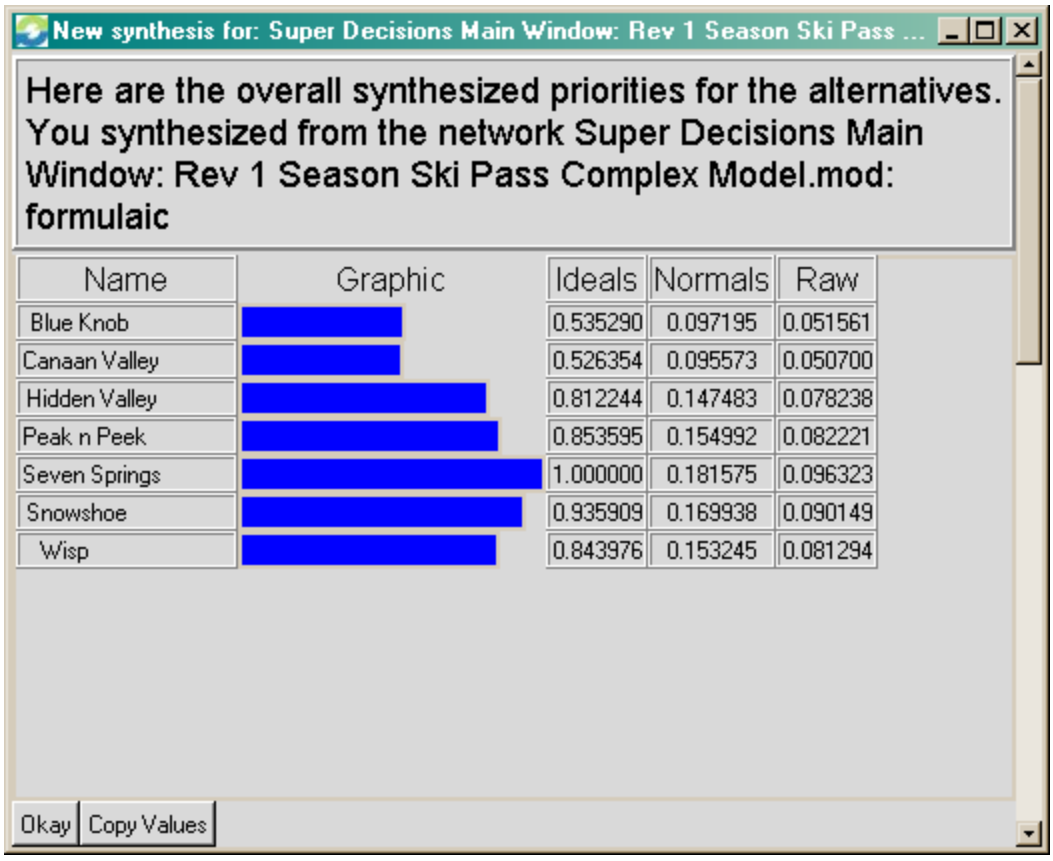
Results

Before beginning our model, each team member submitted a guess as to what they believed would be the top three choices of where to purchase a season ski pass. The results from those guesses, along with the actual results, appear below:

Ski Resort	Team Member Guesses			Actual Results	
	Jeff Senchak	Jeremy Sottile	Regan Thompson		
Blue Knob					9.72%
Canaan Valley					9.56%
Hidden Valley	3	2	2		14.74%
Peek 'N Peak			3	(3)	15.50%
Seven Springs	1	1	1	(1)	18.16%
Snowshoe	2	3		(2)	16.99%
Wisp					15.32%

The overall synthesis is shown in the following figure. This is the final result after applying the Additive (negative formula) to combine the subnet results. The percentages in the Actual Results column above are extracted from the Normals column.

In analyzing why Hidden Valley was not one of the top three choices, even though all the participants guessed it would be, shows that perhaps they underestimated the priority of Costs at 15.4% . The Costs sensitivity graph shows that Hidden Valley is the best choice once Costs are more than 15.4% of the concern.


New synthesis for: Super Decisions Main Window: Rev 1 Season Ski Pass ...
Here are the overall synthesized priorities for the alternatives. You synthesized from the network Super Decisions Main Window: Rev 1 Season Ski Pass Complex Model.mod: formulaic
Name
Graphic
Ideals
Normals
Raw
Blue Knob
0.535290
0.097195
0.051561
Canaan Valley
0.526354
0.095573
0.050700
Hidden Valley
0.812244
0.147483
0.078238
Peak n Peek
0.853595
0.154992
0.082221
Seven Springs
1.000000
0.181575
0.096323
Snowshoe
0.935909
0.169938
0.090149
Wisp
0.843976
0.153245
0.081294
Okay
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