FRANCISCO RODA
TAIS ABREU

CIMAL/IMR New Facility Location

Topic: Decision on a new facility Location for a Furniture Company (RODA GROUP)

Background: Cimal/IMR is part of the RODA Group, located in Bolivia since 1960, producing furniture to export mainly to Europe. Some of its current customers include Lowe's, Tyndall Creek and Smith and Hawken in the US. B&Q in the UK and Carrefour and Leroy Merlin in France.

Bolivia is living a political crisis, which has forced the President to resign, and elections are to be held in 6 months. The political instability along with the continuous roadblocks has forced the company to look for alternatives. Along with these factors there are several incentives that are being considered.

The company would like to analyze the best option to locate its factory in order to achieve better-cost efficiency, lower risks, long-term sustainability and better customer satisfaction.

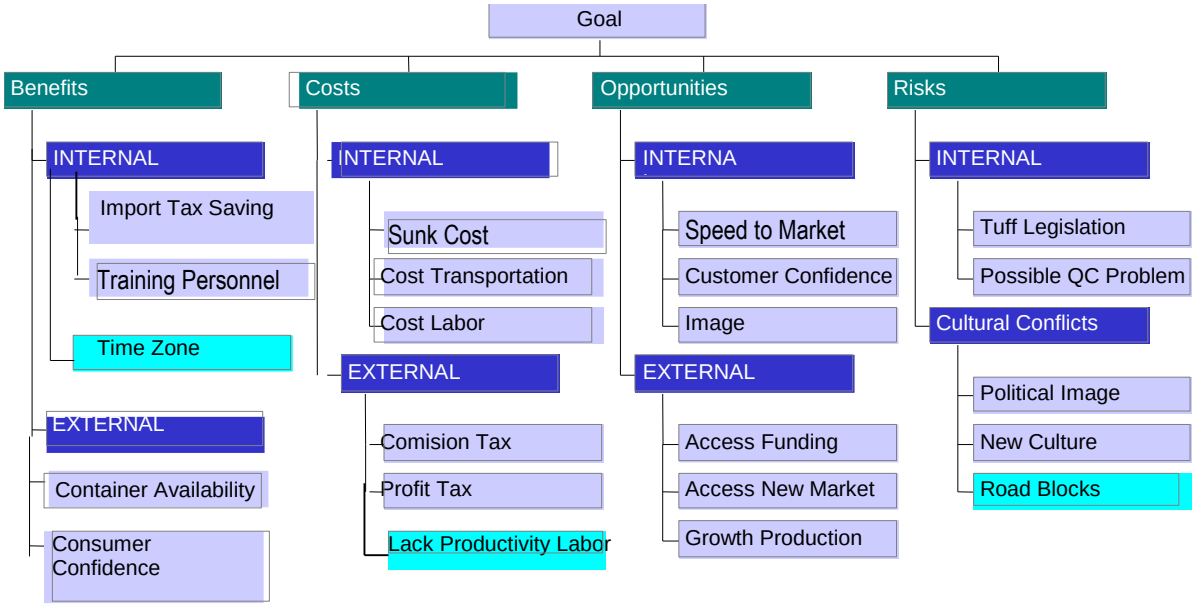
Cimal/IMR decided they would analyze the 4 possible options:

1- Maintain the factory at Bolivia
2- Move it to another location in the north of Bolivia (tax free zone)
3- Move it to Arica (Chile)- Port city they use to export their goods, another tax free zone.
4- Move it to Tacna (Peru)- 68 Km from the Port of Arica, another tax free zone.

In order to help this decision, Cimal/IMR Company designed the following model:

Alternatives: Decide the location for the installation of a new assembly Plant for CIMAL/IMR
Alternative 1: Existing Plant (Bolivia)
Alternative 2: Puerto Aguirre (Bolivia)
Alternative 3: Arica (Chile)
Alternative 4: Tacna (Peru)

Clusters and Nodes

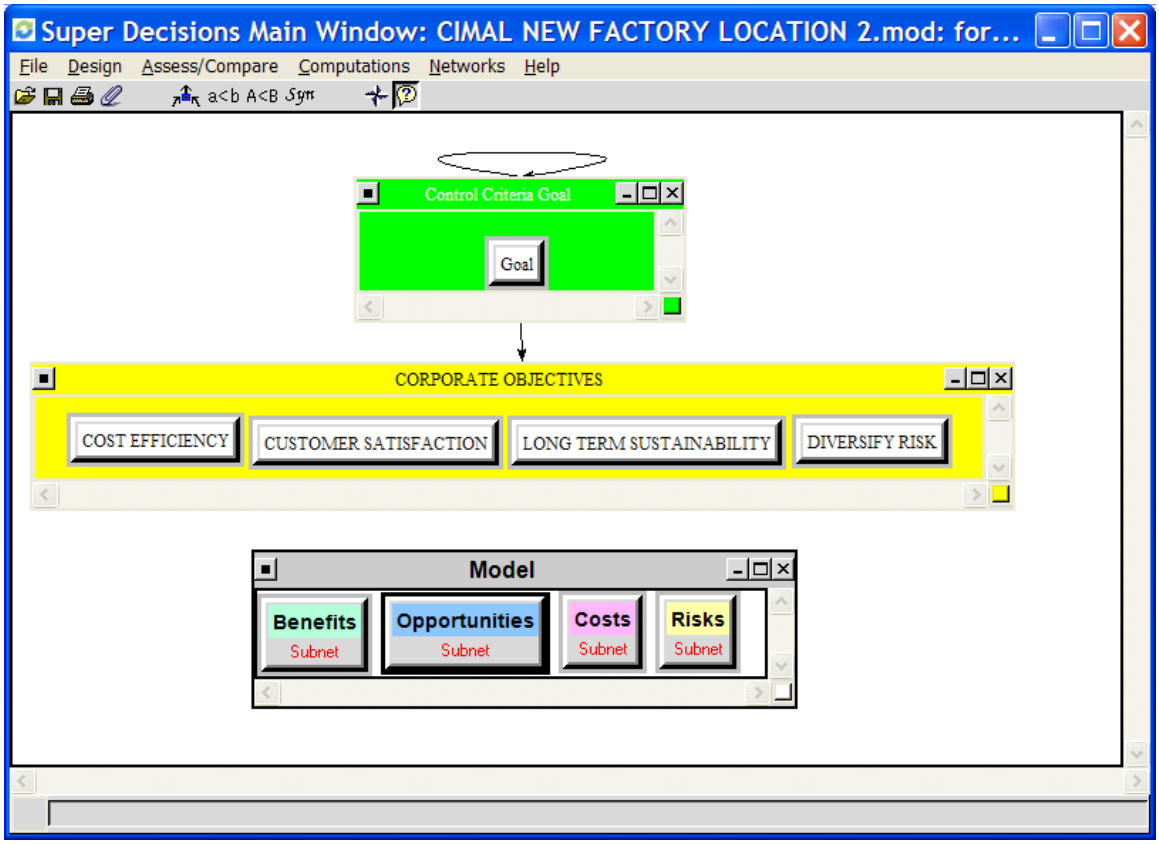


Clusters/Nodes	• **Criteria**
	  ○ **Cost Efficiency**
	  ○ **Customer Satisfaction**
	  ○ **Long Term Sustainability**
	  ○ **Diversify Risk**
	• **Model:** *This is the top level network.*
	  ○ **Benefits:** *Benefits*
	  ○ **Costs:** Costs
	  ○ **Opportunities:** *Opportunities*
	  ○ **Risks:** *Risks*

The Model

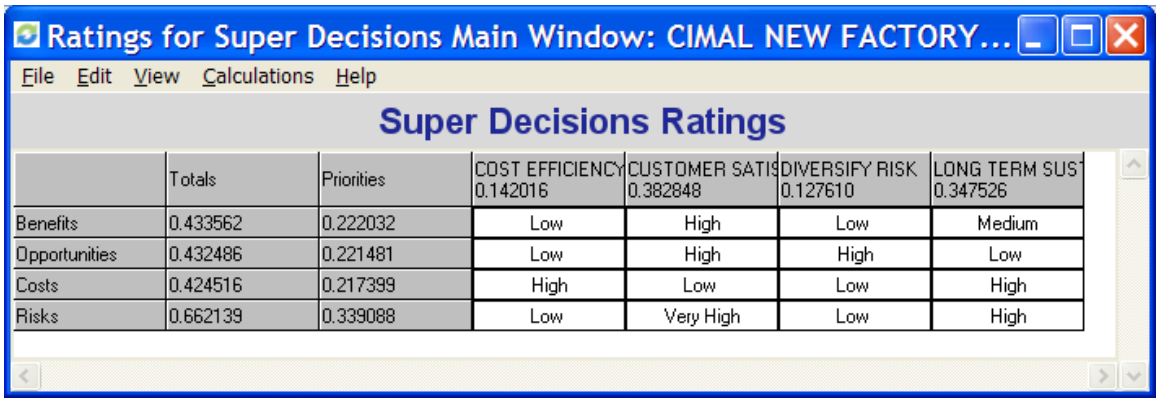
Ratings

To establish Ratings scales and evaluate the importance of Benefits, Costs, Risks and Opportunities of the Decision Making Model, we developed a value criteria. Cost Efficiency, Customer Satisfaction, Long Term Sustainability and diversification of Risks.



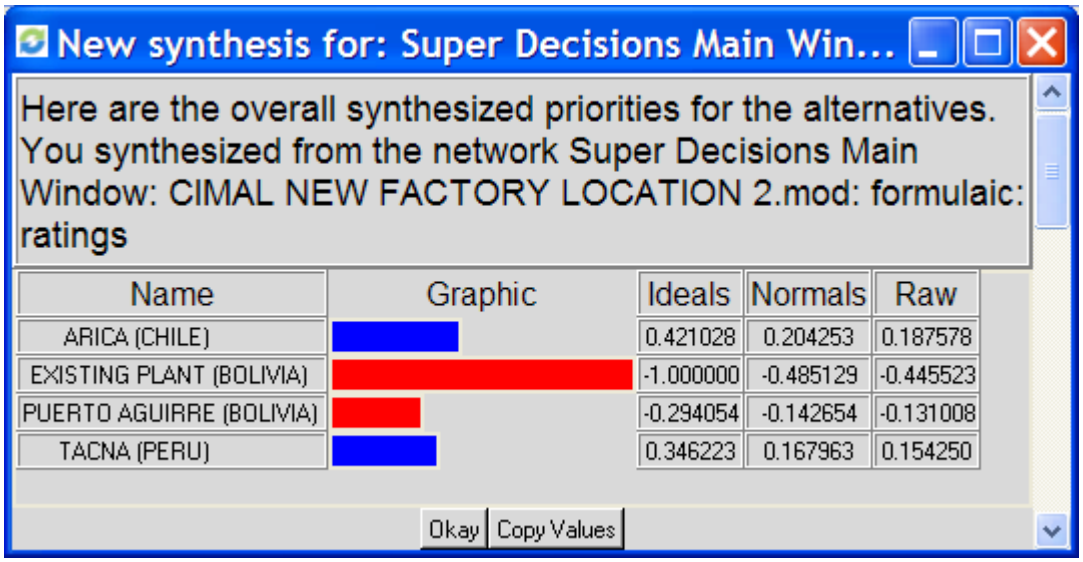
Hierarchy of Criteria for Rating Benefits, Opportunities, Costs and Risks

The four merits of BOCR were rated according to four intensities listed below along with their priorities. The outcome is summarized.



	Totals	Priorities	COST EFFICIENCY 0.142016	CUSTOMER SATIS 0.382848	DIVERSIFY RISK 0.127610	LONG TERM SUST 0.347526
Benefits	0.433562	0.222032	Low	High	Low	Medium
Opportunities	0.432486	0.221481	Low	High	High	Low
Costs	0.424516	0.217399	High	Low	Low	High
Risks	0.662139	0.339088	Low	Very High	Low	High

(Table 1)



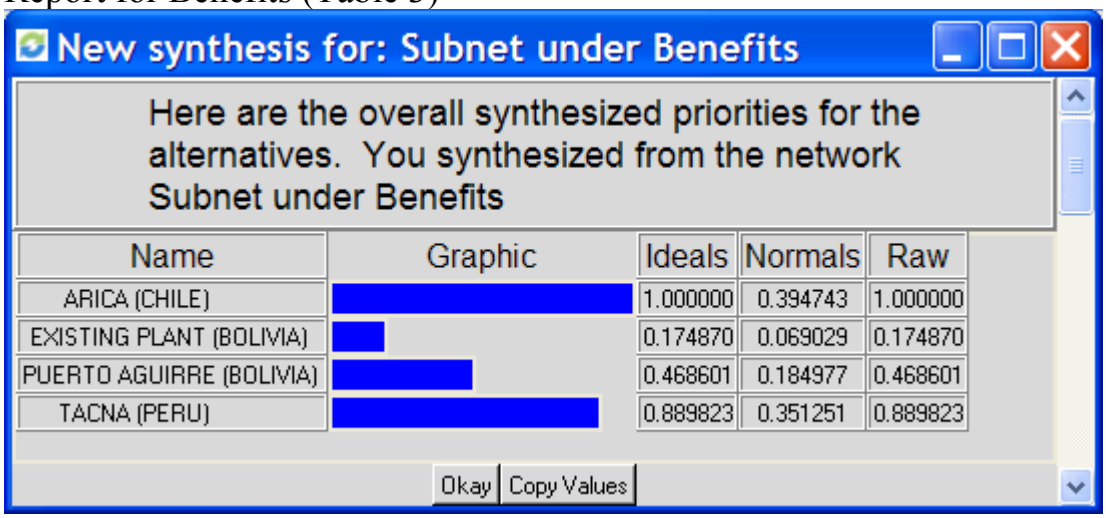
Name	Graphic	Ideals	Normals	Raw
ARICA (CHILE)		0.421028	0.204253	0.187578
EXISTING PLANT (BOLIVIA)		-1.000000	-0.485129	-0.445523
PUERTO AGUIRRE (BOLIVIA)		-0.294054	-0.142654	-0.131008
TACNA (PERU)		0.346223	0.167963	0.154250

(Table 2)

Synthesized Results from Super Decision program

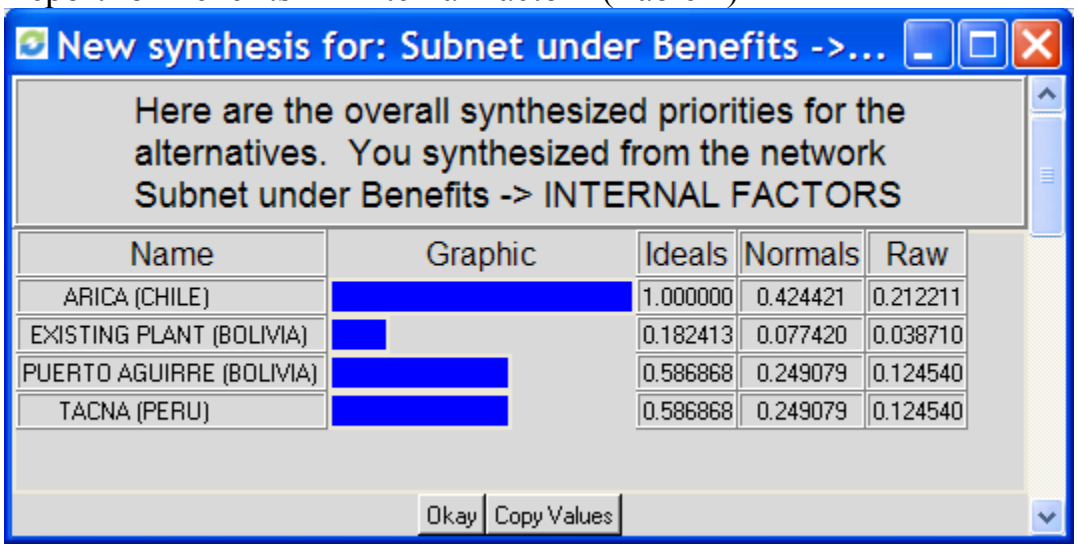
By using Super Decisions program, we obtained the synthesized results regarding Benefits, Opportunities, Costs, Risks and the final result of the whole model.

Report for Benefits (Table 3)



Name	Graphic	Ideals	Normals	Raw
ARICA (CHILE)		1.000000	0.394743	1.000000
EXISTING PLANT (BOLIVIA)		0.174870	0.069029	0.174870
PUERTO AGUIRRE (BOLIVIA)		0.468601	0.184977	0.468601
TACNA (PERU)		0.889823	0.351251	0.889823

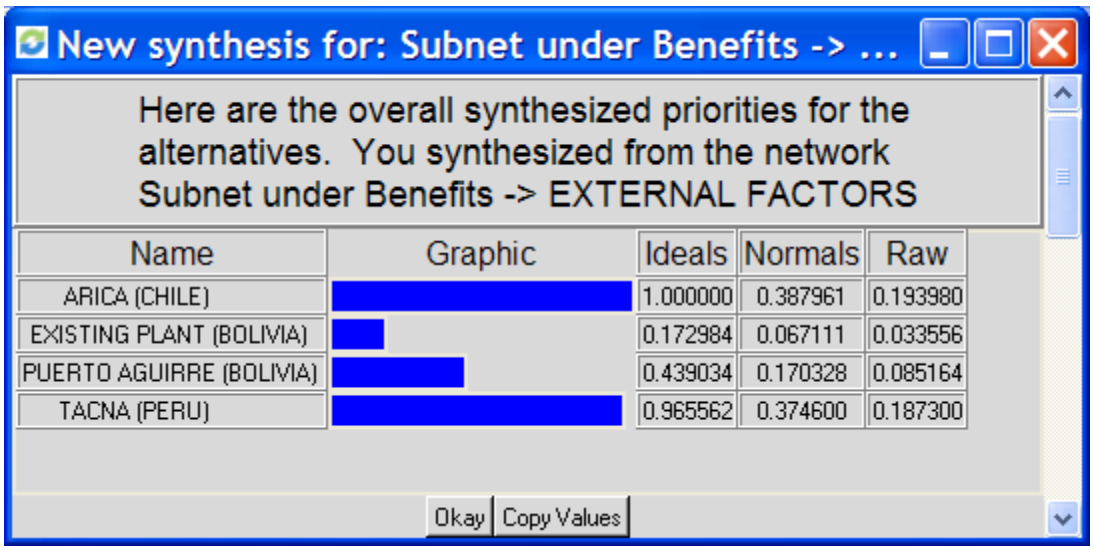
Report for Benefits => Internal Factor (Table 4)



Name	Graphic	Ideals	Normals	Raw
ARICA (CHILE)		1.000000	0.424421	0.212211
EXISTING PLANT (BOLIVIA)		0.182413	0.077420	0.038710
PUERTO AGUIRRE (BOLIVIA)		0.586868	0.249079	0.124540
TACNA (PERU)		0.586868	0.249079	0.124540

The criteria considered to define the internal benefits were Import Tax savings, training personnel and Time Zone.
Maintaining the plant in Bolivia requires a hardware tax payment of about 10% that is not required either in Chile or Peru.
Chile presents an advantage regarding training personnel because the government pays the program for employee's development.
Chile and Peru have the advantage to ensure a delivery on time, as it is closer to Port of Arica.

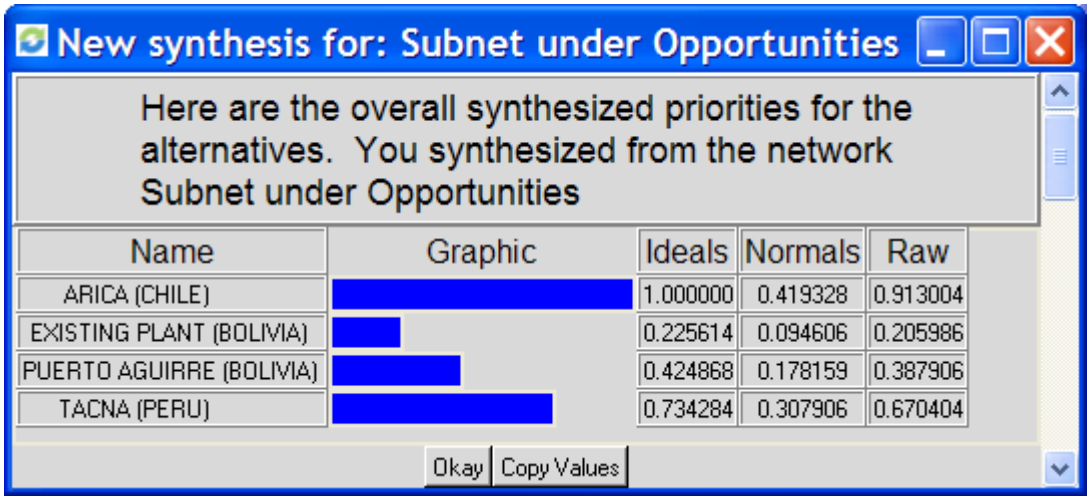
Report for Benefits => External Factors (Table 5)



Name	Graphic	Ideals	Normals	Raw
ARICA (CHILE)		1.000000	0.387961	0.193980
EXISTING PLANT (BOLIVIA)		0.172984	0.067111	0.033556
PUERTO AGUIRRE (BOLIVIA)		0.439034	0.170328	0.085164
TACNA (PERU)		0.965562	0.374600	0.187300

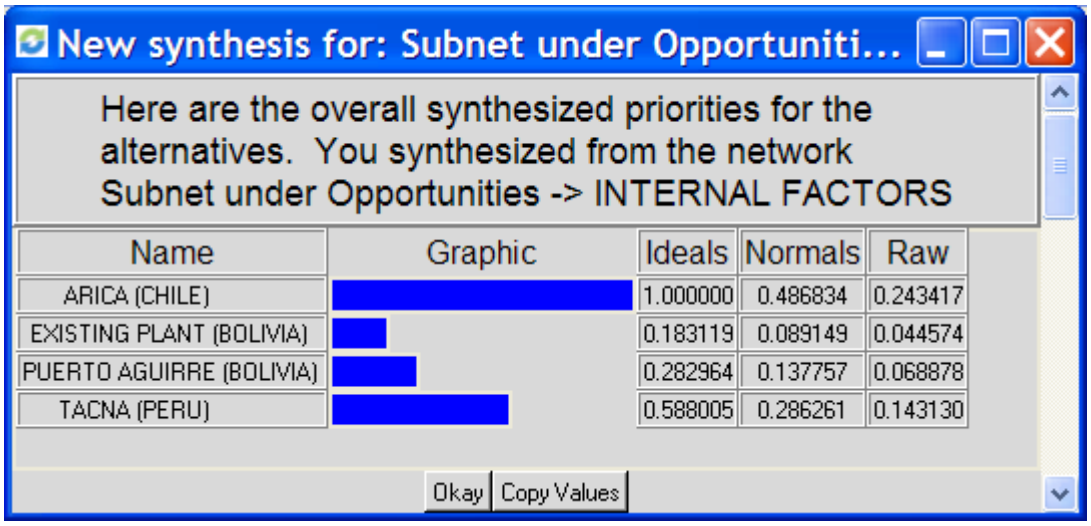
The criteria considered to define the external benefits were Container Availability and Consumer Confidence.
In Bolivia there is no container availability and it costs around U$ 1.000,00 to bring the containers, while in Peru and Chile the containers are available.
Moving the factory to Chile or Peru would also ensure a better consumer confidence, as the company would not suffer so much with the Bolivarian crisis.

Report for Opportunities (Table 6)



Name	Graphic	Ideals	Normals	Raw
ARICA (CHILE)		1.000000	0.419328	0.913004
EXISTING PLANT (BOLIVIA)		0.225614	0.094606	0.205986
PUERTO AGUIRRE (BOLIVIA)		0.424868	0.178159	0.387906
TACNA (PERU)		0.734284	0.307906	0.670404

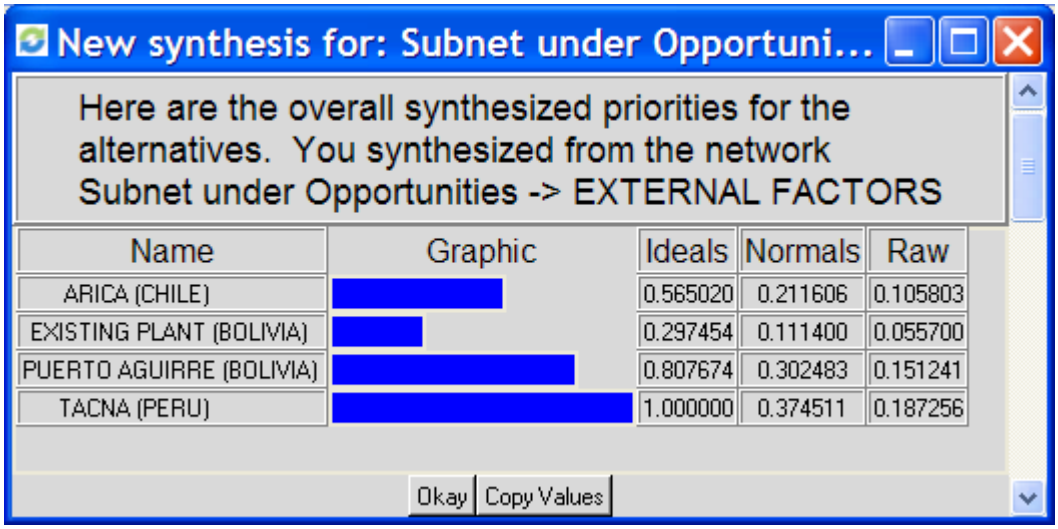
Report for Opportunities => Internal Factors (Table 7)



Name	Graphic	Ideals	Normals	Raw
ARICA (CHILE)		1.000000	0.486834	0.243417
EXISTING PLANT (BOLIVIA)		0.183119	0.089149	0.044574
PUERTO AGUIRRE (BOLIVIA)		0.282964	0.137757	0.068878
TACNA (PERU)		0.588005	0.286261	0.143130

The criteria considered defining the internal Opportunities were Speed to Market, Customer Confidence and Image.
Moving the factory to Chile or Peru would ensure a better speed to market, as they would have bigger stock near to the Port of Arica to ship to Europe.
Chile and Peru would also allow the company to have a better customer confidence and image, as those countries are less risky than Bolivia.

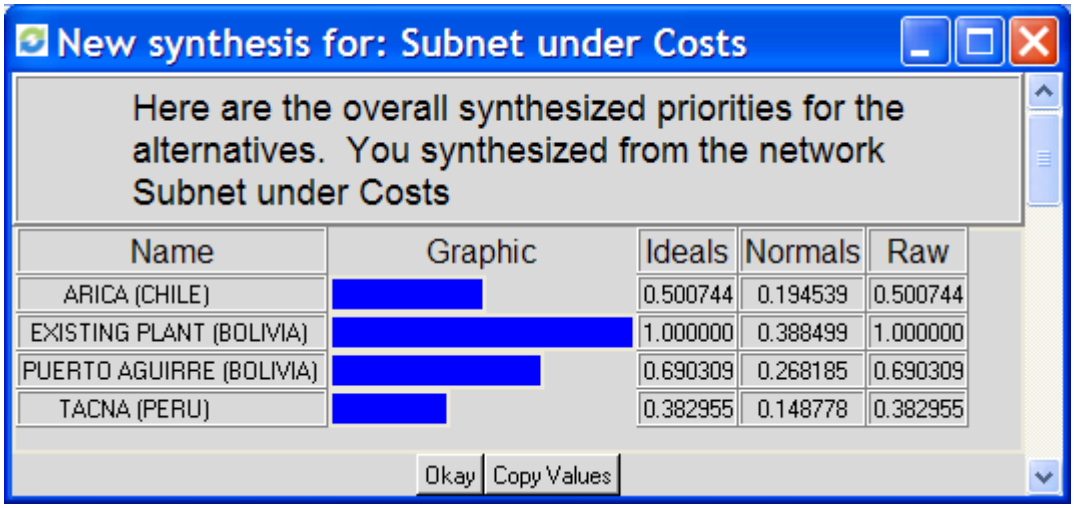
Report for Opportunities => External Factors (Table 8)



Name	Graphic	Ideals	Normals	Raw
ARICA (CHILE)		0.565020	0.211606	0.105803
EXISTING PLANT (BOLIVIA)		0.297454	0.111400	0.055700
PUERTO AGUIRRE (BOLIVIA)		0.807674	0.302483	0.151241
TACNA (PERU)		1.000000	0.374511	0.187256

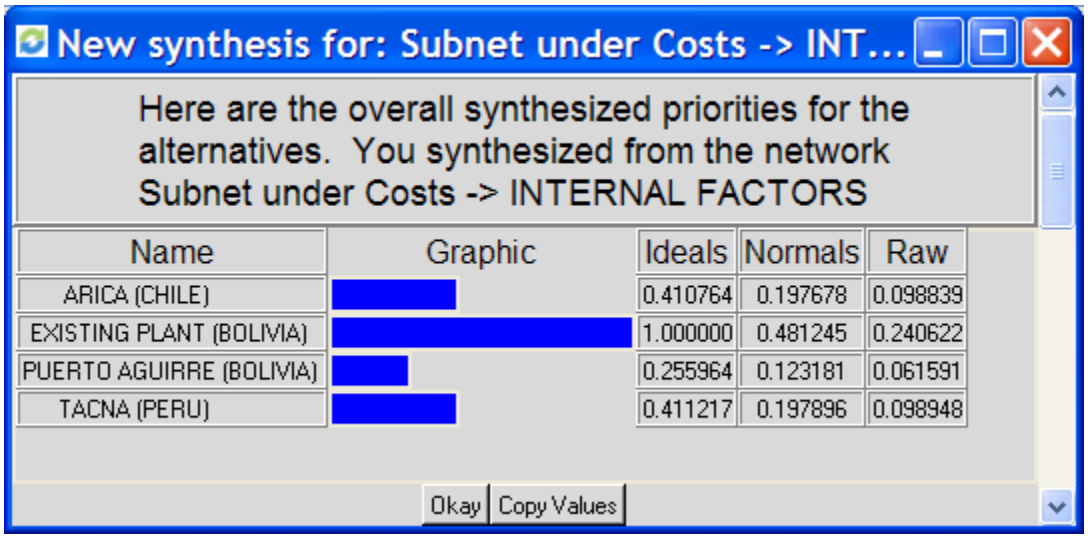
The criteria considered to define the external opportunities were Access to Funding, Access New Market and Growth Production
Chile has the advantage of the greater access to funding, however there is less possibilities of Production Growth in the future as the manpower cost is about the double of Bolivia and much more than Peru also.
Both Peru and Chile would allow the company to enter new markets and improve their credibility in the marketplace.

Report for Costs (Table 9)



Name	Graphic	Ideals	Normals	Raw
ARICA (CHILE)		0.500744	0.194539	0.500744
EXISTING PLANT (BOLIVIA)		1.000000	0.388499	1.000000
PUERTO AGUIRRE (BOLIVIA)		0.690309	0.268185	0.690309
TACNA (PERU)		0.382955	0.148778	0.382955

Report for Cost => Internal Factors (Table 10)



Name	Graphic	Ideals	Normals	Raw
ARICA (CHILE)		0.410764	0.197678	0.098839
EXISTING PLANT (BOLIVIA)		1.000000	0.481245	0.240622
PUERTO AGUIRRE (BOLIVIA)		0.255964	0.123181	0.061591
TACNA (PERU)		0.411217	0.197896	0.098948

The criteria considered to define the internal costs were Sunk Cost, Cost of Transportation and Cost of Labor.

The only option that does not require investment as sunk cost is to stay in the current place. All the other 3 options present the same sunk cost.

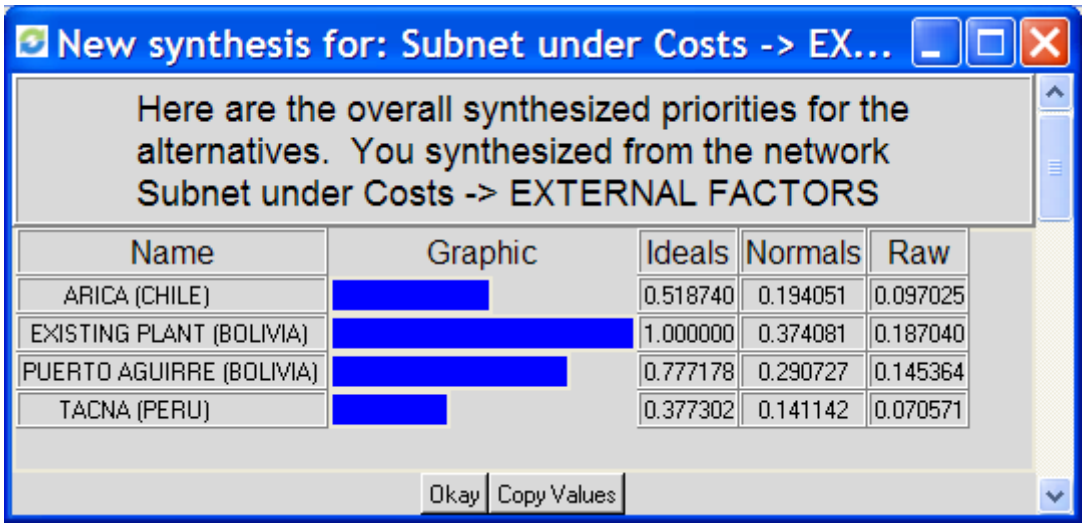
Arica (Chile) and Tacna (Peru) presented a great advantage regarding the transportation cost, as they would transfer the goods from Bolivia to be packed at

Chile and that would require only half of containers they use nowadays to transfer the final goods to the Chilean port (at Arica).

Tacna (Peru) present a lightly higher cost of transportation in comparison to Chile, as the city is about 68Km from the Port of Arica (Chile)

However Chile has a much higher manpower cost than Bolivia (almost the double) and a significant higher cost than Peru.

Report for Cost => External Factors (Table 11)



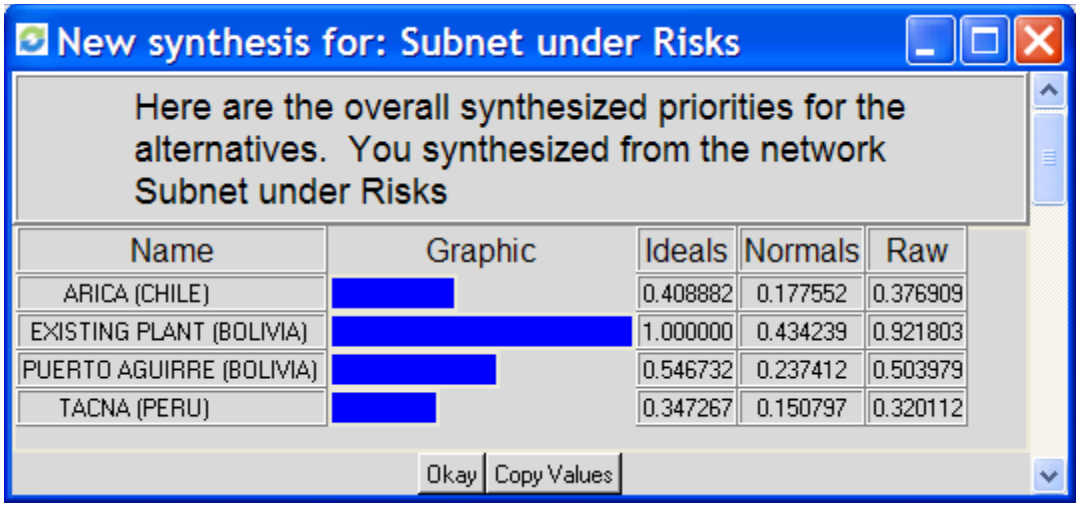
Name	Graphic	Ideals	Normals	Raw
ARICA (CHILE)		0.518740	0.194051	0.097025
EXISTING PLANT (BOLIVIA)		1.000000	0.374081	0.187040
PUERTO AGUIRRE (BOLIVIA)		0.777178	0.290727	0.145364
TACNA (PERU)		0.377302	0.141142	0.070571

The criteria considered to define the external costs were Commission Tax, Profit tax and Lack of Productivity.

The bolivarian law requires a sales commissions and rebates of about 12,6% while either Chile or Peru present this requirement.

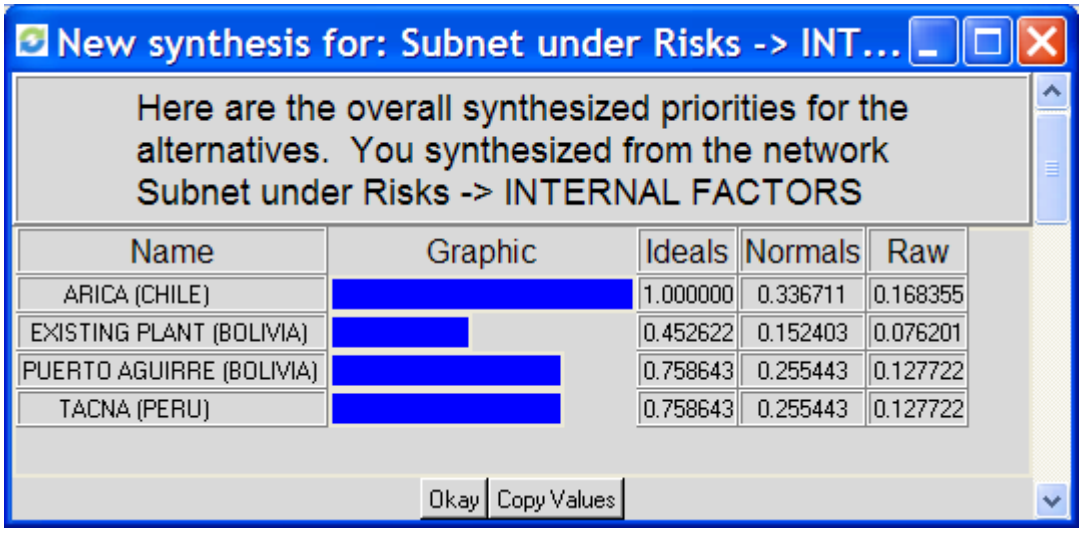
Arica (Chile), Tacna (Peru) and Puerto Aguirre (Bolivia) presented competitive advantage in comparison to current plant in Bolivia regarding tax, as these regions are Tax-free and nowadays, the company has to pay profit taxes to the government of about 30% in the existing plant in Bolivia.

Report for Risks (Table 12)



Name	Graphic	Ideals	Normals	Raw
ARICA (CHILE)		0.408882	0.177552	0.376909
EXISTING PLANT (BOLIVIA)		1.000000	0.434239	0.921803
PUERTO AGUIRRE (BOLIVIA)		0.546732	0.237412	0.503979
TACNA (PERU)		0.347267	0.150797	0.320112

Report for Risks => Internal Factors (Table 13)

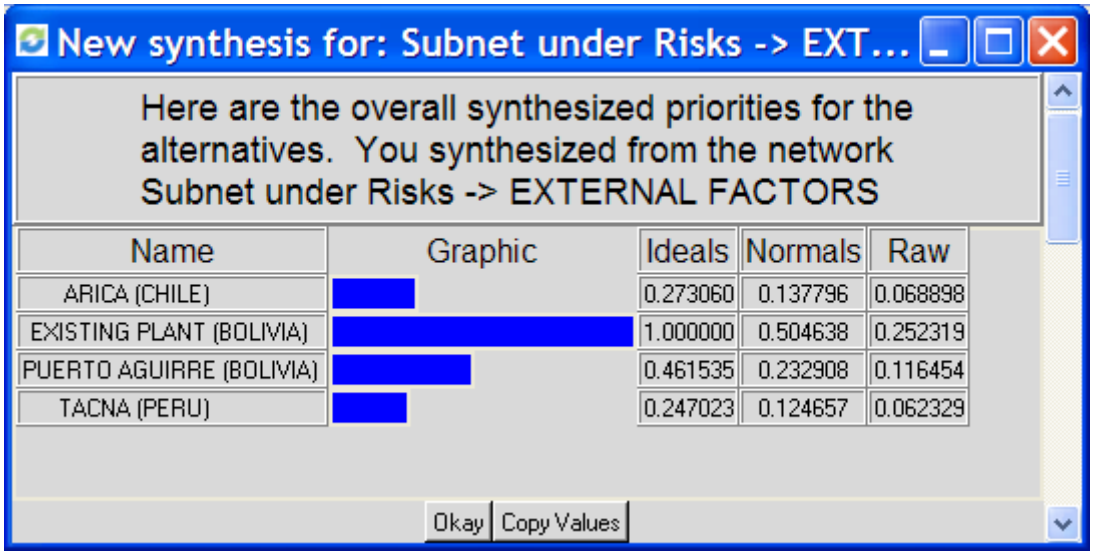


Name	Graphic	Ideals	Normals	Raw
ARICA (CHILE)		1.000000	0.336711	0.168355
EXISTING PLANT (BOLIVIA)		0.452622	0.152403	0.076201
PUERTO AGUIRRE (BOLIVIA)		0.758643	0.255443	0.127722
TACNA (PERU)		0.758643	0.255443	0.127722

Regarding internal risks, we considered Tuff Legislation and Possible Quality Control Problem.
Chile has a really tuff legislation that is quite different from the bolivarian one.

Moving the factory to any other place (Tacna, Arica or Puerto Aguirre) also creates the risk of having quality control problems.

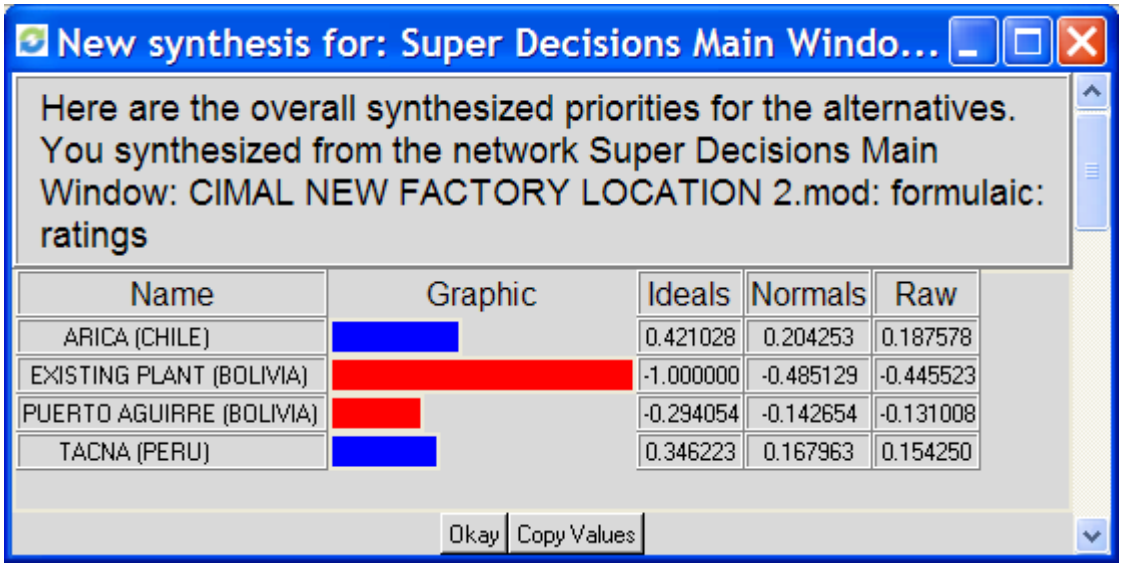
Report for Risks => External Factors (Table 14)



Name	Graphic	Ideals	Normals	Raw
ARICA (CHILE)		0.273060	0.137796	0.068898
EXISTING PLANT (BOLIVIA)		1.000000	0.504638	0.252319
PUERTO AGUIRRE (BOLIVIA)		0.461535	0.232908	0.116454
TACNA (PERU)		0.247023	0.124657	0.062329

Regarding external risks, we considered Political Image, New Culture and Road Block
Maintaining the whole production in Bolivia present some risks concerning the political crisis and possible roadblocks.
Moving the factory to Chile present the risk regarding the productivity of the Chilean labor and also the different culture.

Final Result of Whole Model (Table 15)



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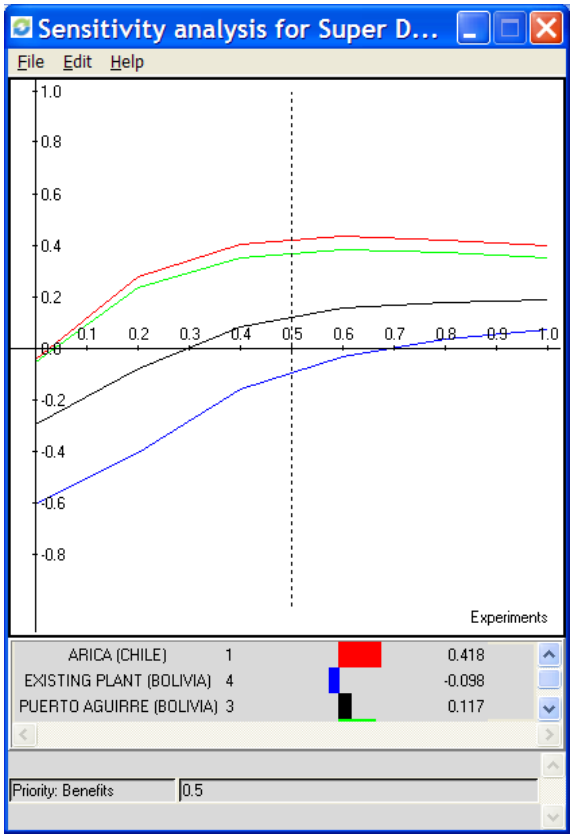
TACNA (PERU)		0.346223	0.167963	0.154250

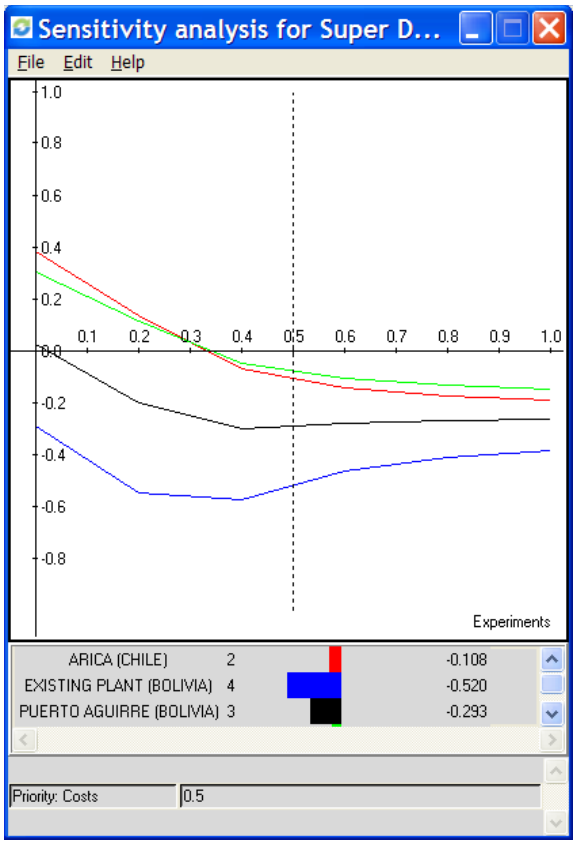
Sensitivity Analysis

From the sensitivity graph we had the following results.

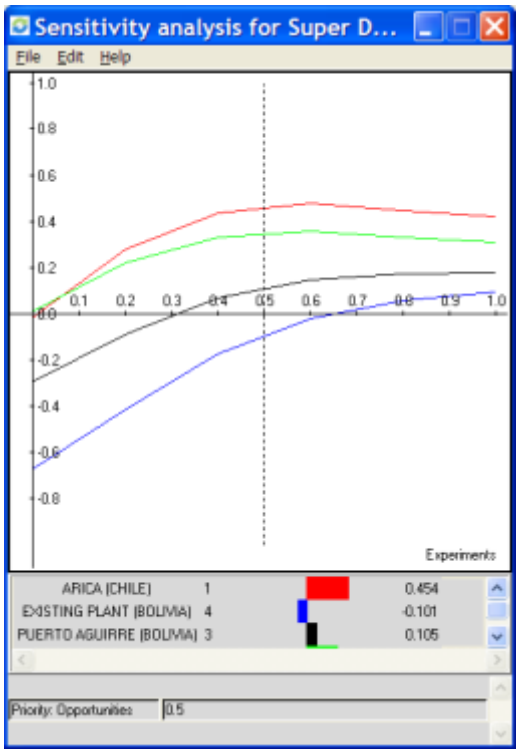
- A change in the Benefit priority will not have a change in Arica being the best Alternative.
- A change in the Cost priority could change the best alternative from Arica to Tacna.
- A change in the Opportunities priority will not have a change in Arica being the best Alternative.
- A change in the Risk priority could change the best alternative from Arica to Tacna.



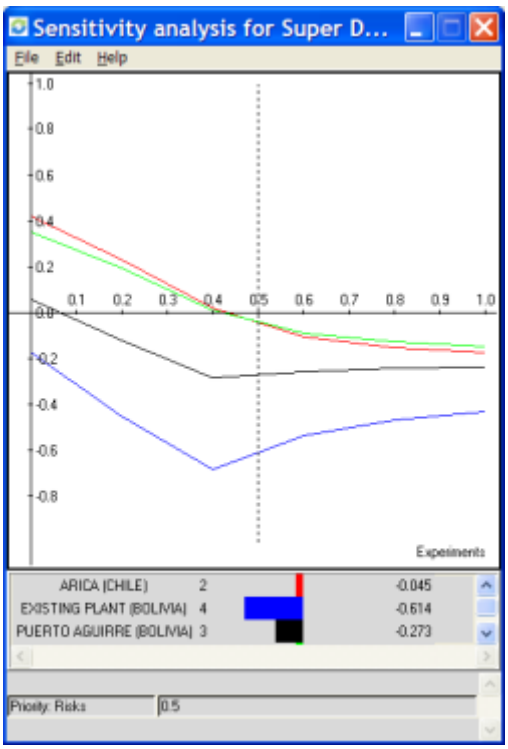
Sensitivity Analysis for Benefits



Sensitivity Analysis for Costs



Sensitivity Analysis for Opportunities



Sensitivity Analysis for Risks

Conclusion

Taking all that into consideration in the Super Decisions Tools, we realized that Arica (Chile) is the best option. The second best option would be to move the factory to Tacna (Peru). The third option would be Puerto Aguirre (North Bolivia) and the last option is to stay in the current plant.