4/26/2011

BQOM 2521: DECISION MAKING IN A COMPLEX ENVIRONMENT

ANALYTIC NETWORK PROCESS MODEL: WHAT SHOULD BE DONE TO RESOLVE THE PUBLIC TRANSPORTATION CRISIS IN PITTSBURGH, PA?

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1 Background

Pittsburgh is the second-largest city in the U.S. Commonwealth of Pennsylvania. It is the 22nd-largest urban area in the United States with the population of the Greater Pittsburgh area being identified as 2,356,285 in the 2010 US Census. While the population of the Greater Pittsburgh area is large, the actual population within the city limits has shrunk significantly over the years, and is currently identified as just over 305,000 (Lord, Smydo, & Barcousky, 2011). However, the city itself continues to be an economic influence, ranking at 25th in the nation for jobs within the urban core and 6th in job density (Miller, 2008). Pittsburgh supports over 1,600 technology companies ranging from a Google campus to small startups (Bobkoff, 2010).

The Pittsburgh area has a multitude of bridges, and is known as "the city of bridges" with over 2,000 bridges in Allegheny County (Iacone, 1995). In addition to the bridges of the area, primary traffic routes into and out of the city are routed through tunnels (primarily the Fort Pitt Tunnel, Squirrel Hill Tunnel, and Liberty Tunnel). While the specific reasons for this are unknown, traffic at the bridges and tunnels often slows down. Because of the overall number of bridges and the corresponding tunnels, a rush hour gridlock is predominant.

Port Authority of Allegheny County (Port Authority) is the region's mass transit system. Port Authority runs a network of bus routes, inclined railways on Mount Washington, and a light rail system that runs mostly above-ground in the suburbs and underground as a subway in the city (commonly known as the "T").

Since 2006, the Port Authority claims to have cut its annual expenses by $52 million and raised its revenues by $14 million to help alleviate a statewide transportation funding crisis (Port Authority Board Adopts FY2011 Budget, 2010). The funding crisis has only grown worse, however. The state legislature assumed it would receive permission to convert Interstate 80 into a toll road to increase revenues, but the federal government denied the request, leading to a gap in the state transportation budget of $472 million.

On November 24, 2010, the Port Authority's board of directors approved a massive service cut and fare hike to go into effect in March 2011. The service cut would reduce total service hours by approximately 35 percent, including the elimination of 45 routes (Schmitz, 2010). The Port Authority's budget from the state is to be substantially reduced for 2011. These cuts were identified as a direct result of the budget cuts, as the Port Authority is required by law to operate under a balanced budget.

On December 13, 2010, the Southwestern Pennsylvania Commission approved a plan by Governor Ed Rendell to allocate $45 million in temporary funding for the Port Authority to help reduce the magnitude of these service cuts (Schmitz J. , 2010). Many details of the emergency funding, including how long the

Port Authority must make the $45 million last and exactly how many routes slated to be cut could be saved, were not settled by the end of 2010.

On Sunday March 27th the Port Authority completed another round of cuts and layoffs. The results were the elimination of 29 routes, a reduction in service on 45 routes, the abolition of 260 jobs and the closure of the Harmar bus garage (Barcousky, 2011). The Port Authority estimates that these cuts will mean an estimated 5 to 6 percent loss in weekday ridership and as many as 13,000 fewer passenger trips. The board of directors also allowed a private company to take over and privatize the route to still service the areas north of the city.

The City of Pittsburgh

2 The Problem

The Port Authority of Allegheny County has recently reduced the public transportation services offered to the Greater Pittsburgh region as a result of insufficient funding received from the state and local governments that typically subsidize a large part of their operations. This has resulted in a loss of jobs and a limited quality of service. The government has recognized that this is a problem, and is discussing what the governmental strategy for the future of public transportation in the Greater Pittsburgh region.

The possible alternative solutions that we have considered for the purpose of the ANP model are discussed in the next section.

3 The Alternatives

The three alternatives evaluated for the purpose of this model are as follows:

3.1 Increased Government Involvement

As the name suggests, this alternative involves the state and local governments allocating more funds for investment in the public transport of Pittsburgh. The major effects of going for this option would be:

- Transportation costs remain unchanged for the public
- Possible higher taxation for the public
- The volume and frequency of transportation increases throughout the city. Areas previously without public transport will now also have accessibility.
- This alternative will receive higher Union support as jobs will only increase.

3.2 Status Quo

In this alternative, no steps in terms of investment or control would be taken by any government with regards to the Public transportation situation in Pittsburgh. The major effects of choosing this option would be:

- Slight increase in transportation costs to the public
- Tax to the Pittsburgh population stays the same

- A reduction in the volume and frequency of transportation which includes shutting down transportation services in specific routes of the city.
- Some loss of Jobs leading to protests by the Unions

3.3 Private Public Transportation

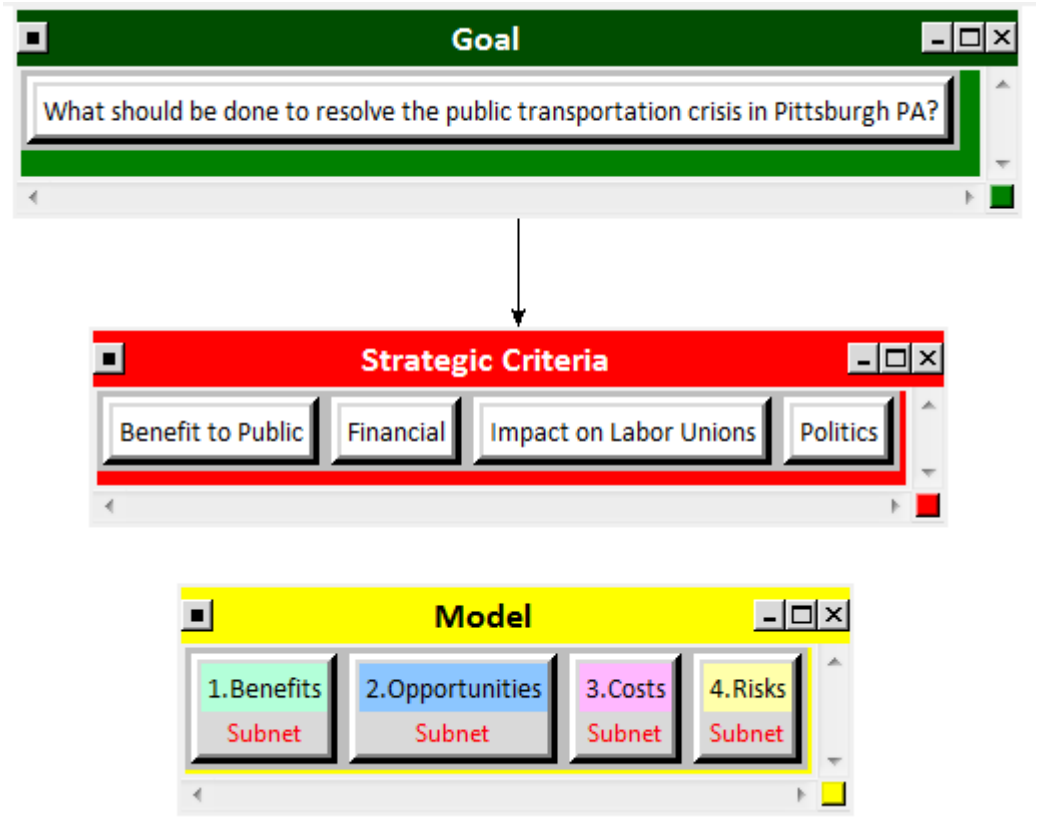
In this alternative, the government will open public transportation in Pittsburgh to private companies thereby allowing them to run their own buses, pick their own routes and charges for the service. The following would be the consequences of taking up this option:

- Increase in transportation costs for the public
- The government taxes to the public is unlikely to change
- There would be a low to medium volume and frequency of transportation as private operators would prefer to run buses on the most profitable routes
- Union would be disbanded in its current state and there would be a significant loss in jobs

4 The Model

The model has 4 different strategic criteria that were used as the objective of the study. The best solution in terms of what Pittsburgh, PA should do to resolve the public transportation crisis must take into consideration its impact with respect to:

Strategic Criteria
Benefit to Public
Financial
Impact on Labor Unions
Politics

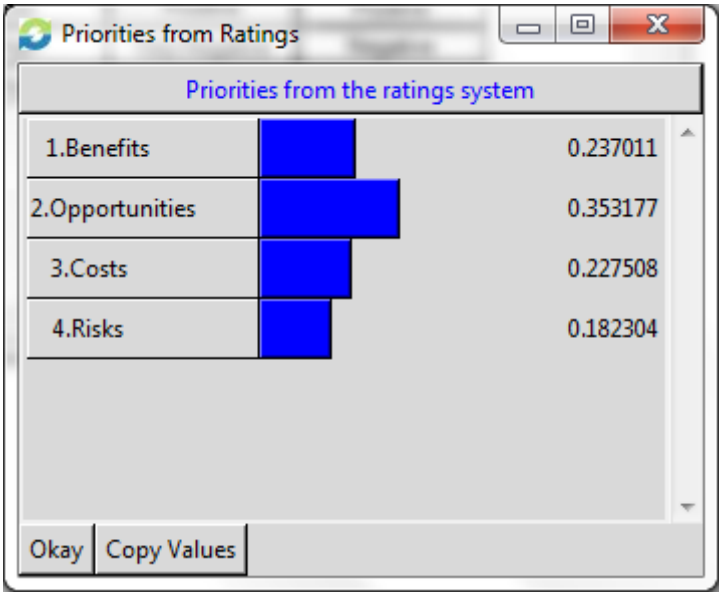


The model utilized the ratings approach weighing each criterion against the Benefits, Opportunities, Costs, and Risks. **The most important was politics at 47%.**
This criterion was related to all the political aspects that the decision would have on politicians and the state and local governments. Financial and benefit to the public were second and third respectively followed by impact on labor unions. The four benefits of BOCR according to the Strategic criteria are also shown below.

	Priorities	Benefit to Public 0.137106	Financial 0.314588	Impact on Labor Ur 0.078874	Politics 0.469432
1.Benefits	0.237011	High	Low	Very Positive	Neutral
2.Opportunities	0.353177	Very High	Low	Positive	Positive
3.Costs	0.227508	High	High	Very Negative	Negative
4.Risks	0.182304	Medium	High	Negative	Very Negative

Note that the "Benefits" and "Opportunities" were rated considering the alternative: "Increased Involvement", while the "Costs" and "Risks" were rated considering the alternative: "Privatization". These alternatives had the highest priority in the corresponding areas of the BOCR Model.

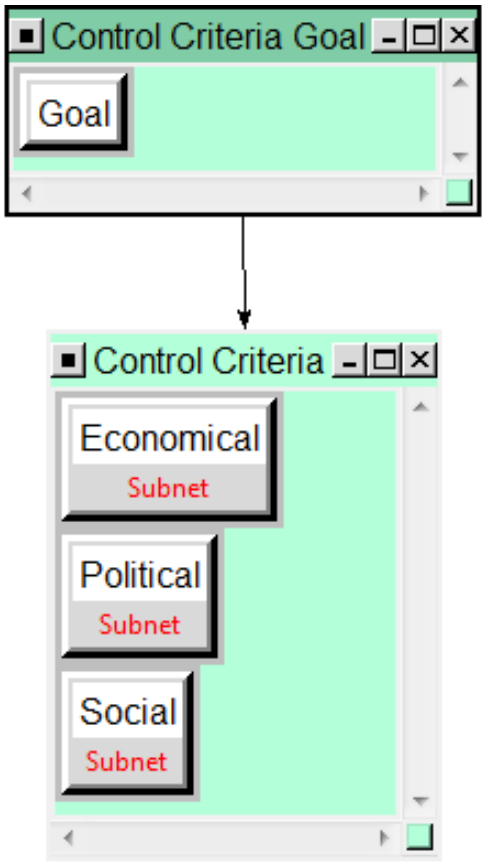
Each BOCR was also rated and the following priorities were obtained:



Each subnet of Benefits, Opportunities, Cost and Risk were divided into:

1) Economical
2) Political
3) Social

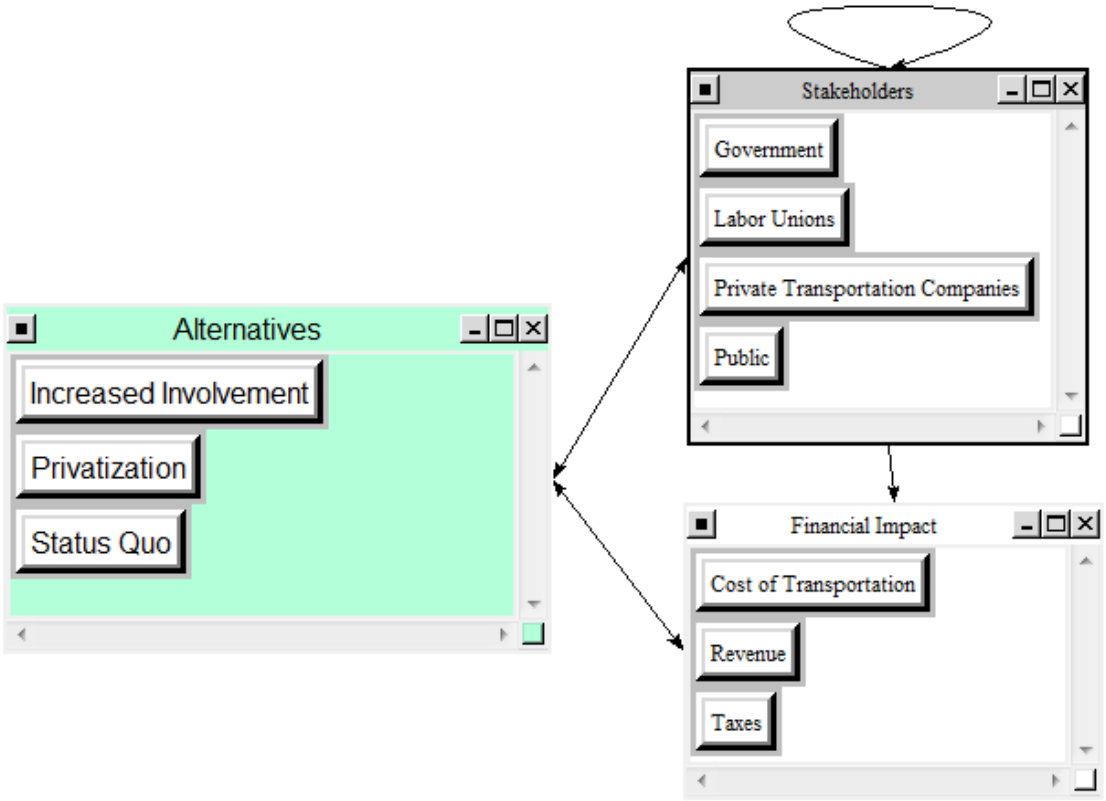
The screenshot below is a sample of the control criteria inside a subnet



4.1 Benefits:

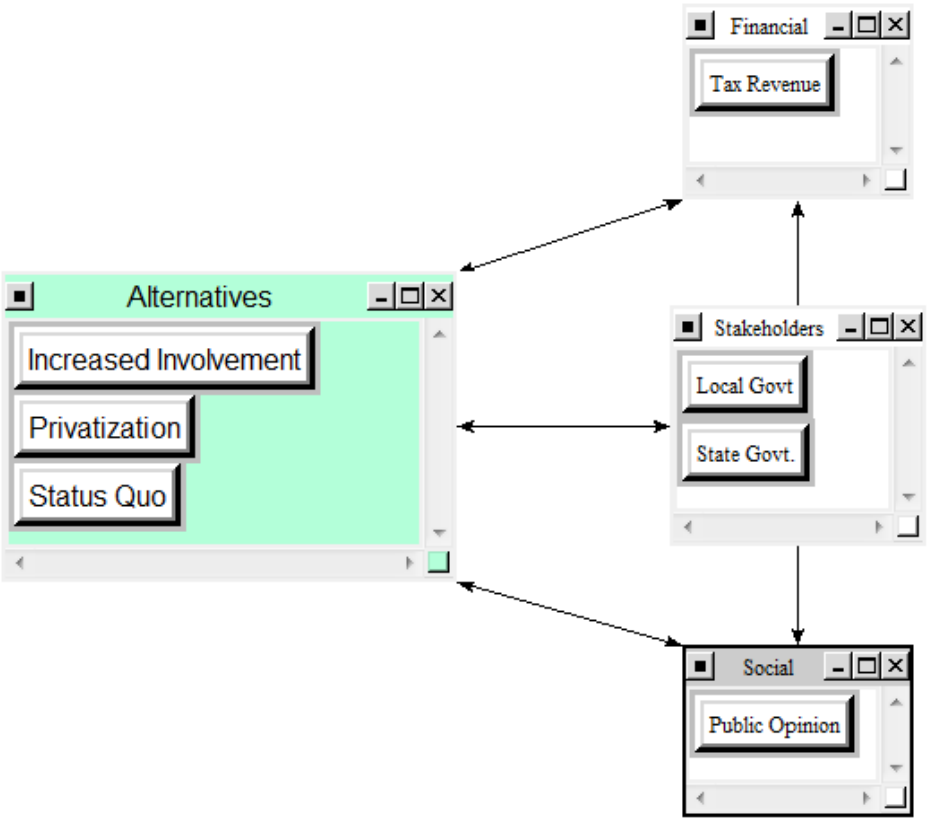
4.1.1 Economic

The economic benefits were divided as per its impact on the stakeholders under each alternative.



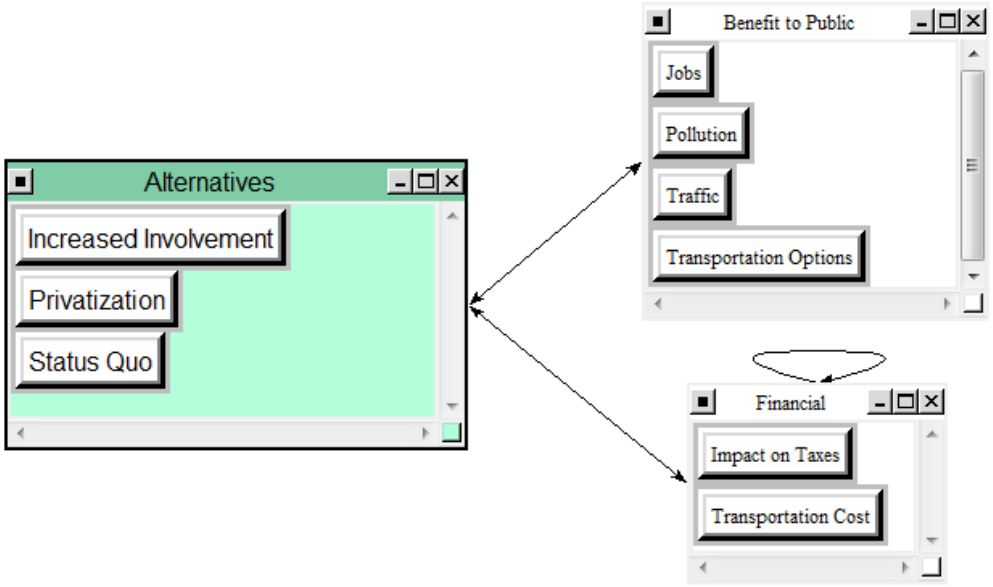
4.1.2 Political

The political benefit was divided into social and financial and their effect on the stakeholders of local and state government.



4.1.3 Social

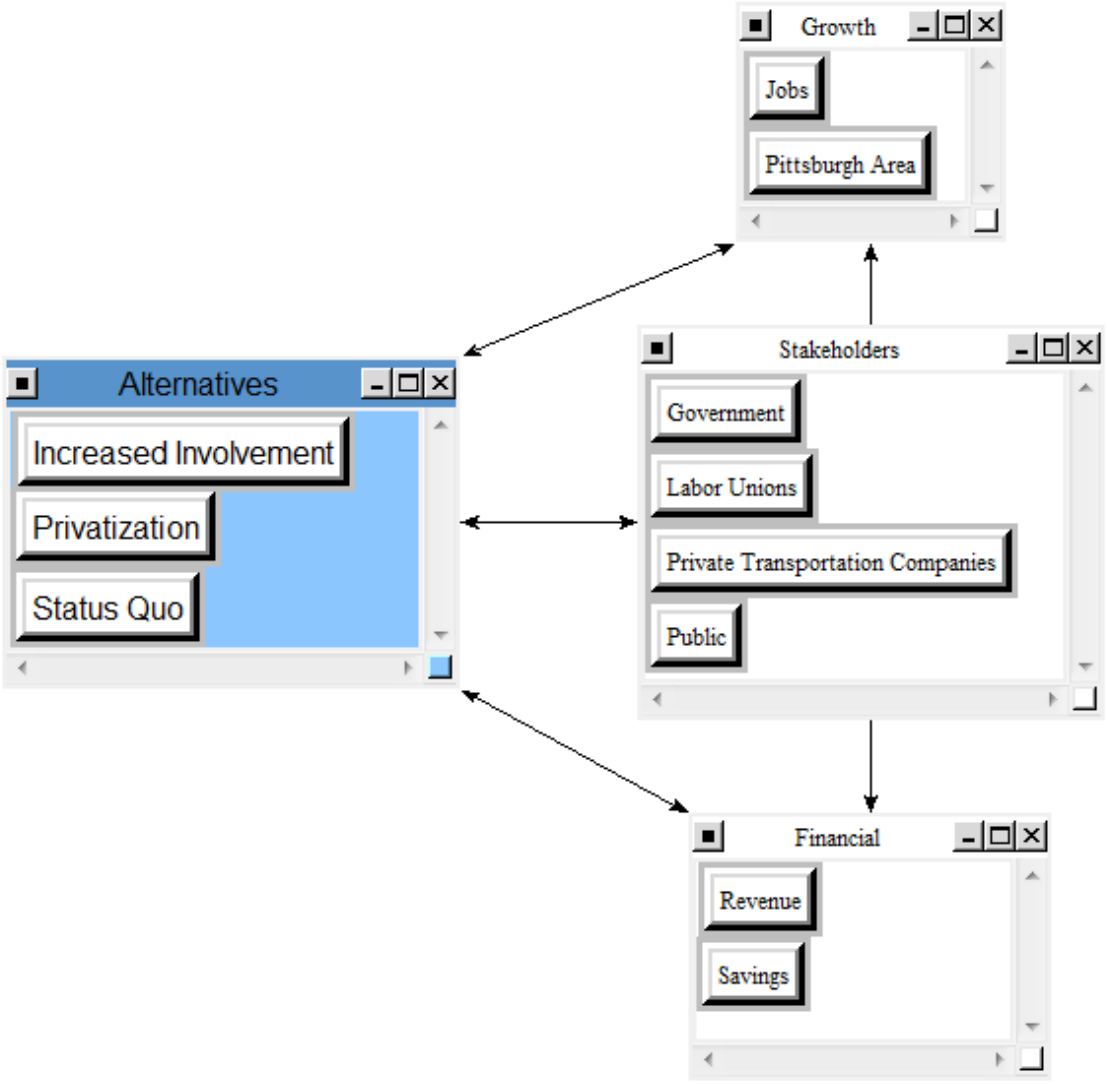
The social benefits were divided into benefit to the public and financial



4.2 Opportunity

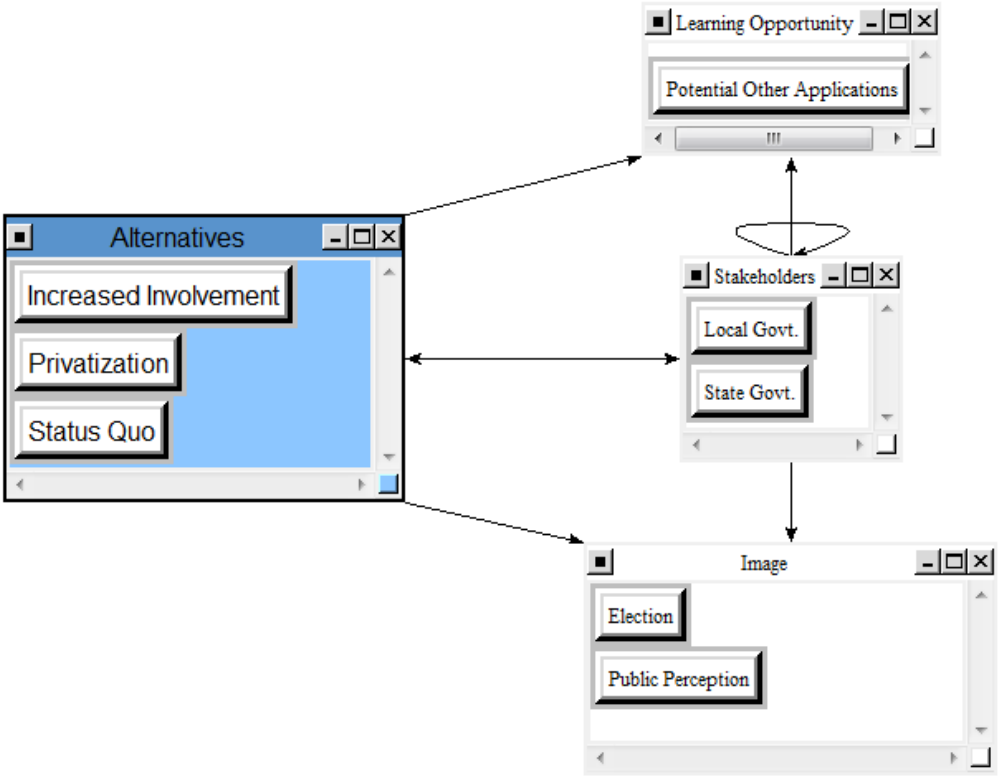
4.2.1 Economical

The economic opportunity related is related to the growth and financial possibilities in relation to the stakeholders.



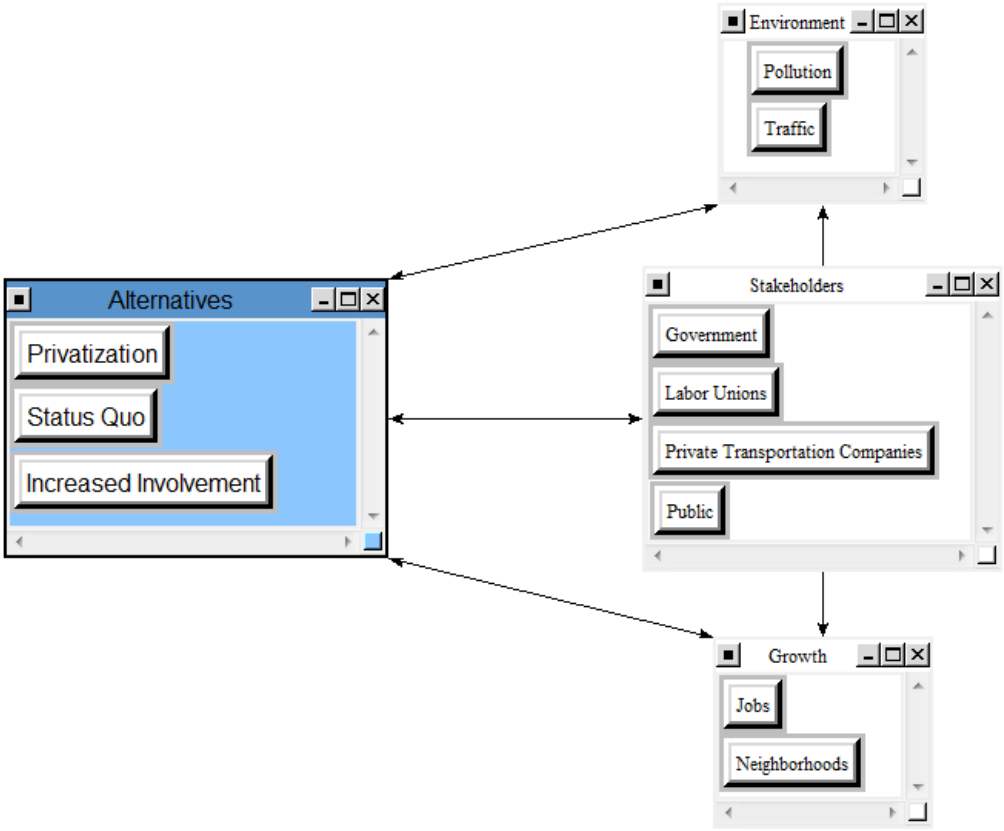
4.2.2 Political

The political opportunity is related to the possibility of re-election and public perception (image) and for the ability to use this solution in other cities.



4.2.3 Social

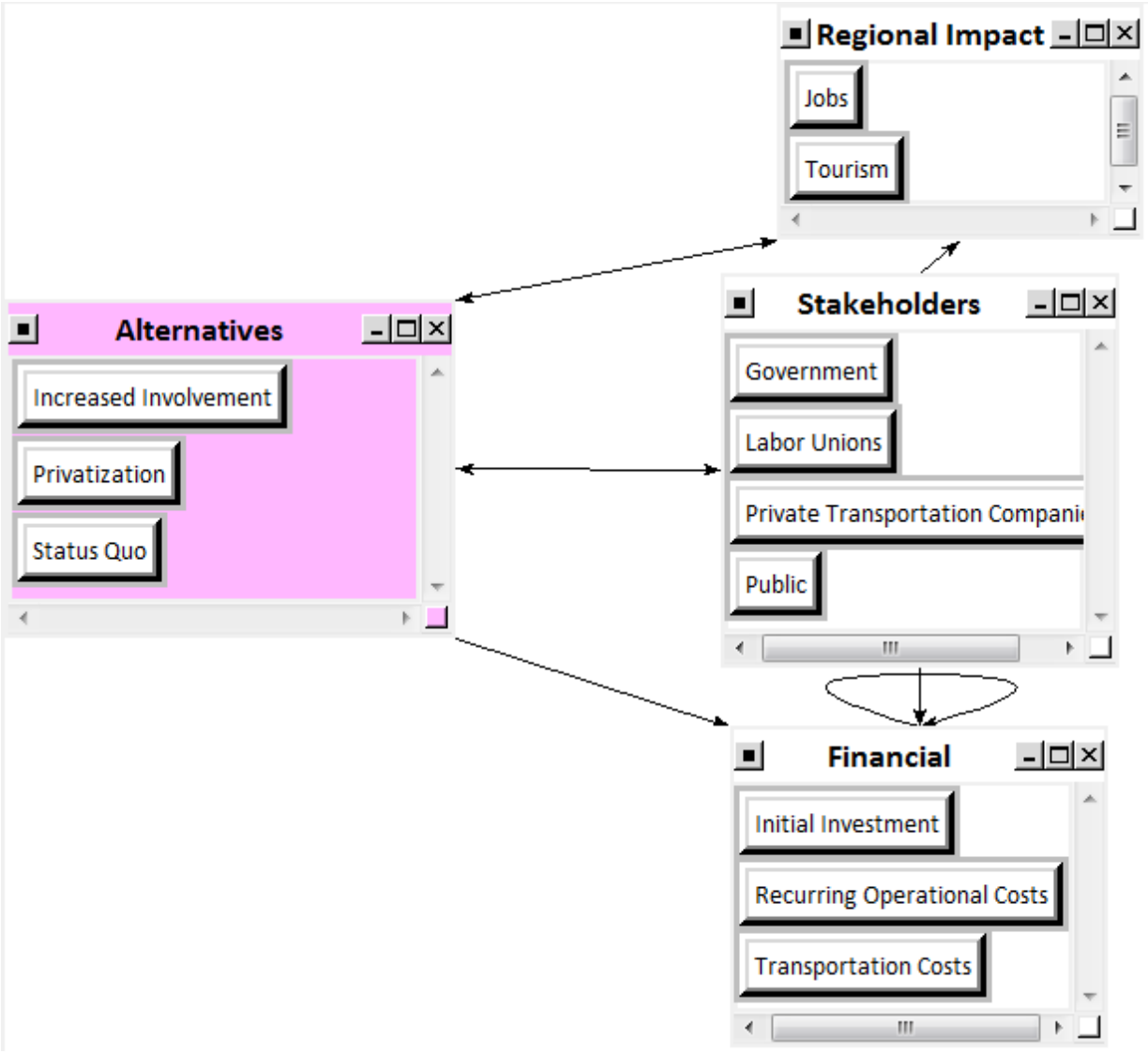
The social opportunity was measure in term of the possibility to increase traffic conditions, pollution, and the growth in relation to the stakeholders.



4.3 Cost

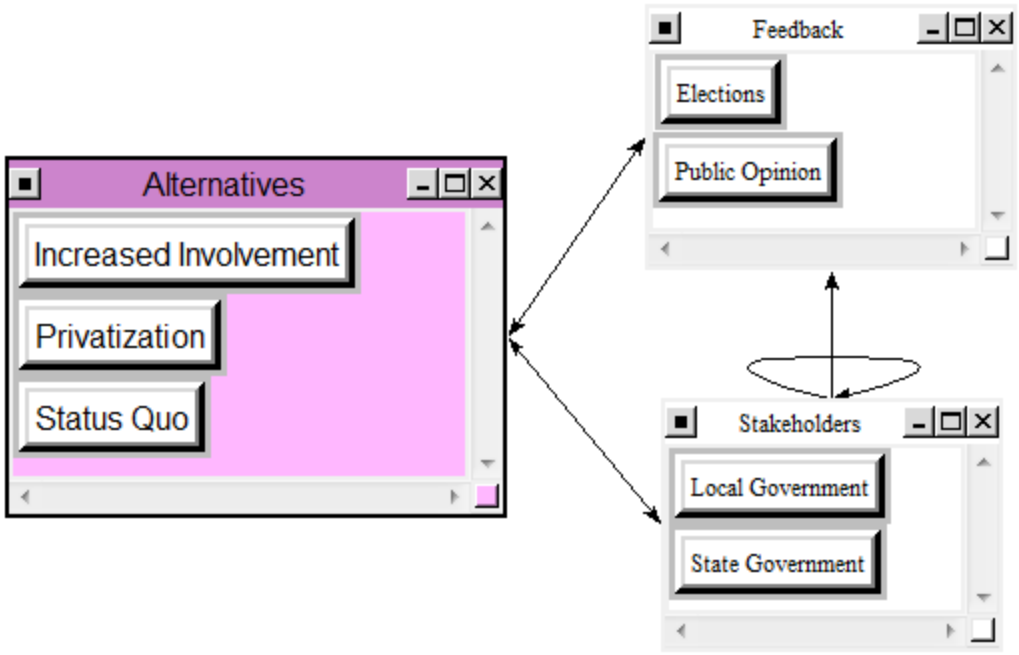
4.3.1 Economic

The economic cost is related to the amount invested and its returns/effect on the stakeholders.



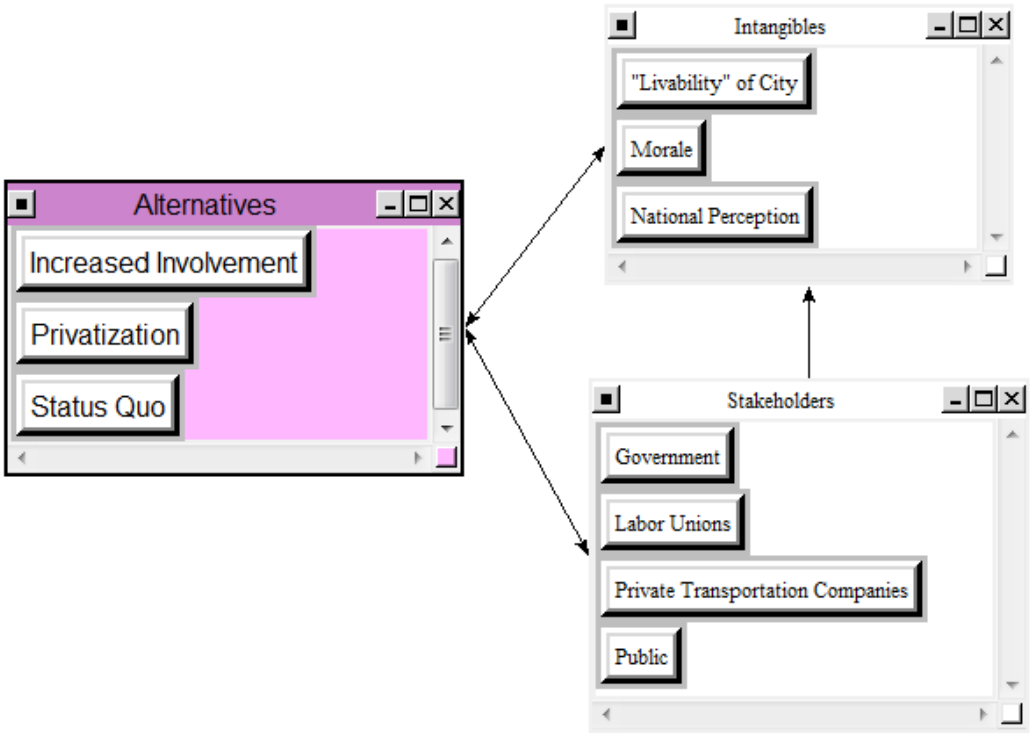
4.3.2 Political

The political cost is related to the population perception of the alternatives and the effect on the local and state government.



4.3.3 Social

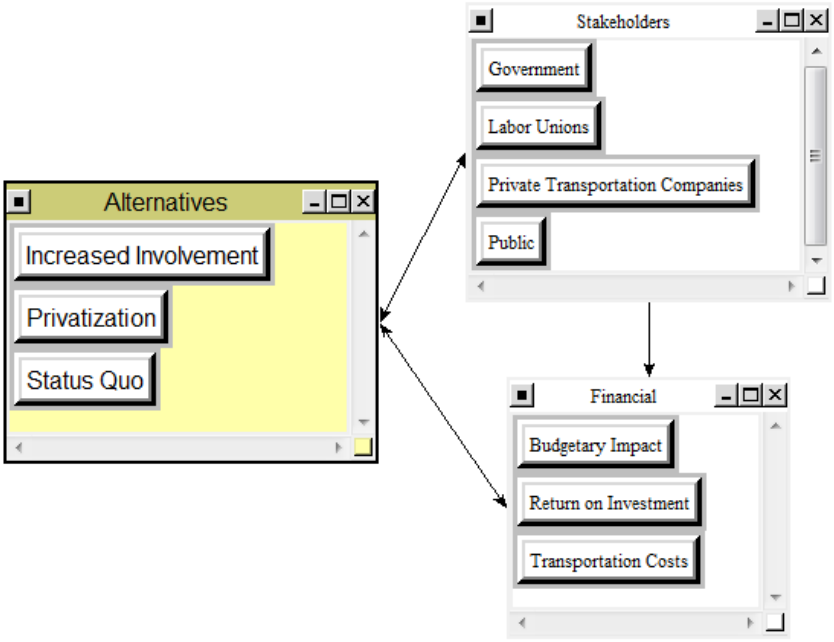
The social cost is the effect on the moral on the city, the livability of the city (meaning jobs and means of getting to your job) in relation to the stakeholders.



4.4 Risk

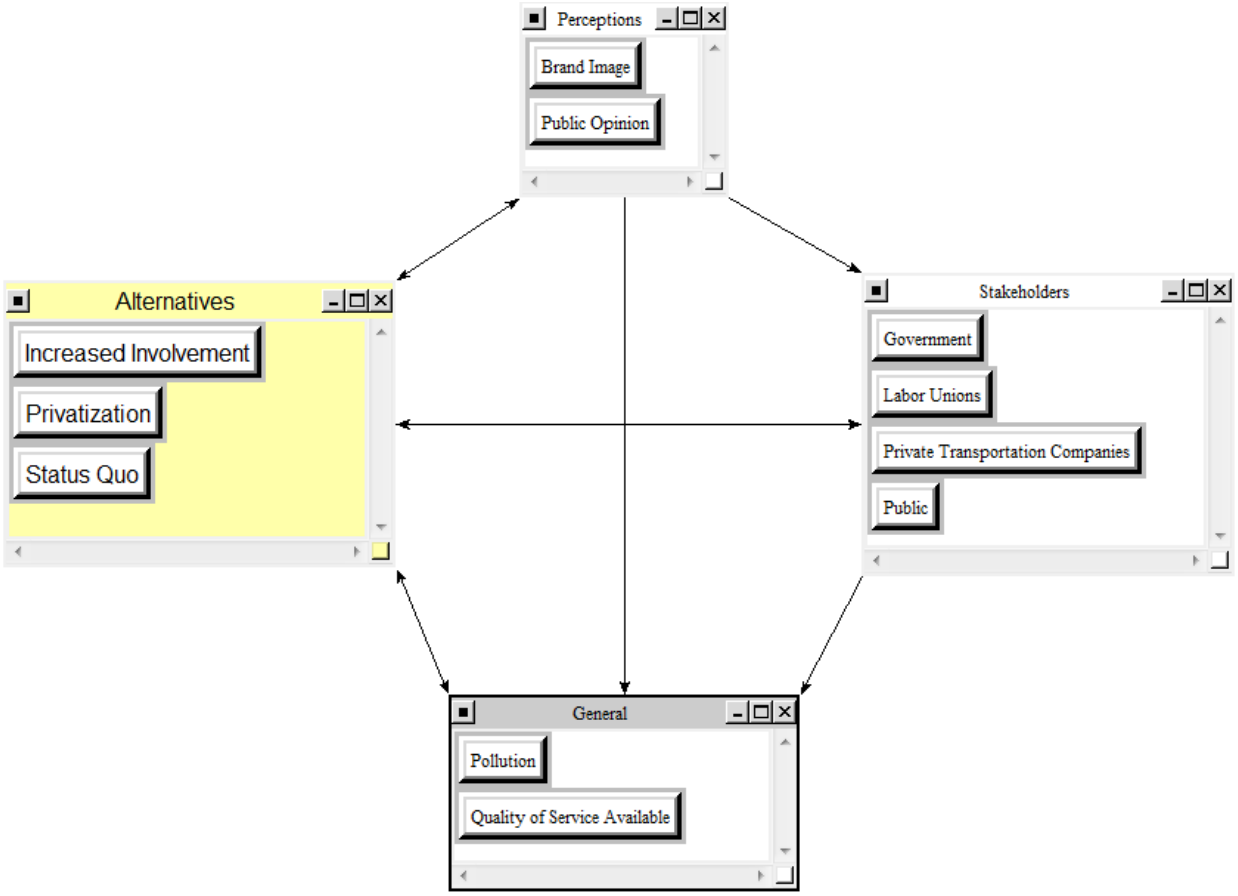
4.4.1 Economic

The risk is related to the amount of finding ROI, and costs to the public.



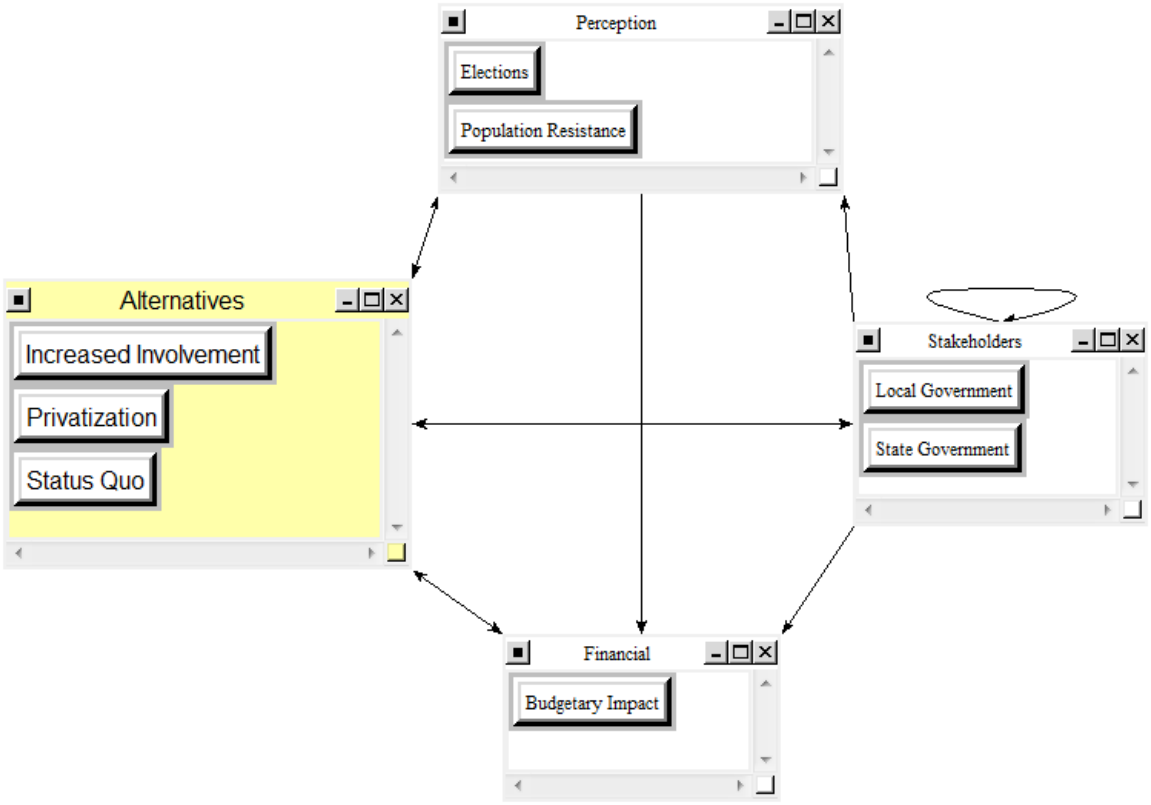
4.4.2 Social

The social risk is related to the public perception (image and opinion) and the effect on pollution and quality of service based on the stakeholders when evaluated against the alternatives.



4.4.3 Political

The political risk is the public perception and the financial impact against the state and local government.


Perception
Elections
Population Resistance
Alternatives
Increased Involvement
Privatization
Status Quo
Stakeholders
Local Government
State Government
Financial
Budgetary Impact

5 Results

As all nodes and clusters were compared based on their relationship with one another, the best solutions reached with the model was for the government to pursue an **increased involvement** based on both the additive negative and multiplicative results.

The multiplicative results (short term):

Name	Graphic	Ideals	Normals	Raw
Increased Involvement		1.000000	0.769328	4.248228
Privatization		0.053337	0.041034	0.226589
Status Quo		0.246498	0.189638	1.047180

The additive negative results (long term):

Name	Graphic	Ideals	Normals	Raw
Increased Involvement		1.000000	0.605365	0.362878
Privatization		-0.356023	-0.215524	-0.129193
Status Quo		0.295872	0.179111	0.107365

5.1 Benefits Results

The highest priority alternative from the Benefits model was “Increased Involvement”, as shown below.

Name	Graphic	Ideals	Normals	Raw
Increased Involvement		1.000000	0.478795	0.969666
Privatization		0.524240	0.251003	0.508337
Status Quo		0.564337	0.270202	0.547219

5.2 Opportunities Results

The highest priority alternative from the Opportunities model was “Increased Involvement”, as shown below.

Name	Graphic	Ideals	Normals	Raw
Increased Involvement		1.000000	0.509547	1.000000
Privatization		0.397163	0.202373	0.397163
Status Quo		0.565363	0.288079	0.565363

5.3 Costs Results

The highest priority alternative from the Costs model was “Privatization”, as shown below.

Name	Graphic	Ideals	Normals	Raw
Increased Involvement		0.257651	0.144601	0.257651
Privatization		1.000000	0.561231	1.000000
Status Quo		0.524149	0.294168	0.524149

5.4 Risks Results

The highest priority alternative from the Costs model was “Privatization”, as shown below.

Name	Graphic	Ideals	Normals	Raw
Increased Involvement		0.994262	0.378498	0.885897
Privatization		1.000000	0.380682	0.891010
Status Quo		0.632602	0.240820	0.563654

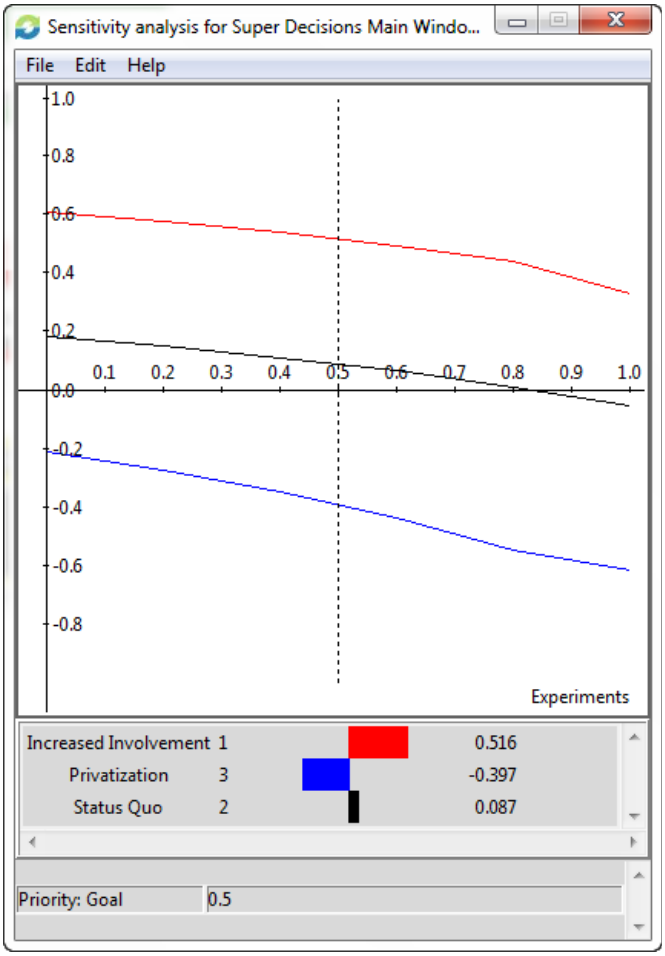
6 Sensitivity Analysis

The sensitivity analysis was performed taking into consideration the Benefits, Costs, Opportunities and risks as independent variables. **All the analysis confirmed “Increased involvement” as the best possible decision for this problem.**

In a situation where “Increased involvement” cannot be chosen as alternative any longer, the sensitivity analysis would provide further comparison between “Privatization and “Status Quo” This could be useful since the priorities of these two are similar.

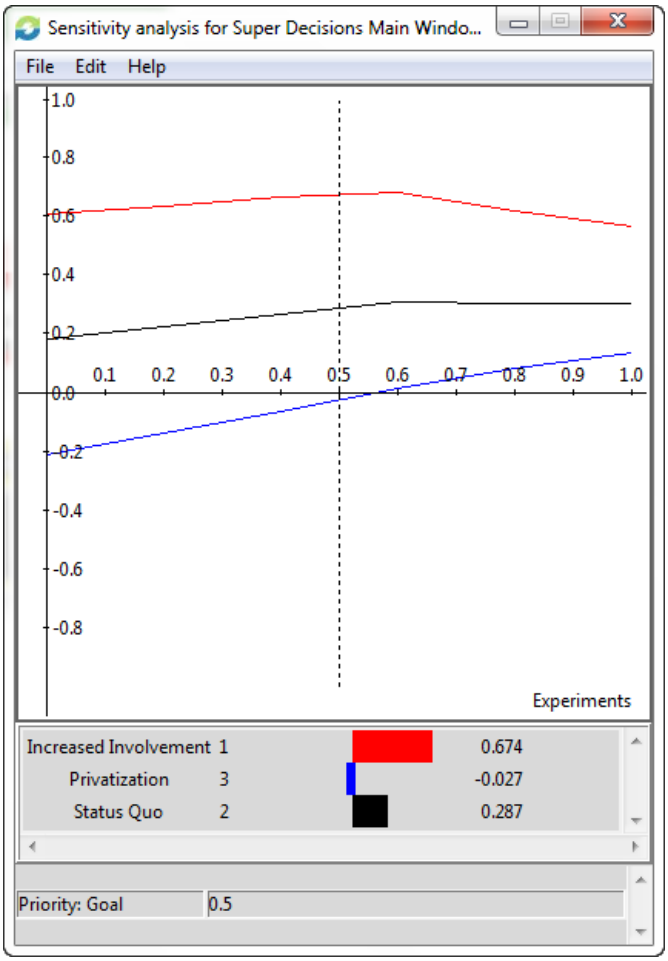
6.1 Benefits

This sensitivity analysis demonstrates that increased involvement is the best across the board because as we change the priority the decision stays the same.
Likewise, in the determination of the second best alternative, the preferred alternative is status Quo.



6.2 Costs

This sensitivity analysis on costs as the independent variable also demonstrated that increased involvement is the best possible decision.
When determining the second best alternative, only when the priority is very high, Status Quo will come close to the increased involvement.

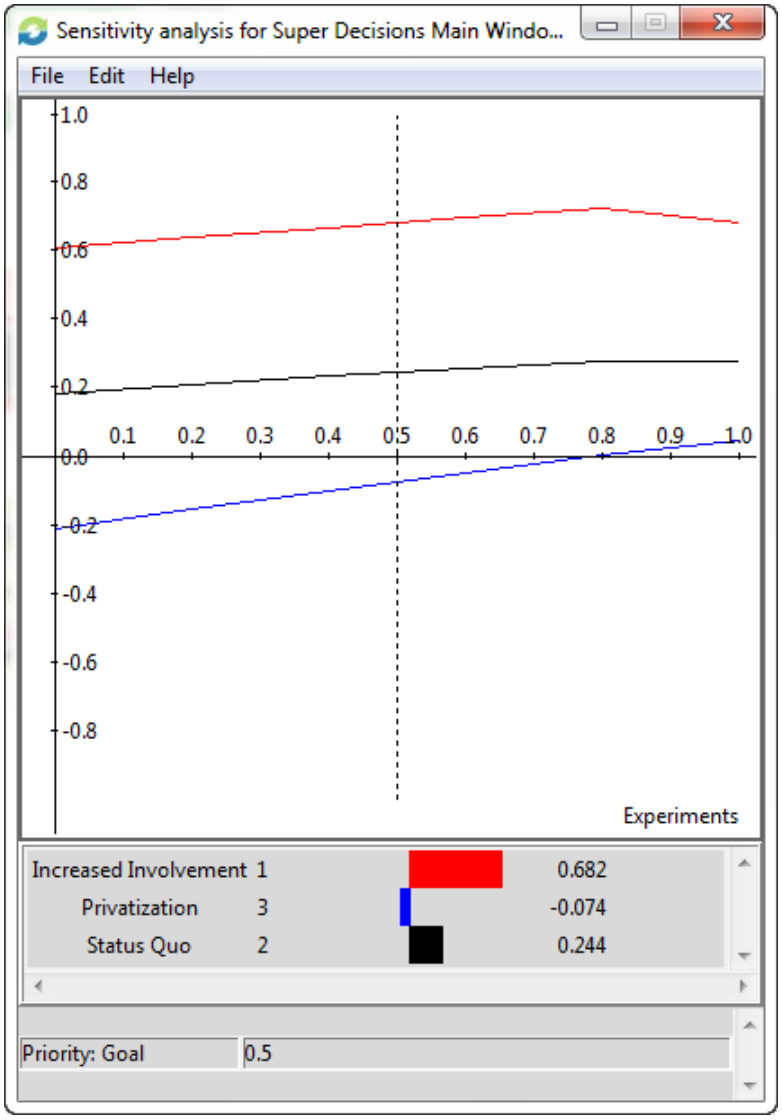


6.3 Risks

Along with costs, this can be considered one of the two most important analysis due to the nature of this problem.

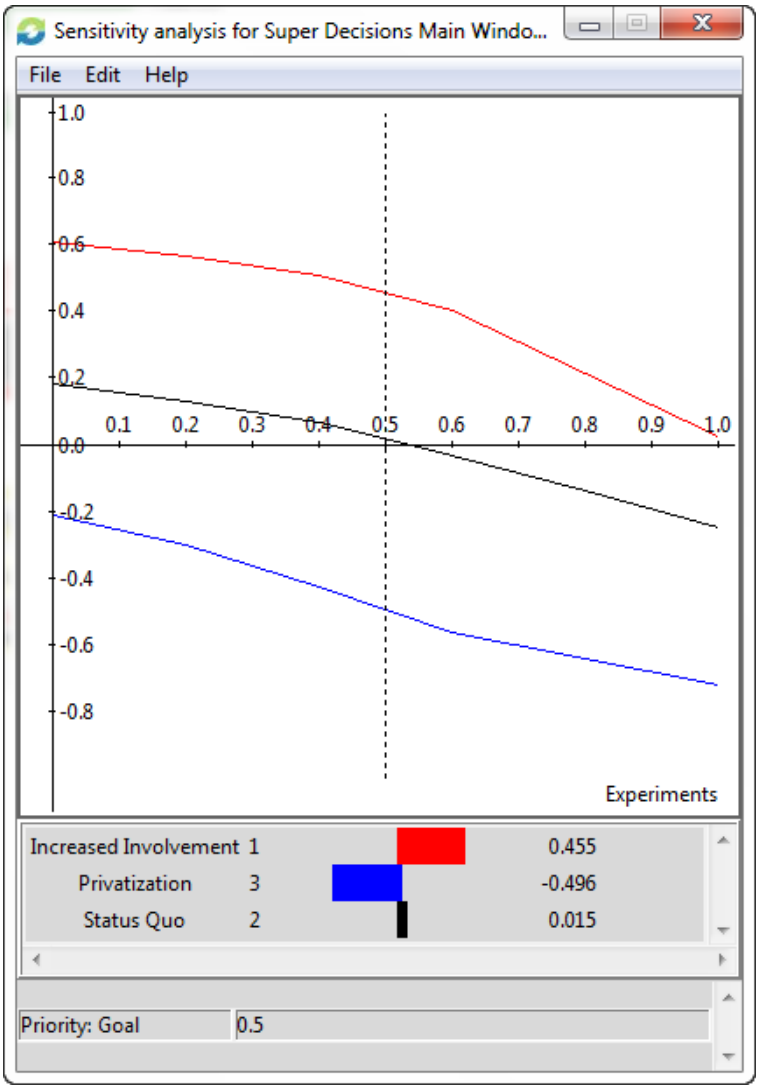
This analysis demonstrated that increased involvement is the decision that will provide the lowest exposure to risk.

Status Quo appears as the second best alternative.



6.4 Opportunities

Finally, the sensitivity analysis on opportunities also demonstrated that increased involvement is the best possible decision. The second best alternative is status quo.



7 Conclusion

By using the additive negative formula, the model synthesized that increased involvement would be the best decision with a 49% normalized priority, while the other two options were nowhere close to each other because privatization was a negative percent.

To reach this decision, it took into consideration many variables that embrace all the stakeholders of a project of this nature, such as public riders, government, politicians, community, etc.

We can conclude that the choice for the increased involvement can be taken with a considerable amount of comfort by the deciders of this issue. The only factors that we cannot accurately predict and might change the outcome significantly would be the people factor (i.e. if people will approve funding, re-elect politicians, and peoples overall response to the decisions). People are unpredictable and therefore cannot be 100% accurately predicted by the AHP model.

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