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BOCR Model – Final Project
Decision Making in Complex Environments

Problem:

COVID-19 has turned every facet of life, work, and leisure on its head and left them all in a state of uncertainty. Nothing and no one have been able to escape its grasp, and the University of Pittsburgh is no exception. Due to the concerns for public health and the restrictions placed by the state and other governmental bodies, the ability to have large gatherings is greatly reduced. Since the University of Pittsburgh relies on their undergraduate student body converging in Oakland from all over the world, there are severe consequences for bringing them back to campus, as well as ushering them away. Due to this situation, the University of Pittsburgh is grappling with the question of how to deliver undergraduate classes in the fall. In an effort to make the best decision for the University of Pittsburgh, a BOCR analysis and model will conducted to help them decide the best course of action.

Goal:

For the University of Pittsburgh decision makers to decide how to offer classes for the Fall 2020-2021 Term.

Strategic Criteria:

The University of Pittsburgh's stated strategic priorities as presented in "The Plan for Pitt: Making a Difference Together – Academic Years 2016-2020" are as follows:

- Consistently Deliver Excellence in Education
- Impact Through Pioneering Research
- Build Community Strength
- Extend Our Global Reach
- Provide Top Value
- Secure an Adequate Resource Base

An additional priority that is worth including (especially since COVID has caused a recession and is directly impacting the University of Pittsburgh's ability to generate revenue) is:

- Be Profitable

Since Pitt's stated strategic priorities are all encompassing for the University as a whole, some values do not directly apply to offering undergraduate classes. The strategic criteria used for the BOCR analysis in their priority order are:

1. Consistently Deliver Excellence in Education
2. Be Profitable
3. Provide Top Value
4. Build Community Strength
5. Extend Our Global Reach

Alternatives:

The alternatives available for the University of Pittsburgh to choose from are:

1. Offer classes in their traditional manner (primarily in-person)
    - This would essentially commit to offering classes in the accustomed manner for undergraduates, which involves students meeting in classrooms along with occupying Oakland and the surrounding areas

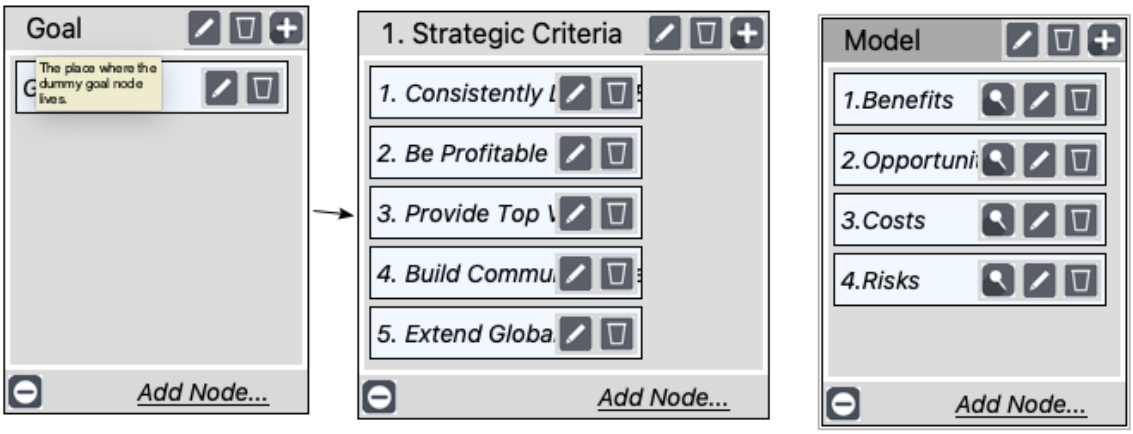
2. Offer online classes
    - This would essentially commit to offering all classes in an online format, which involves students meeting through ZOOM sessions, submitting assignments through CANVAS, and taking tests on their computers

3. Offer hybrid-style classes
    - The would be a mix on the online learning format and the traditional learning format. The purposed method is an in-person first part of the semester (running through Thanksgiving break) and an online second part of the semester (after Thanksgiving break) that is used for finals.

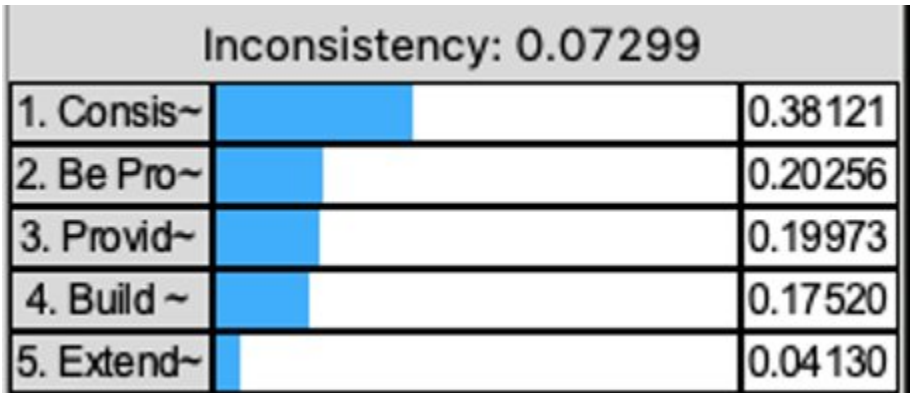
~~4. Cancel classes~~
    - ~~This would cancel all classes for the semester. While far from ideal, many higher education colleges and universities have already been forced into this course of action.~~
        - Although it is a possible alternative it is very unlikely for this to be selected as it contradicts many of the University's values and obligations to their students, as such it has been ruled out
            - An attempt was made to include this alternative in the BOCR model, however when it was included the inconsistency measure would not fall below .10, and as such was removed as an alternative in the model

BOCR Model

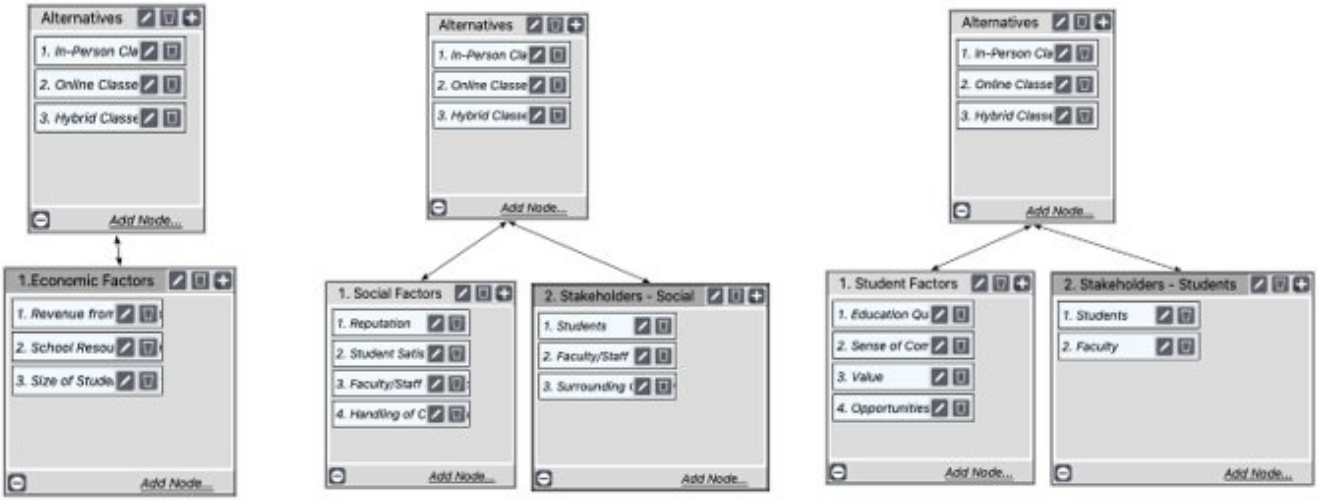
The BOCR model template was used in SuperDecisions to setup the initial model. At the top-level Goal cluster was connected to all the nodes in the Strategic Criteria cluster. The Alternatives cluster was left unconnected at the top level and is connected to the strategic criteria using a ratings model, once all the bottom level networks were established.



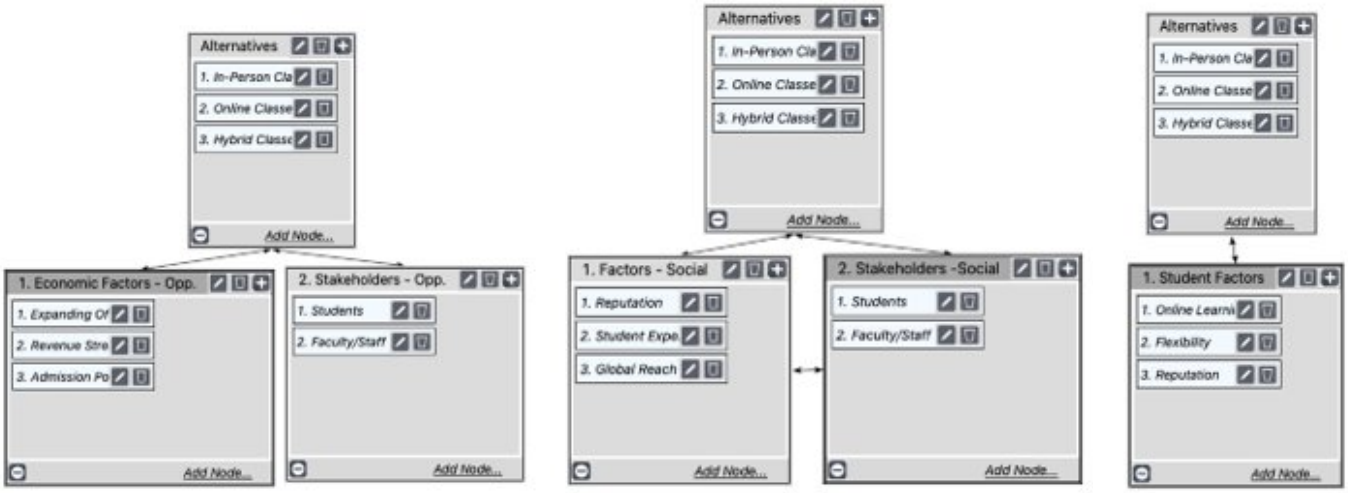
The weights of the strategic criteria were established using pairwise comparisons, with careful consideration to ensure that the inconsistency level was below .10. The actual weights used are shown below.



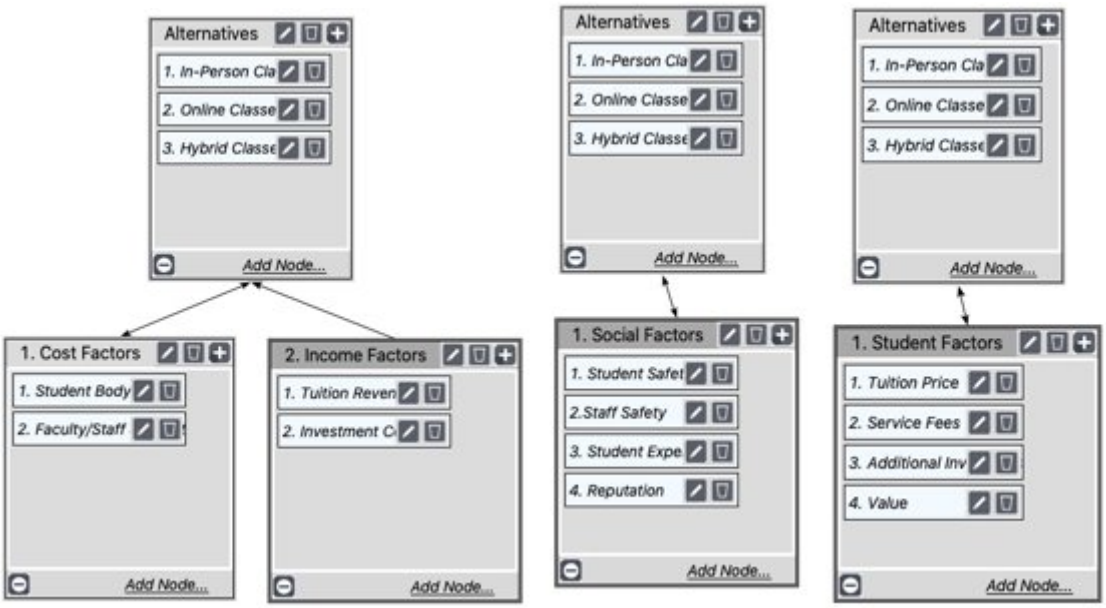
The next step was to create the lower level networks for the Benefits, Opportunities, Costs, and Risks. The Benefits network consisted of three control criteria, Economic Factors, Social Factors and Student Factors. They were modeled as shown below.



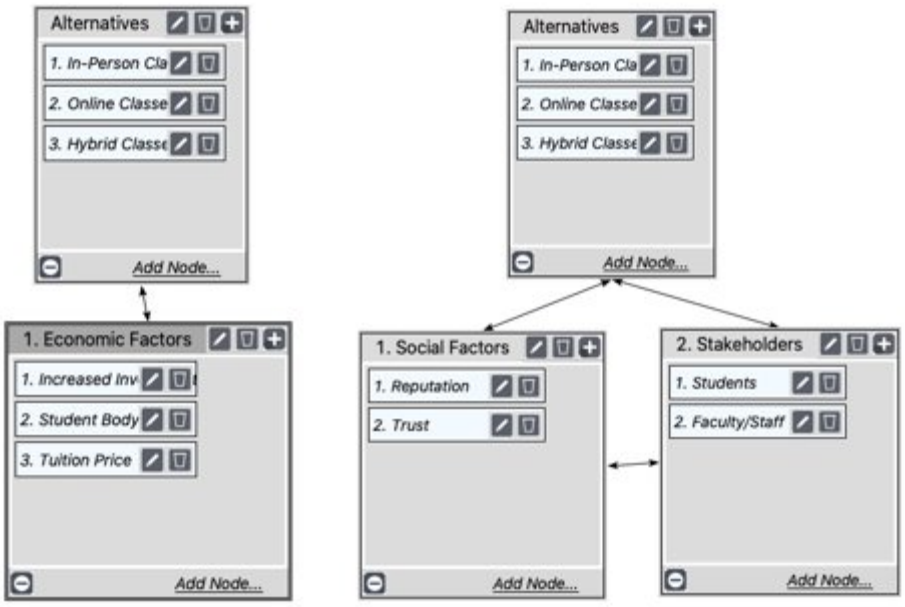
The Opportunities network consisted of three control criteria, Economic Factors, Social Factors, and Student Factors. They were modeled as shown below.



The Cost network consisted of three control criteria, Cost (Economic) Factors, Social Factors, and Student Factors. They were modeled as show below.



The Risk network consisted of two control criteria, Economic Factors and Social Factors. They were modeled as shown below.



Once the networks were setup the pairwise comparisons for each network were entered, with special consideration paid to the inconsistency value to ensure it stayed below .10. Once completed the results for each of the BOCR networks were determined. The most beneficial alternative was in-person classes, the most opportunity alternative was online classes, the most costly alternative was online classes, and the most risky alternative was in-person classes. The results of the network and the best alternative in each network is shown below.

Benefits

Inconsistency 0

	Economic	Social	Students	Final
	0.57	0.29	0.14	Most Beneficial
1. In-Person Classes	56%	44%	61%	52%
2. Online Classes	18%	15%	13%	16%
3. Hybrid Classes	26%	41%	27%	31%

Costs

Inconsistency 0.05156

	Economic	Social	Students	Final
	0.63	0.17	0.19	Most Costly
1. In-Person Classes	25%	39%	25%	25%
2. Online Classes	43%	27%	43%	41%
3. Hybrid Classes	32%	35%	32%	35%

Opportunities

Inconsistency 0.00885

	Economic	Social	Students	Final
	0.42	0.13	0.46	Most Opportunity
1. In-Person Classes	32%	40%	16%	27%
2. Online Classes	36%	21%	49%	39%
3. Hybrid Classes	32%	39%	35%	34%

Risks

Inconsistency 0

	Economic	Social	Final
	0.50	0.50	Most Risky
1. In-Person Classes	17%	53%	34.0%
2. Online Classes	49%	14%	32.3%
3. Hybrid Classes	34%	33%	33.7%

Once the results for each network were established a ratings model was created for the top level of the model. The winning alternative in each network was then rated for each of the strategic criteria. The ratings for each of the winning alternatives for each of the criteria are show below.

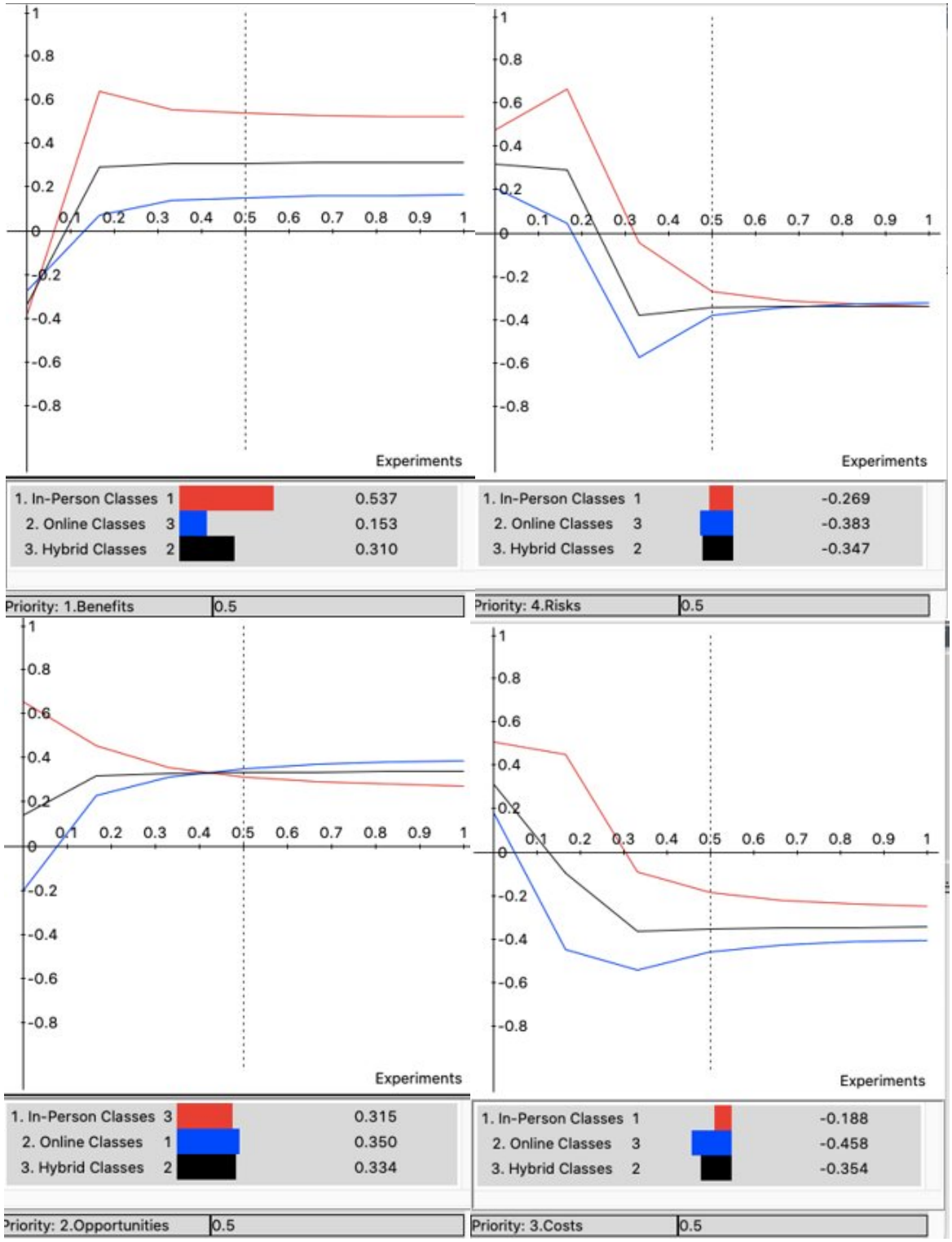
Alternatives	Priorities	Totals	1. Consistently De... (0.3812)	2. Be Profitable (0.2026)	3. Provide Top Val... (0.1997)	4. Build Communit... (0.1752)	5. Extend Global R... (0.0413)
1.Benefits	0.4885	0.8360	Above Average	Hi	Excellent	Excellent	Below Average
2.Opportunities	0.1757	0.3007	Average	Med	Average	Poor	Excellent
3.Costs	0.0781	0.1336	Below Average	Lo	Poor	Average	Poor
4.Risks	0.2577	0.4409	Above Average	Med	Average	Average	Poor

Once the ratings is completed the whole model is synthesized to obtain the final results. The additive-negative method is used to determine the best solution for the long-term. The multiplicative method is used to determine the best solution for the short-term. Based on this BOCR model the best solution for the long-term and short-term is to deliver classes in-person for the Fall 2020-2021 semester.

Alternative	Long Term (Additive Negative)	Short Term (Multiplicative)
1. In-Person Classes	58%	55%
2. Online Classes	12%	16%
3. Hybrid Classes	30%	30%

Sensitivity Analysis:

The sensitivity analysis for this BOCR model is shown below. There is no rank reversals for the Costs or Risks. There is one rank reversal for the Benefits, when the weight applied is below 5% the rankings are in the reverse order. The biggest change is for the Opportunities. As the weight applied to this network approaches 40%, the ranking order converge, and once it surpasses 40% the 1st ranking alternative and the 3rd ranking alternative reverse.



Conclusion:

Based on this BOCR model the best solution for the decision makers of the University of Pittsburgh to choose is to offer classes in-person for the Fall 2020-2021 semester in both the short-term and the long-term. However, based on the current situation (how they have implemented work from home orders and already turned the second half of the past Spring semester along with the current Summer semester into online classes), I thought the model would recommend hybrid classes as the final result. A hybrid offering would be the middle ground between the online and in-person solutions and would allow for the mitigation of the downsides of those two

offerings. It seemed like the best way to maximize the educational offering while minimize the risk to student safety.

This model may have failed to return a hybrid result for a couple of reasons. The costs associated with implementing online and hybrid classes may have been lower than expected because the University already had to invest in online learning solutions for the second part of the Spring semester. It is also possible that the weight attributed to the Being Profitable Strategic Criteria was too much, which would cause the model to weigh the in-person alternative more favorably.

Ultimately, the University of Pittsburgh decided to go with a “hybrid” offering. However, this hybrid solution involved a student's spending a large percentage of time on campus, largely acting like an in-person offering. Time will tell if this is the best solution for the University, and lends itself to some interesting questions regarding the Spring 2020-2021 semester.