Project Report Framework

OR 6205: Deterministic Operations Research

Road Trip BOS-FLO

Your Name: _____

How to Use This Framework

This framework provides the structure for your individual report. Each section includes guidance on what to address and how it connects to the grading rubric. Use these prompts to ensure you demonstrate your understanding of the full project, not just the parts you personally worked on.

Remember: This is YOUR report demonstrating YOUR understanding of the collaborative work. Write in your own voice and show that you can explain and defend any aspect of the analysis.

Length recommendations in each section.

Executive Summary (half a page)

Write this section last, after completing the rest of the report.

Provide a brief overview (approximately half a page) that includes:

- The problem you analyzed and why it matters
- Your modeling approach (brief)
- Key findings from both models
- Your primary recommendation and its main caveat

A busy decision-maker who reads only this section should understand what you did, what you found, and what you recommend.

1. Problem Definition (around 1 page)

Rubric connection: Supports Decision and Assumption Justification; Communication Effectiveness

1.1 The Problem

Describe the problem you are solving in clear, non-technical language. Address:

- What situation or challenge does this analysis address?
- Why does this problem matter? What is at stake?
- Who is the primary decision-maker? What decision do they need to make?

1.2 Stakeholders

Identify who is affected by the decisions this model informs:

- Who benefits from optimization? How?
- Who else is affected, even if they are not the decision-maker?
- Whose interests might be in tension with one another?

1.3 Scope and Boundaries

Define what your analysis includes and excludes:

- What aspects of the problem did you address?
- What did you intentionally leave out of scope? Why?
- What time frame or geographic boundaries apply?

2. Model Formulation (around 1 page)

Rubric connection: Decision and Assumption Justification; Mathematical Model Appropriateness

You developed two models with distinctive goals. Present each model clearly, explaining not just WHAT you built but WHY you made each choice.

2.1 Model 1: [Give it a descriptive name]

2.1.1 Problem Statement

State clearly: What does this model optimize? For whom? Complete this sentence:

"This model [minimizes/maximizes] _____ so that [decision-maker] can _____."

2.1.2 Decision Variables

Define each decision variable. For each variable, briefly explain why this is the right way to represent the decision.

2.1.3 Objective Function

Present your objective function mathematically and explain:

- What does this objective function measure?
- Why is this the right thing to optimize for this problem?
- What values or priorities does this objective reflect?

2.1.4 Constraints

Present each constraint and explain its purpose.

2.1.5 Assumptions for Model 1

List and justify your key assumptions. For each significant assumption, address:

- **The assumption:** What did you assume?
- **Why this assumption:** Why is this reasonable for this problem?
- **Alternatives considered:** What else could you have assumed? Why didn't you?
- **Consequence:** How does this assumption affect your results or who benefits?

- **Choice vs. constraint:** Did you make this assumption by choice, or was it imposed by data limitations, time, or scope?

Use the sentence frame: "We assumed X instead of Y because [reason connected to problem/decision-maker], and this means [specific consequence]."

2.2 Model 2: [Give it a descriptive name] (around 1 page)

2.2.1 Problem Statement

"This model [minimizes/maximizes] _____ so that [decision-maker] can _____."

How does this differ from Model 1? What different value or priority does it reflect?

2.2.2 Decision Variables

2.2.3 Objective Function

Present and explain. Specifically address: How does optimizing this objective lead to different outcomes than Model 1?

2.2.4 Constraints

2.2.5 Assumptions for Model 2

Follow the same structure as Model 1. Highlight any assumptions that differ between models and explain why.

2.3 Why These Models? (around half a page)

Mathematical Model Appropriateness

- **Model type:** What type of optimization problem is this (LP, network flow, etc.)? Why is this type appropriate for this problem?
- **Alternatives considered:** What other modeling approaches did you consider? Why did you choose this approach over alternatives?
- **Fit to problem:** How do the characteristics of your problem (linearity, structure, data availability) align with the chosen model type?

Complete this sentence: "We chose [model type] rather than [alternative] because [specific reason related to problem characteristics], and this choice means [consequence for what we can and cannot analyze]."

3. Data (around a page, not counting figures/graphs)

Rubric connection: Decision and Assumption Justification; Critical Analysis and Limitations

3.1 Data Sources

Describe the data you used.

3.2 Data Limitations

Be honest about the limitations of your data:

- What data would have been ideal but was unavailable?
- Whose experiences or situations might be underrepresented in your data?
- How might these limitations affect your conclusions?

4. Results

Rubric connection: Results Interpretation and Sensitivity Analysis

4.1 Model 1 Results (around a page, not counting figures/graphs)

Present the optimal solution clearly:

- What is the optimal value of the objective function? What does this number mean in real-world terms?
- What are the optimal values of the decision variables? What actions do these represent?
- Which constraints are binding? What does this tell you about the problem?

Go beyond reporting numbers. Interpret what the results mean for the decision-maker (y'all).

4.2 Model 2 Results (around a page not counting figures/graphs)

Present and interpret using the same approach as Model 1.

4.3 Comparison of Models

Compare the results from your two models:

- How do the optimal solutions differ?
- What trade-offs do these differences reveal?

- What does comparing these models tell you about the values embedded in the choice of objective function?

5. Sensitivity Analysis (around a page not counting figures/graphs)

Rubric connection: Results Interpretation and Sensitivity Analysis

5.1 Parameters Tested

Explain which parameters you tested and why.

Connect your choices to real-world uncertainty. Why would a decision-maker care about these parameters?

5.2 Findings

For each parameter tested, report:

- How sensitive is the optimal solution to changes in this parameter?
- At what point (if any) does the optimal decision change?
- What does this tell you about the robustness of your recommendation?

5.3 Implications for Decision-Making

Synthesize your sensitivity analysis:

- How confident should the decision-maker be in your recommendation?
- Under what conditions would your recommendation change?
- What should the decision-maker monitor going forward?

6. Recommendations

Rubric connection: Recommendations

6.1 Recommended Action (around a page)

Based on your analysis, what do you recommend the decision-maker do? Be specific and actionable.

- How do your results support this recommendation?
- How does your sensitivity analysis affect your confidence in this recommendation?

6.2 Caveats and Conditions (half of page)

Under what conditions does this recommendation apply?

- What assumptions must hold for this recommendation to be sound?
- What circumstances would warrant revisiting this analysis?
- What factors should the decision-maker monitor?

6.3 Stakeholder Considerations (a couple of sentences would suffice, it is up to you)

Address how your recommendation affects different stakeholders:

- Who benefits from this recommendation?
- Who might be disadvantaged? How might this be mitigated?
- Are there implementation considerations related to stakeholder buy-in?

7. Limitations and Critical Reflection

Rubric connection: Critical Analysis and Limitations

7.1 Model Limitations (half page)

What can your model not capture? Be honest:

- What aspects of the real-world problem did your model simplify or ignore?
- What assumptions might not be held in practice?
- How might these limitations affect the reliability of your recommendations?

7.2 Unintended Consequences (A couple of sentences)

How might your recommended solution create new problems?

- What could go wrong if your recommendation is implemented?
- Are there potential negative effects on stakeholders not fully represented in your model?

7.3 Team Blind Spots (A couple of sentences)

Reflect on your team's perspectives:

- What perspectives might your team have been missing?
- How might your collective backgrounds and experiences have shaped your analysis?
- How could these blind spots affect your conclusions?

This reflection should be honest and specific, not generic. Every team has blind spots, acknowledging them is a sign of analytical maturity.

7.4 Future Work

If you had more time or data, what would you explore?

- What questions remain unanswered?
- What additional analysis would strengthen your conclusions?
- What data would help address your limitations?

8. Conclusion

Briefly summarize (one-half page):

- The problem and its significance
- Your approach and key findings
- Your recommendation and its basis
- The most important limitations to keep in mind

References

List any sources you used: textbook, external data sources, articles, tools.

Appendices (as needed)

Include supporting material that would interrupt the flow of the main report:

- Detailed mathematical formulations
- Complete data tables
- Additional sensitivity analysis results
- Code – Google Colab link **(needed)**

Reference appendices in the main text where appropriate.

Questions? Contact me by email or Teams.

Disclaimer: I used Claude AI to improve and verify the completeness of the framework against my rubric, learning objectives, and specifications.