



The Hidden Cost of Delay

Using Data to Decide Which TTC Route Should Be Prioritized



Every day, people rely on the TTC to get to school, work, appointments, grocery stores, community programs, and home. When transit is reliable, people have more control over their time. When transit is unreliable, the cost is not only measured in minutes. It can mean arriving late, feeling stressed, missing part of a class, losing wages, missing an appointment, or having less time with family.

In this task, you will work in a group as data analysts representing a TTC stakeholder. The TTC has limited funding and can only prioritize one route for reliability improvements. Your group will help decide which route should be improved.

As new information is introduced, your group's thinking may change. You will begin with an early judgment, analyze data, consider different priorities, discuss trade-offs, and revise your recommendation before making a final decision.

How to Use This Processfolio

Use this processfolio to record your thinking as it develops. Do not worry if your first answer changes. The goal is to show how your group uses new evidence, notices trade-offs, and builds a stronger recommendation over time.

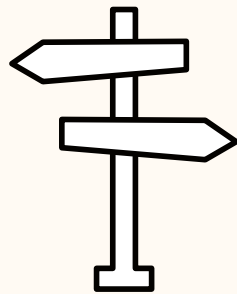
The Question Guiding Our Investigation

As you work through this task, keep returning to this question:

How can data help us determine which TTC route should be prioritized to improve reliability and better serve Toronto riders?

This question will guide each part of the processfolio. At first, you may answer it using your own instincts. Later, your answer may change as you analyze delay data, rider impact, funding limits, accessibility needs, and equity concerns.

By the end, your group should be able to answer this question with evidence, not just opinion.



Learning Launch

The TTC is considering three routes

Route A - Frequent small delays

Route B - Fewer delays, but severe when they happen

Route C - Moderate delays, but many more riders



- **Which route would you prioritize first? Why?**
- **What makes a delay “serious”?**
- **What information would you need before making a fair decision?**

Now that you have made your first judgment, your group will be assigned a stakeholder role. This role may affect which criteria matter most in your recommendation.

In this task, your group will act as data analysts representing a TTC stakeholder group. The purpose of the stakeholder role is to show that public decisions are not made from data alone. Different groups may look at the same evidence but care about different priorities, such as reliability, cost, accessibility, fairness, or the number of riders affected.

Your task is to help decide which **one** TTC route should be prioritized for reliability improvements. As you move through the processfolio, new data will be introduced to help your group think more carefully about the decision.

By the end, your group will recommend one route, explain the criteria that mattered most to your stakeholder, and use mathematical evidence to support your decision. You will also consider trade-offs and explain how your chosen improvement could better support the daily lives of Toronto riders.

Your group will share your recommendation with another stakeholder group for feedback before presenting your final decision to the **Transit Reliability Review Committee**.

Stage 1: Deciding What Matters

Focus Inquiry: *What should count as reliable?*



Four stakeholder groups are looking at the same TTC problem. One cares most about system efficiency, one about public benefit, one about accessibility, and one about fairness. Do you think they will all choose the same route to improve? What might make their choices different?

1

TTC Operations Team

"Our job is to keep the transit system moving. When buses are delayed, the whole system becomes harder to manage. We care about reducing delays, improving on-time performance, and making service more predictable for riders and operators."

2

Toronto City Council

"We have limited public funding, so we need to make a decision that creates the greatest benefit for the city. We care about how many riders are affected, whether the improvement is worth the cost, and whether the investment can be justified to the public."

One TTC problem.

Four stakeholder perspectives.

One final recommendation.

3

Accessibility Advisory Committee

"Reliable transit is especially important for riders who depend on the TTC for essential and accessible trips. We care about whether routes connect riders to hospitals, clinics, seniors' residences, Wheel-Trans connections, and other services that support independence and daily life."

4

Community Transit Equity Coalition

"Transit reliability is also an issue of fairness. Some communities have fewer transportation options, fewer rapid transit alternatives, or more households without cars. We care about whether improvements support riders and neighbourhoods that depend most heavily on public transit."



Use these criteria to think about what your stakeholder group values most. You do not need to treat every criterion equally.

Reliability — How often do delays happen, how long do they last, and can riders realistically plan around them?

Rider Impact — Does this route affect a small number of riders, or does it add up to significant lost time across many people?

Cost-Benefit — Does the expected improvement justify the cost of the fix?

Accessibility Need — What's at stake for access to hospitals, clinics, seniors' residences, Wheel-Trans connections, and other essential services?

Equity / Transit Dependence — Who relies on this route most — car-free households, lower-income households, or areas with few nearby rapid transit alternatives?

Review all five criteria. Rank each criterion from 1–5 based on how important it is to your stakeholder group. Then choose your top three and explain why they matter.

Criterion	Priority Ranking
Reliability	
Rider Impact	
Cost-Benefit	
Accessibility	
Dependence	

Our Top Three Priorities

Based on our stakeholder role, our top three criteria are:

- 1.
- 2.
- 3.

We chose these because: _____

Stage 2: Looking Beneath “Late”

Focus Inquiry: *What does the reliability data show about each route?*



Which route looks least reliable so far? What number are you paying most attention to?

Route	Delay Incidents	Average Delay	On-Time Performance
Route A	300	7 min	85.0%
Route B	180	14 min	88.0%
Route C	240	10 min	86.7%





In the launch, you may have focused on one number, such as delay incidents, average delay, or on-time performance. But reliability can mean more than one thing. A route might have frequent delays, long delays, unpredictable delays, or lower on-time performance.

In this inquiry, your group will look beneath the word “late” and use several measures to decide what kind of reliability problem each route has.

The table below shows different ways to measure route reliability: how often delays happen, how long they last, and how predictable each route is. Use the table to calculate the probability of delay for each route:

$$\text{Probability of delay} = \text{delay incidents} \div \text{scheduled trips}$$

Then compare the measures and complete the **Reliability Analysis** table to decide what kind of reliability problem stands out most for each route.

Route	Scheduled Trips	Delay Incidents	Average Delay	Median Delay	Standard Deviation	On-Time Performance
Route A	2,000	300	7 min	6 min	3 min	85.0%
Route B	1,500	180	14 min	10 min	9 min	88.0%
Route C	1,800	240	10 min	9 min	5 min	86.7%

Reliability Measures

Probability of delay — how often delays happen compared to the number of scheduled trips.

Mean delay — the average delay length.

Median delay — the typical delay length, less affected by extreme delays.

Standard deviation — how spread out or unpredictable the delays are.

On-time performance — how often the route runs as expected.

Reliability Analysis

Route	Probability of Delay	Main Reliability Concern	Evidence	What this Means for Riders
Route A				
Route B				
Route C				

Explain what reliability concern stands out the most so far.

Stage 3: Measuring the Cost of Delay

Focus Inquiry: Which route creates the greatest public impact?



Route B has the longest average delay. Route A has the most riders. Route C has moderate delays and high ridership. **Which route do you think creates the greatest public impact?**

Route	Estimated Daily Riders	Estimated Improvement Cost
Route A	42,000	\$4.2M
Route B	24,000	\$2.6M
Route C	35,000	\$3.8M

Should funding go to the route with the worst delays, the most riders, or the greatest total delay burden?



Use your probability of delay and average delay from Stage 2. Combine them with daily ridership data to calculate expected rider-delay burden. Then compare this burden with the estimated improvement cost to think about cost-benefit.

The TTC has a mock budget of **\$4 million**. Only one route improvement can be funded. A route slightly over budget can still be recommended, but your group must explain why the extra cost is worth it.

Examples:

If a route has a 10% probability of delay, an average delay of 8 minutes, and 20,000 daily riders:

$$0.10 \times 8 \times 20,000 = 16,000 \text{ rider-minutes per day.}$$

If a route has an expected rider-delay burden of 20,000 rider-minutes per day and costs \$4M to improve:

$$20,000 \div 4 = 5,000 \text{ rider-minutes per \$1M}$$

Route	Probability of Delay	Average Delay	Estimated Daily Riders	Expected Rider-Delay Riders	Improvement Cost	Rider-Delay Burden per \$1M
Route A						
Route B						
Route C						

1. Which route has the greatest total rider-delay burden?
2. Which route gives the strongest cost-benefit result?
3. Did this change your thinking from Stage 2? Why or why not?

Stage 4: Whose Needs Are Hardest to Ignore?

Focus Inquiry: How should accessibility and equity shape the final recommendation?



Route C creates the most total rider-delay burden, but Route B serves more hospitals, seniors' residences, Wheel-Trans transfer points, low-income households, car-free households, and has fewer rapid transit alternatives. **Should Route B still be prioritized over Route C?**

Route	Expected Rider-Delay Burden	Approx. Rider-Hours Lost per Day	Hospitals / Clinics	Seniors' Residences	Wheel-Trans Transfer Points	Low-Income Households	Car-Free Households	Rapid Transit Alternatives
Route A	44,100 rider-min/day	735 rider-hours /day	1	3	1	22%	32%	High
Route B	40,320 rider-min/day	672 rider-hours /day	2	6	3	31%	46%	Low
Route C	46,550 rider-min/day	776 rider-hours /day	1	4	2	27%	39%	Medium

Should a route serving fewer total riders ever be prioritized over a route serving more riders? Why or why not?



By this point, your group has looked at several kinds of evidence: reliability, rider impact, cost-benefit, accessibility need, and equity/transit dependence. The data may not all point to the same route.

1. Which route has the strongest accessibility case?
2. Which route has the strongest equity/transit-dependence case?
3. What evidence supports this?
4. Does this evidence challenge your recommendation so far?
5. Should accessibility and equity change how your stakeholder weighs the routes?

Stage 5: Making the Case

You have now investigated reliability, rider impact, cost-benefit, accessibility, and equity. The evidence may not all point to the same route. Use the weighted decision matrix to organize your evidence and build a recommendation your group can defend.

A weighted decision matrix will help your group organize the evidence and make your final recommendation. This does not mean the matrix makes the decision for you. Your group still needs to decide which criteria matter most for your stakeholder role and explain why.

Step 1: Assign Weights

Use your stakeholder role and your criteria ranking to decide how important each criterion should be. Your weights must add up to **100%**.

Give the highest weights to the criteria that matter most to your stakeholder group. The other criteria should still receive some weight so they are not ignored completely. Add each weight to **Table 1: Weights and Scores**.

Step 2: Score Each Route

Use the scale below to score each route for each criterion.

A score should be based on the data, not just preference.

For example, if one route has the strongest evidence for accessibility need, it should receive the highest score for that criterion. Add the scores to **Table 1: Weights and Scores**.

Scores:

Score	Meaning
5	Strongest evidence / best fit
4	Strong evidence
3	Moderate evidence
2	Weak evidence
1	Weakest evidence

Step 3: Calculate Weighted Scores

For each route, multiply the criterion weight by the route score and add it to **Table 2: Weighted Score Totals**.

Weighted score = weight × route score

Example:

If *Reliability* has a weight of **30%** and Route A receives a score of **4**:

$$0.30 \times 4 = 1.20$$

Step 4: Complete Table 2

Use **Table 2** to show each route's weighted score calculation. Add the weighted scores together to find each route's total weighted score.

The route with the highest total weighted score may be your strongest recommendation. Please explain the trade-offs, limitations, and why your recommendation makes sense from your stakeholder's perspective.

Table 1: Weights and Scores

Criterion	Weight	Route A Score	Route B Score	Route C Score	Why did we weight this criterion this way?
Reliability					
Rider Impact					
Cost-Benefit					
Accessibility					
Equity/ Transit Dependence					

Table 2: Weighted Score Totals

Route	Weighted Score Calculation	Total Weighted Score
Route A		
Route B		
Route C		

1. **Our stakeholder group recommends Route ___ because...**
2. **The strongest evidence for our recommendation is...**
3. **One trade-off or weakness in our recommendation is...**
4. **Another stakeholder might disagree because...**

Stage 6: Recieving Peer Feedback

Before presenting your final recommendation, your group will share your thinking with another stakeholder group. Their job is not to mark your work. Their job is to help you test your reasoning by asking questions about your evidence, criteria, assumptions, and trade-offs.

Our Recommendation So Far

Our stakeholder group is: _____

We are recommending Route: _____

Our main reason is:

The strongest evidence we are using is: _____

The biggest trade-off we noticed is: _____

Feedback We Received

Who gave us feedback?

Stakeholder group: _____

What question or challenge did they raise?

What part of our thinking did this feedback challenge?

- ☐ our criteria
- ☐ our evidence
- ☐ our route scores
- ☐ our weights
- ☐ our trade-off reasoning
- ☐ our Good Life connection
- ☐ other: _____

How did our group respond in the moment?

Feedback We Want to Think About More

Of all the feedback we received, the question or challenge that made us think the most was:

It made us think because:

Stage 7: Revising Our Recommendation

After the peer challenge, return to your recommendation. You do not have to change your route, but you should use the feedback to strengthen your reasoning.

Our Revision Decision

After receiving feedback, our group decided to:

- ☐ keep our recommendation the same
- ☐ revise part of our reasoning
- ☐ change our recommendation

We decided this because: _____

What We Strengthened

The part of our work we revised or strengthened was:

- ☐ our criteria
- ☐ our evidence explanation
- ☐ our weighted matrix
- ☐ our route scores
- ☐ our trade-off explanation
- ☐ our Good Life connection
- ☐ our response to another stakeholder perspective
- ☐ other: _____

Explain what changed or improved: _____

Final Recommendation Check

Our final recommendation is Route ____ because: _____

The feedback helped us make our recommendation stronger by: _____

Stage 8: Final Reflection

Complete this reflection individually

At the beginning, I thought Route ____ should be prioritized because...

Now, I think Route ____ should be prioritized because...

The evidence that most changed or strengthened my thinking was...

One assumption I had to reconsider was...

This task showed me that data-based decisions are complicated because...

Guide to Success: Questions to Check Our Thinking

Stage 1: Deciding What Matters

- What is our stakeholder role making us notice first?
- What might our group be overlooking because of that role?
- Are our top criteria based on evidence, or just what we personally care about?

Stage 2: Looking Beneath “Late”

- Which reliability number is pulling our attention most?
- Does that number tell the whole reliability story?
- Has our first judgment changed now that we can compare frequency, delay length, and predictability?

Stage 3: Measuring the Cost of Delay

- Did ridership change what we thought was the biggest problem?
- What does rider-delay burden show that average delay alone does not?
- What does rider-delay burden still hide?

Stage 4: Accessibility and Equity

- Who might be overlooked if we only choose the route with the biggest total number?
- Which riders have fewer alternatives when transit is unreliable?
- How should fairness affect our recommendation?

Stage 5: Making the Case

- Do our weights honestly match our stakeholder role?
- Are our scores based on evidence, or are we trying to justify the route we already wanted?
- What trade-off are we accepting?

Stage 6: Peer Feedback

- What did another group notice that we missed?
- Which question made our recommendation feel less certain?
- Did we actually consider the feedback, or just defend our answer?

Stage 7: Revision

- What part of our reasoning became stronger?
- Did we change our route, or strengthen our explanation?
- How is our final recommendation better than our first idea?

Stage 8: Final Reflection

- How did my thinking change from the launch to the final recommendation?
- Which evidence mattered most?
- What did this task show me about using data to make public decisions?