WORKBOOK

Analytics for Decision-Making

Instructor: Jen Schellinck
with Tristan Shaeen

Description: Data analytics improves the use of evidence-based solutions to solve difficult governance problems. Organizations are increasingly turning to data to help facilitate transformational changes.

This course provides participants with a baseline knowledge of analytics to support evidence-based decision making. Participants will improve their understanding of the processes used in decision making, and the tools and techniques for the application of analytics to these processes. Discussions include the most common and useful analytics methods, techniques, and software. This course will provide participants with a knowledge base that will equip them to make improved allocations of resources in the most effective way.

This is a survey course. Programming and statistical competencies are not required.

Instructor/Facilitator: Jen Schellinck's goal is to help organizations understand the value that cutting-edge data technology can bring to their

work and success. She uses her knowledge of Artificial Intelligence, Machine Learning, and Data Science to help organizations achieve their greater potential. For each project, she provides clients with a clear path towards attaining their data supported goals, through consulting, workshops and data solutions.

Her clients include government departments (Global Affairs, Industry Canada, Health Canada and others), not for profits and corporations (focusing and SMEs).

Jen received her Ph.D. in Cognitive Science in 2009 and has been active in the A.I. field for ten years. She is currently an adjunct researcher at the Institute of Cognitive Science at Carleton University and continues to be an active researcher in the field. She has Secret Level clearance with the Government of Canada.

Tristan Shaeen is a data and Al consultant with a background in experimental psychology, statistics, and cognitive science. He has worked with both government departments and small and medium sized enterprises, providing insights into applications of analytic techniques and AI tools for operations and decision support. He specializes in data presentation, data storytelling and social science statistical training. He is also a pilot with a special interest in decision-making both within and outside the aviation industry.

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Exercise 1, Section 1: Race Car

In your group, discuss what you would do in the following situation, and then come to a decision about whether or not to race.

Scenario:

- You are the owner of a struggling racing team, fighting to keep your lifelong dream alive. It's the day of the final race of the season - the Grand Prix - and your hopes are resting on today's result. You're currently teetering on the brink of bankruptcy and need a good finish today to secure the prize money that will keep your team afloat for another year.
- Your ace driver, a veteran with years of experience under his belt, is aware of the team's predicament. He's loyal to the core, a true embodiment of team spirit, ready to drive his heart out for the team's survival.
- In the early hours of the race day, your chief mechanic, a grizzled figure with grease-stained overalls and hands that have repaired a thousand engines, brings an unsettling issue to your attention. The "Turbo Couplers", the crucial components that connect the engine to the turbocharger, boosting your car's speed, have never been tested under the day's projected cold weather conditions.
- The mechanic explains that all previous races had temperatures of at least 18 degrees Celsius. But today, a cold front has brought in a bone-chilling -1 degree Celsius. The Turbo Couplers might fail under these conditions. If they do, the car will lose its turbocharged speed, making a top finish impossible, and the car might even crash.
- With the weight of this information heavy on your shoulders, you share the concern with your driver. He looks at you, determination burning in his eyes, and says, "Boss, I'm ready to drive. I know the risks, but this is our shot. Let's do it." What do you do?

Exercise 2, Section 1: Pre-Mortem and Back-Casting

Conduct a pre-mortem/back-casting exercise for a new youth mental health initiative.

Assume that your organization has created an app which aims to improve the mental health of Canadian teenagers, post-pandemic. Assume that it is now two years from today and you are looking back on the app's launch.

Pre-Mortem: Give 3 reasons within your control and 3 outside of your control why the launch failed.

Back-Casting: Do the same, but for why the launch succeeded.

Exercise 3, Section 2: Small Group Analysis

In your group of two, select one of the two sample datasets (hiking dataset or arts funding dataset). Each member of the group will then load the dataset into RAWGraphs (or another program of your choice).

Working in parallel, experiment with visualizing the dataset, and creating a combined list of insights or facts that you can gather from the graphs you produce. Optionally, you may load the dataset into Statisty or another program and use that to explore the dataset as well.

If you finish exploring one of the datasets, you may choose to explore the other datasets as well.

Exercise 4, Section 3: Cognitive Bias

In your groups take the assigned cognitive bias, find it in the Decision Lab's index (https://thedecisionlab.com/biases) and determine the following:

- What is this bias?
- Why does it happen?
- What can be done to mitigate its effects?
- What phase(s) of the decision-making process do you think this would effect?

Come back and share your findings with the group.

Exercise 5, Section 3: Boeing Case Study

- Listen to instructor presentation;
- Watch YouTube video (https://www.youtube.com/watch?v=-ORkC4Hiub8);
- Read Infographic (https://content.fortune.com/wp-content/uploads/2024/02/timeline_01-01.png?w=1440&q=75);
- Take 10 minutes to make notes individually;
- Return to group and discuss:

Boeing Pre-Decision State/Processes

- What can we say about Boeing's Pre-Decision State/Processes?
    - Culture?
    - Goals?
    - Knowledge?
    - Practices?
- Are there any biases that you can see?
- Problem Identifier: "We may lose orders to Airbus and their A380. What do we do?"

Boeing's Decision State/Processes

- How did Boeing frame their decision?
- What were the choices they generated?
- Are there potentially any biases in play?

Boeing's Post-Decision State/Processes

- What are the outcomes of Boeing's decision to go forward with their new partnership model?
- Were there any other potential metrics that might have helped evaluate the outcomes of the decision?

Lab: Funding to Improve The Situation of Houseless People In Canada

This group lab exercise will be carried out in groups of several people. Some people in the group will carry out the roles of analysts/SMEs. Others will be decision makers (roles will be assigned by the instructor at the start of the exercise).

The goal of this exercise is to give participants an opportunity to engage in a fun, hands-on fashion with the concepts introduced in the course (e.g. the three elements of the decision context, the "grab bag of facts", factors, the role of imagination in decision-making). **We recognize that in the available time, you will not be perfecting each stage of the decision-making process**. Rather, the focus here is on learning and exploring in a friendly and forgiving environment. We hope that by experiencing the core concepts we've discussed in this lab context the ideas presented will come to life in a meaningful and lasting fashion.

Lab Scenario

You are part of a nation-wide Canadian charity dedicated to reducing the number of people living without stable housing in Canada. The organization has just received a major donation from an individual philanthropist. You have the opportunity decide how this money will be used to support the organizational goal of reducing houselessness* in Canada.

You are aware that, following from the pandemic, and during the current housing crisis, houselessness is an acute current issue in Canada at this moment in time.

Within this broader context, you must decide how you will allocate 2 million dollars of the donated money to homeless* shelters across the provinces and territories.

* *although the term 'homeless' has been used in the past to describe people without access to stable housing, and is still used by some groups, this term can have stigma associated with it. Other terms in current use include houseless and unhoused.*

Lab Overview

The lab activity will be divided into five parts. In some of the parts, analysts/SMEs and decision makers will work separately (in separate break out rooms) and in other parts all the members of your team will all come together to carry out the part of the lab.

Lab Part 1 – Orienting to the Data and the Decision context (~25 minutes, separate)
Lab Part 2 – Discussing Relevant Data and Default Decisions (~25 minutes, together)
Lab Part 3 – Data Analysis and Action Options (~30 minutes, separate)
BREAK (15 minutes)
Lab Part 4 – Discussion of Relevant Findings and Factors (~30 minutes, together)
Lab Part 5 – Making the Decision (~20 minutes, together)
Lab Part 6 - Presentation of Lab Results (~30 minutes, full class)

Lab Part 1 – Orienting to the Data and the Decision context (~30 minutes, separate)

In this part of the lab, analysts/SMEs and decision makers will work separately. Please see the relevant instructions below.

Lab Part 1 Instructions for Analysts/SMEs:

In this part of the exercise you will have some time to review and orient towards available data and facts on homelessness. This includes:

- Data on numbers of homeless shelters in each province;
- Data on numbers of houseless in each province;
- Demographics data for each province;
- Articles discussing the houselessness issues.

For this data and information:

- Examine the factors or aspects of the situation about which you have information – for example, factors might be age, circumstance, type of shelter.

Identified factors are: _____.

- Identify the ***types or kinds*** of facts you can potentially put in your "giant bag of facts" based on your available information. You don't need to identify the specific facts at this stage, but more generally what the facts could be about (what objects, entities, events - for example, "facts about number of beds in different parts of the country").

Related, consider what ***types*** of questions you might be able to answers.

- You may wish to engage in some exploratory analysis of your datasets, using RawGraph and Statisty. Note that you will have more time to work with your data in Part 3 of the lab.

As you are doing this, keep in mind that in the next part of the lab you will be sharing and summarizing this information with the decision-makers on your team, who will not have been exposed to the information.

Lab Part 1 Instructions for Decision Makers:

To further orient yourselves to the broader issue, you may wish to review the provided infographic.

Through discussion, and referring to the scenario for the lab:

- Identify and describe the problem situation.

The problem situation is _____.

- Identify the triggers for the decision-making process you are now in.
- Identify the more specific goals related to your organization and your specific task.

Our goals are _____.

- Identify some values you are going to keep in mind (and possible biases and pre-conceptions).

Our values are _____.

- Following Kozyrkov's suggestion, through some preliminary discussion determine what your default choice of action would be to

achieve these goals in the absence of data would be, and what facts would be required to change your mind on this front. Identify what you don't know and turn this into questions. You may also wish to note other possible actions.

Our default action is _____.

As you are doing this, keep in mind that in the next part of the lab you will be sharing this information with the decision supporters on your team. One or more decision makers should take some notes about what you have identified (see fill-in-the-blanks above).

Lab Part 2 – Discussing Relevant Data and Default Decisions (~20 minutes):

In this part of the lab all members of the team will come together and exchange knowledge and information.

To start this portion of the lab, decision makers will describe, using their notes from the previous part of the lab, their goals, values, default action and any other possible actions, along with any other information they consider relevant to the decision support members of the team.

Next, the decision supporters of the team will describe in general terms the available data they have access to, which they believe could be relevant to the goal as described, the type of facts they think they can obtain from this data (what the giant bag of facts could look like) and the possible impacting factors about which they have information.

Lab Part 3 – Data Analysis and Action Options (~30 minutes):

In this part of the lab, analysts/SMEs and decision makers will work separately. Please see the relevant instructions below.

Lab Part 3 Instructions for Analysts/SMEs:

Based on the stated goals and default action provided in the previous exercise, explore the provided data and information. Note that if you wish you may choose to seek out and use additional information – there is no cheating – but this is not required!

Use the data and information, in combination with Raw Graph (and optionally Statisty and other tools if you wish) to produce or identify charts and relevant facts that can increase situational awareness of the state of houselessness in Canada, and potentially provide a deeper understanding of the default action described in Part 2. Consider how this might assist the decision makers in deciding if their possible approaches for distributing the available funds is a good one. Consider constructing a narrative to connect the graphs and facts you have produced or identified.

You will have an opportunity to present these results to the decision makers on the team in the next part of the lab.

You may choose to present graphs and charts produced by your team or by others (e.g. charts identified in the snapshot documents).

Lab Part 3 Instructions for Decision Makers:

Carry out either a pre-mortem or back-casting exercise that explores the possible outcomes of your funds distribution project (if you have time, you may carry out both, but see additional activities for this part of the lab below).

Use the results of the pre-mortem/back-casting exercise to identify possible outcomes and contributing factors that will help to ensure a good decision is made.

Coming out of this, consider what would count as (1) optimal, (2) acceptable and (3) unacceptable outcomes.

Consider which actions/choices might lead to these different outcomes. Come up with a list of two or more possible actions that could be taken to distribute funds based on this.

Lab Part 4 – Discussion of Relevant Findings and Factors (~20 minutes):

In this part of the lab all members of the team will come together and exchange knowledge and information.

The Analysts/SMEs will start by presenting the results of the previous lab activity (review and analysis of available information).

The decision makers of the team will in turn communicate the **current possible actions** they are considering.

At this point, the entire team will discuss as a group how the information presented by the analysts/SMEs could be relevant to the action choices and outcomes, and how this might impact the selection of a particular action.

Lab Part 5 – Making the Decision (~20 minutes):

In this part of the lab all members of the team will continue to work together as a group.

At this point in time, everyone on the team (both decision makers and decision supporters), will decide what decision they will make with respect to the identified options for distributing the funds (both decision makers and decision supporters can participate in this). Everyone should then vote on which of the identified choices of actions the group should take, and the vote can be recorded (or if the group wishes, an alternate method for choosing the action to take may be used).

Once the decision has been made, take some time as a group to decide what to report to the course participants about your experiences. Identify one or two people who will report back to the class.

Lab Part 6 - Presentation of results (~20 minutes):

Coming back to the entire class of participants, each group will now have an opportunity to present the outcome of their decision-making process. You may choose to discuss your considered choices of action, how the decision support analysis activities influenced the course of the decision making and present any other interesting observations about the process as experienced by your team during the lab.