Analytics for Decision-Making

Instructors/Creators: Jen Schellinck, Tristan Shaeen

uOttawa
Institut de développement professionnel
Professional Development Institute

Jen Schellinck

Bio
- CEO ['12 – now | Sysabee Inc.]
- Adjunct Professor ['09 – now | ICS, Carleton]
- Co-Founder ['18 – now | Data Action Lab]
- Co-Founder ['20 – now | AI Guides]
- Director of Modeling Methodologies ['09 – '12 | Cogniva]

Projects and Clients
- GAC; DFO; CATSA; CSPS Digital Academy, etc.

Specializations
- Unsupervised learning techniques
- Simulations

Section 1:

Orientation and Introduction to Concepts

Some Course Housekeeping and Orientation

Recommended: Download Slides/Materials

https://www.data-action-lab.com/pdi_adm-winterspring2025/

Participant Requests and Expectations

Have something available for note taking and diagram sketching – could be old school (pen and paper) or digital

For Virtual: As much as possible, turn cameras on for 'discussion mode' – in particular during breakout room activities. Less important for 'lecture mode'

We expect people will not be making personal recordings of these sessions

Be willing to participate in discussions – but totally okay if you wish to change the names and details of your stories to protect privacy.

Course Audience

Analysts who want to learn about decision making and how analytics fits in to this process.

Decision makers who want to learn about how to use analytics during decision making.

Our Teaching Approach and Philosophy

People learn concepts by actively engaging with them.

People learn skills by practicing them.

The brain is a sponge but only with so much capacity: we try to keep lecture portions relatively short.

Empathy (understanding other roles) is an important element of practical learning.

Introductions – Participants and Instructors

A bit about your background

Your typical roles in the decision making and analytics space

Optional: Why you are interested in this topic

Let's Talk About Decisions in Your Own Life

This course is space for you to think about decision making in your life – your work or personal life.

Maybe you're already an amazing decision maker - you have the know-how, you just need the labels.

First discussion:

- in your groups, take turns briefly chatting about a decision you each recently faced (could be work or personal)
  - Did you make the decision from emotion or reason? Or both? Do you ever flip a coin?
  - Who did you want to help you make a good decision?

Course Structure: Three Passes, Increasing Depth

Full Course

First Section
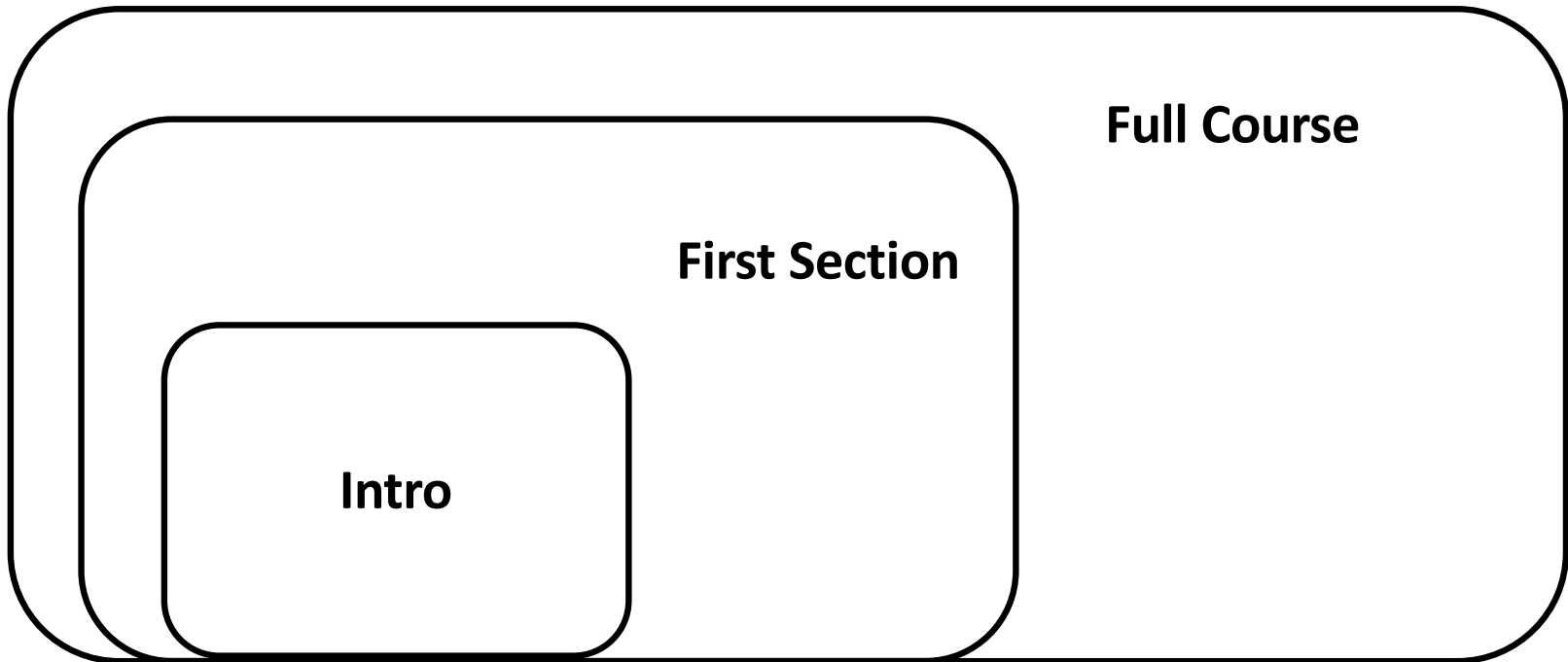
Intro

Workshop Plan/Outline

Section 1: Warming Up To Decision Making	Section 2: Concepts and Data Deep-Dive	Section 3: Human Factors in Decision Making	Section 4:
• Housekeeping, Orientation, Introductions • Introduction: Deciding to Decide! • Getting into the Details of Decision-Making	• Introducing Data • Getting Further Into the Elements of Decision Making • Where Does Analytics Come into Play? • First Data Exercise (prep for Lab)	• Bias in Decision Making • Data Storytelling • Decision Making Frameworks	• Lab – Putting it all together • Final Reflections (if time!)

Goals for this course

We want you to become better at decision making, as well as getting good at using analytics for decision making

We want you to understand how analytics fits into the larger context of decision making.

We want you to know when and how its appropriate to use analytics and data as part of decision making.

We want you to understand what it means to work with others to make decisions, and how different roles fit into that picture.

We want to help improve your level of decision theory expertise.

Introduction: Deciding to Decide!

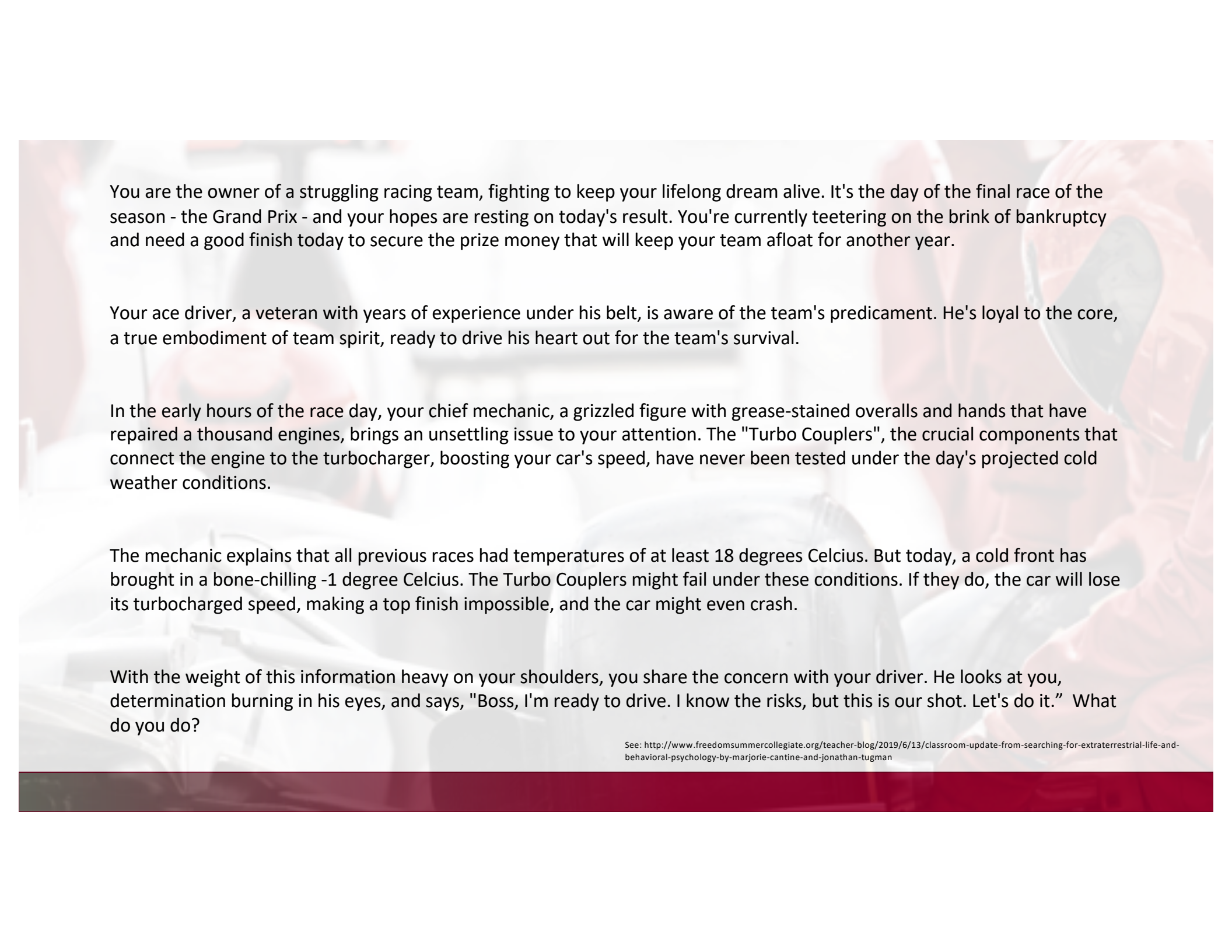# Setting the Baseline: Decision Making without Thought

Flip a coin, read the tea leaves.

You still have to know **the choices**, though.

After that, this approach cuts out everything else (at least in principle).

Would asking an all-knowing oracle (or perhaps an AI) that we could totally trust be better?

Until that comes along (hint – it hasn't yet. And also – free will?) we are still in the space where we need to make decisions.

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 Celcius. But today, a cold front has brought in a bone-chilling -1 degree Celcius. 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?

History of Decision Making – Three Strands

DECISION MAKING IN
MANAGEMENT

EVIDENCE BASED
DECISION MAKING

DECISION INTELLIGENCE
AND ANALYTICS

The History of Decision Making in Management

Source: https://hbr.org/2006/01/a-brief-history-of-decision-making

Decision Making Terminology Shift, Mid-20th century. Bernard, March, Simon, Mintzberg: Theory of Management Decision Making. Make definitive Decisions!

Decision Makers Not Perfect. Simon - Bounded Rationality - Khaneman, Tversky, Domasio, identify Psychological Factors - Decision Bias.

Alternative Approaches: Gigernezer, Etzioni - Emotion's Role, Heuristics, "humble" decision making tactics

Now : Risk Management : Modern Tools vs. Historical Methods

History of Evidence Based Decision Making

Rooted in the evidence-based medicine movement that arose in the 1990's (term "evidence-based medicine" first used in 1990 by Gordeon Guyatt)

The concept of evidence-based policy (or governance) in a medical context quickly followed. This was also connected to evidence-based practice more broadly.

Gained even more momentum in the 2000's. Coincided with a rise in availability of data.

The adjective "data-driven" started to be popular around this time (although, see "data journalism", Wattenberg, 1960).

Impacts of Evidence Based Decision Making In Medicine

From: Evidence-based practice improves patient outcomes and healthcare system return on investment: Findings from a scoping review. (Connor L, Dean J, McNett M, Tydings DM, Shrout A, Gorsuch PF, Hole A, Moore L, Brown R, Melnyk BM, Gallagher-Ford L.)
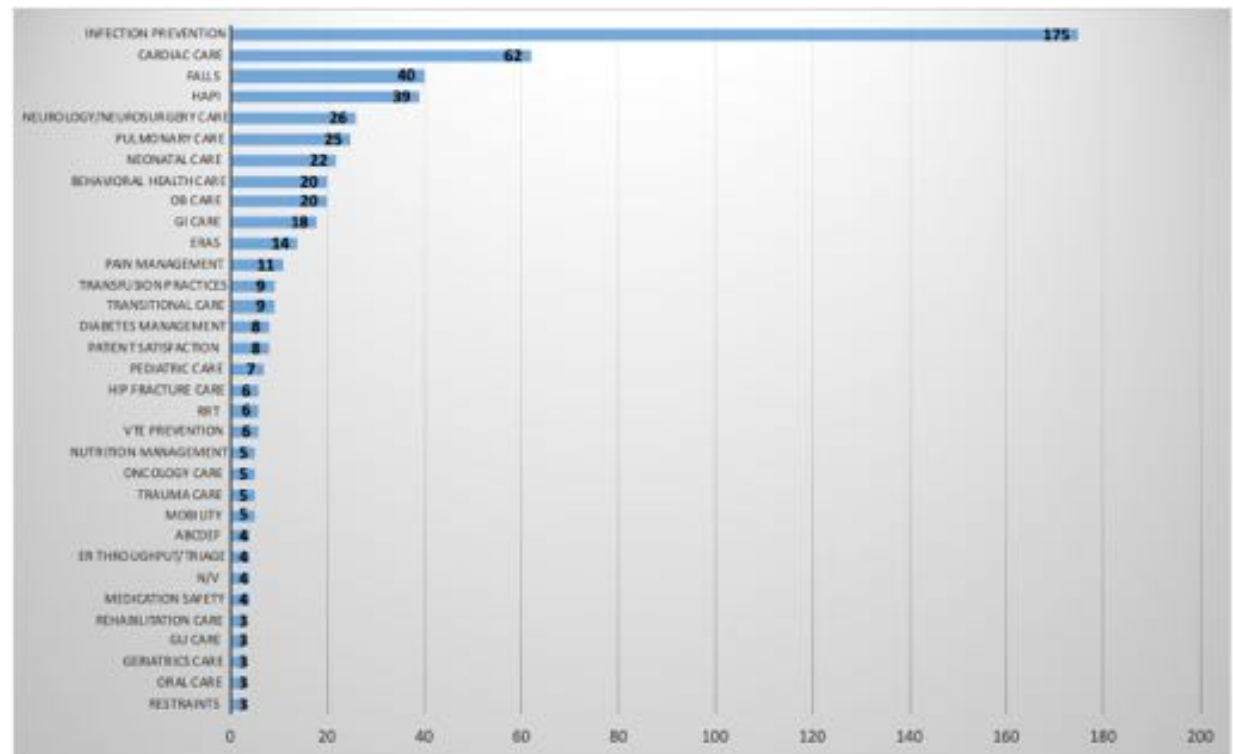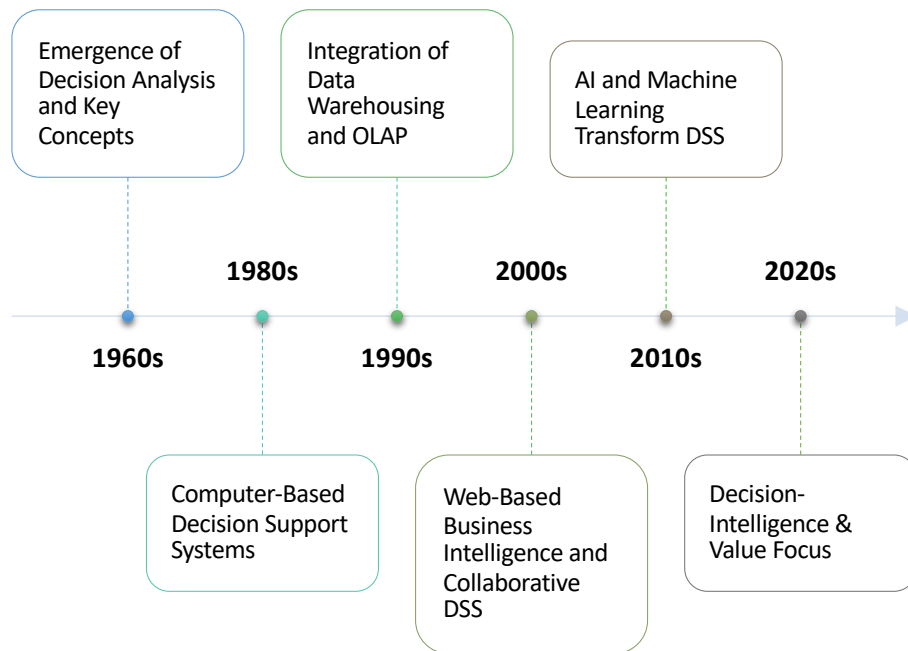
FIGURE 2   Types of EBPs implemented: EBP domains

Decision Intelligence and Analysis Timeline

Emergence of Decision Analysis and Key Concepts

Integration of Data Warehousing and OLAP

AI and Machine Learning Transform DSS

1980s

2000s

2020s

1960s

1990s

2010s

Computer-Based Decision Support Systems

Web-Based Business Intelligence and Collaborative DSS

Decision-Intelligence & Value Focus

Six Key Players and Study Areas

Daniel Kahneman: A Nobel Prize-winning psychologist known for his work in behavioral economics and decision-making under uncertainty.

Gary Klein: A cognitive psychologist renowned for his work on naturalistic decision-making and expertise..

Cassie Kozyrkov: Chief Decision Scientist at Google. She is a prominent advocate for decision intelligence and has contributed extensively to the development and application of decision-making frameworks in organizations.

Richard Thaler: A behavioral economist who won the Nobel Prize in Economics for his contributions to understanding irrational decision-making. Research on nudges.

Sheena Iyengar: A psychologist. Her work focuses on understanding how people make choices and the implications of choice overload.

Annie Duke: A former professional poker player turned decision strategist and author. Her work focuses on the application of decision theory and cognitive psychology in business and personal life.

The First "Decision Scientist": Kozyrkov

"A lot of the training that data scientists have assumes that the decision maker knows exactly what they need and the question and problem are framed perfectly."

Need for a "Decision Scientist" arose from Google's adoption of machine-learning.

But, the algorithm is only as good as the data it is trained on, which is full of human decisions.

Therefore, we need a principled approach to human decision making (i.e., the decision scientist!).

Otherwise, decisions may be steered by unconscious bias rather than the data itself.

Kozyrkov's Take on When Data Should Get Involved

Doesn't think data always needs to be involved in a formal sense.

Distinguishes between data inspired decision making and data driven decision making.

If you already have your preference, and there is nothing that would change your mind, there is no need to turn to the data! Make your decision and call it a day.

But, be mindful of your biases…

Confirmation Bias

- Tendency to seek out information that confirms preexisting beliefs or hypotheses.

- Disregard or dismissal of evidence that contradicts one's beliefs.

- Interpretation and memory of information in a way that supports existing views.

Buy it or Leave it?

Consider a situation where you are shopping with your friend and a brand new shirt catches your eye.

Do you:

- A) Buy the shirt without bothering to look at the price?
- B) Look at the price before making your decision?
- C) Decide what the price would have to be to make your decision one way or the other, *then* look at the price.

Kozyrkov has an opinion about this scenario.

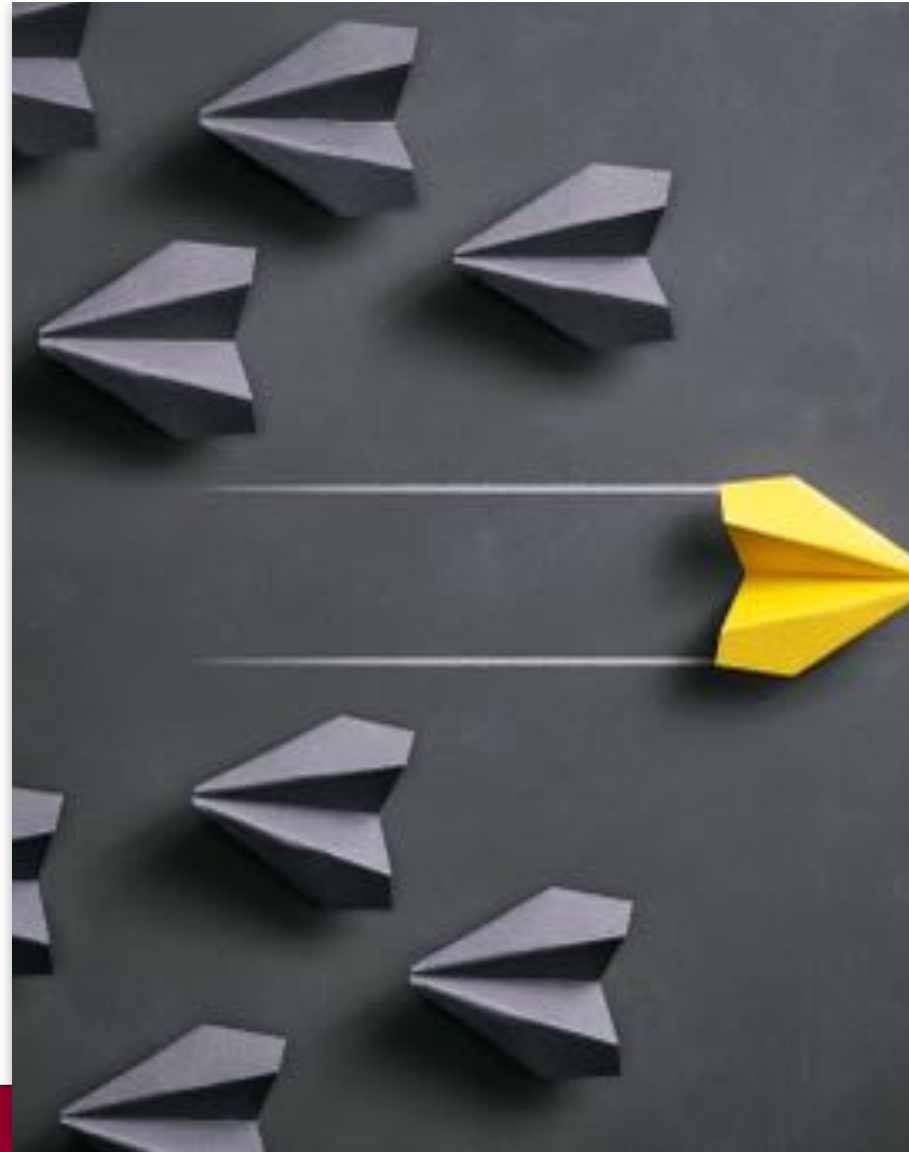# Kozyrkov's decision making process

1

Determine how you will make the decision with no additional information (what would the default choice be?)

2

Define how you would make the decision if you had access to any information you wanted. What would it take to convince you otherwise?

3

Look at whether you can access all the data you ideally want to make the decision.

Revisiting the Race Car

Would you use Kozyrkov's process in the Race Car situation?

(3 steps – default decision, data that would change this, is this data available?)

Why or why not?

Getting Into the Details
of Decision Making

Decision Awareness

How do you know if you need to make a decision? When you have the option to?

How do you know when you need to support someone else in making a decision. What does that look like?

Sometimes it depends on the type of decision. Sometimes it's more obvious than others.

How can we become attuned to the decision environment?

The Bigger Picture: Three Main States
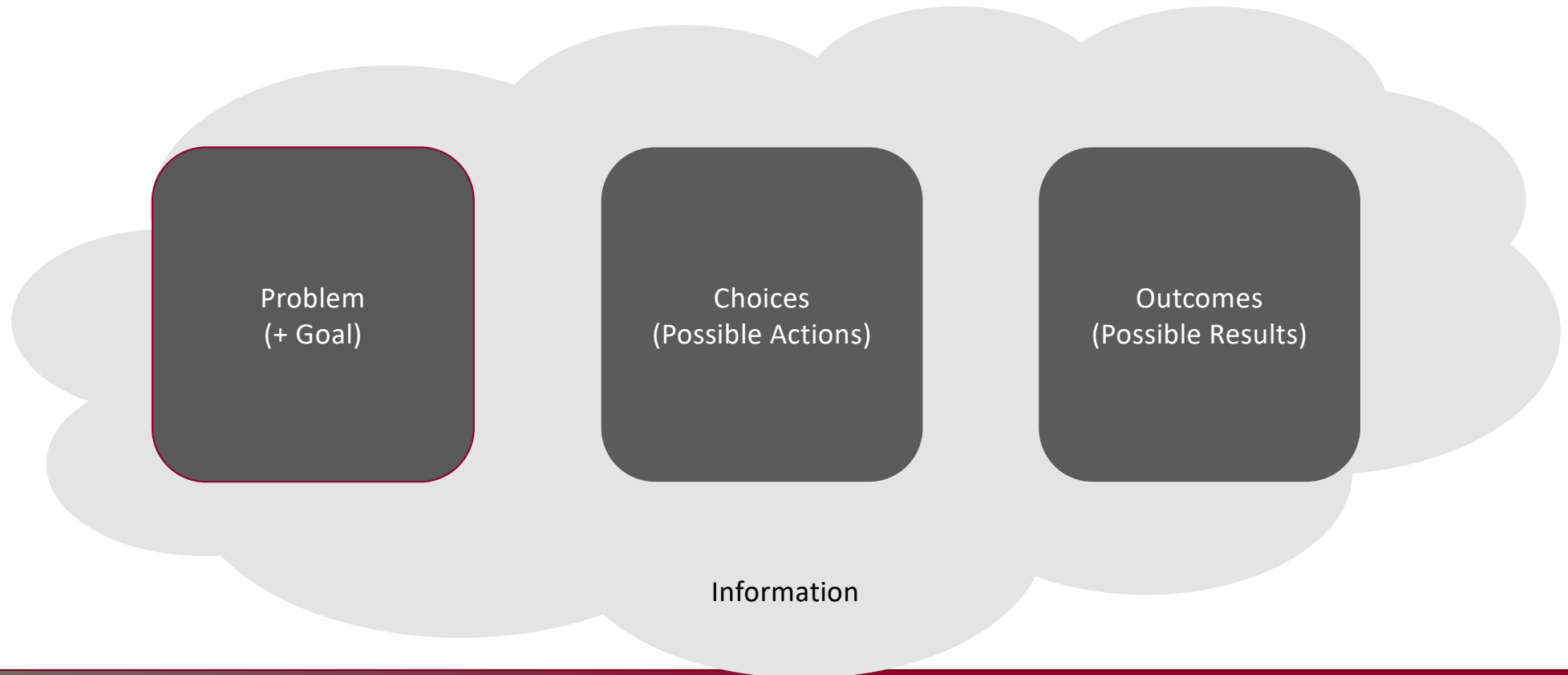
PRE-DECISION MAKING

DECISION MAKING

POST DECISION MAKING

Sneak Preview: The Decision-Making Part

Problem
(+ Goal)

Choices
(Possible Actions)

Outcomes
(Possible Results)

Information

Choice Architecture

- A choice architect shapes environments to influence decision-making.
- Choice architecture connects with nudge theory, emphasizing positive reinforcement and implicit suggestions.

- **Case Study: Organ Donation Systems and Donation Rates:**
  - Analyzed explicit consent vs. presumed consent vs. mandated choice.
  - In the Netherlands, mandated choice and presumed consent systems proved more effective than explicit consent in increasing donor registrations, suggesting the power of defaults in decision-making.

Reducing Uncertainty

How can we feel more confident in the decision we're about to make?

The elements/components of decision making

CHOICES/OPTIONS

FACTORS

ACTIONS

OUTCOMES/RESULTS/
CONSEQUENCES

GOALS

COSTS/BENEFITS/RISKS
/PROBABILITIES

FACTS/INFORMATION/
KNOWLEDGE/BENEFIT
S

Activities Related to Decision Elements

Analysis, Reasoning	Imagining, Speculating (options and results)	Factor Generation (impacts, influences)	Evaluating the results of the decision
	Detecting, mitigating biased thinking	Reducing Uncertainty	Information collecting

How can we become more skilled at these actions? What can improve the quality of these actions?
How does data fit in? How does data enhance these activities?

Sneak Preview:
The Mustard in the Sandwich

Our general position is that we can think of analytics as the mustard in the sandwich.

Perhaps not strictly necessary, **in every situation** but takes a sandwich from "Meh" to "Amazing".

Increase the quality, increase the positive impact.

Concepts and Activities

A First Pass

Imagining Possible Worlds

In general all elements of decision making benefit from the imagination process.

We can think of this as imagining possible worlds.

Each choice option represents a possible world.

Each set of results from a particular choice represents a possible world.

Choice Generation

By imagining possible worlds, and understanding current facts (and factors), we can generate many and creative choices.

In a given situation, are there really only two choices?

Types of Decisions

Fork in river or open water: forced choice vs generated choices

Reversible decisions ("2-way door")

Irreversible decisions ("1-way door")

Choice Overload!

- AKA "overchoice" or "the paradox of choice."
- More choices sometimes bad:
  - Decrease motivation to decide
  - Decrease satisfaction with final choice
  - Increase negative emotions (e.g., regret).
- We gravitate towards more options but don't handle the situation well: **The Jam Experiments**.

Optimization

We can ask ourselves: What is the best possible world, given trade offs and constraints?

This can sometimes be framed as an optimization problem.

Factor Discovery

- Key to optimizing.
- A fundamental element of many of the stages of decision making.
- Goes by many different names:
    - Causes
    - Effects
    - Impacts
    - Variables
    - Influences
- These determine which possible worlds might feasible exist.
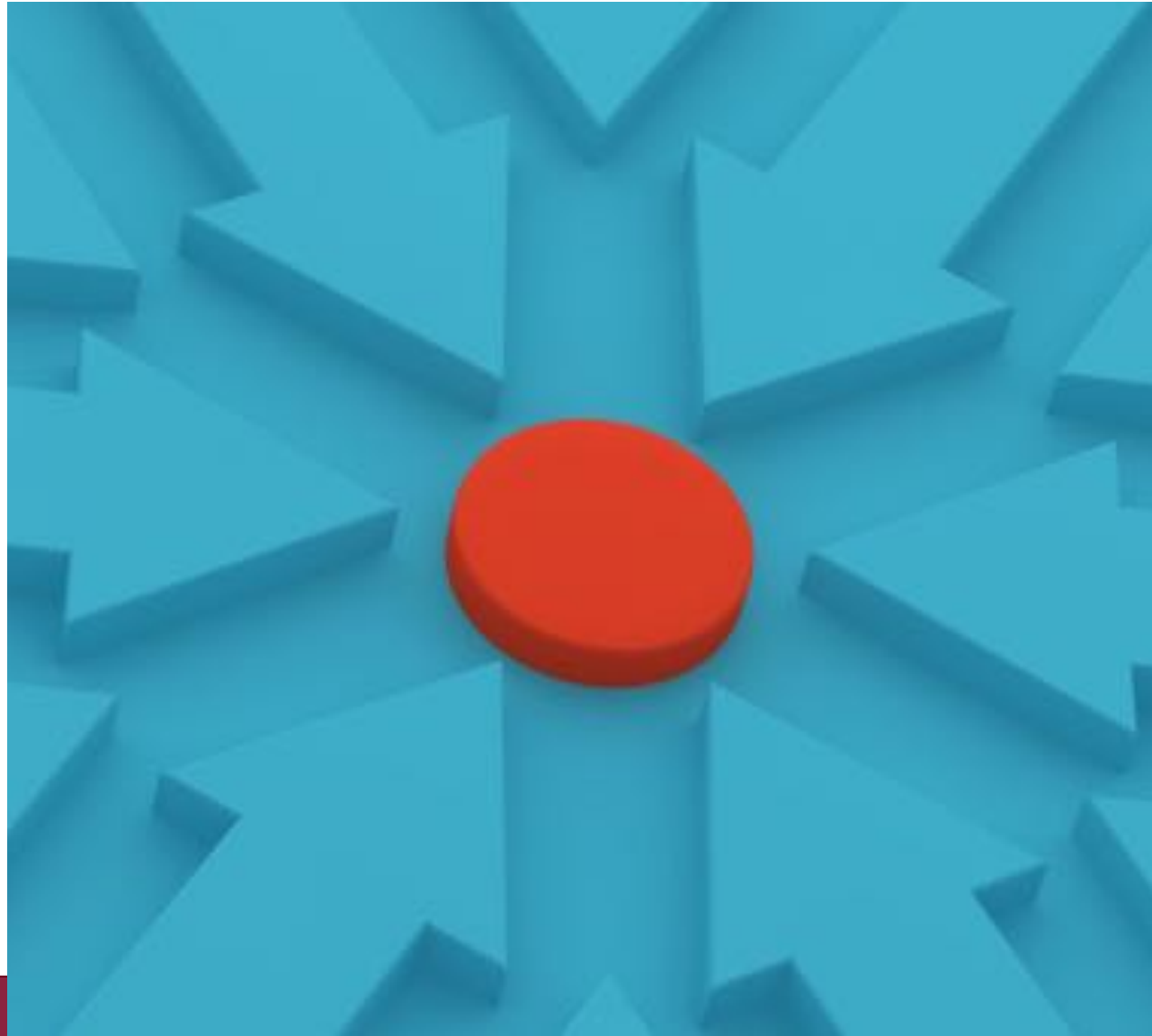
How much energy can you devote to all of this?

Introducing Three Levels of Data Supported Decision Making

ARMCHAIR

DATA | EVIDENCE INSPIRED

DATA | EVIDENCE DRIVEN

Pre-Activity Pop Self-Quiz

What are the three main states you can be in, in the broader decision space?

What are key elements or components of decision making (according to this workshop)?

What are some associated activities?

What are the three levels of data supported decision making?

Approaches to Ensure Quality Decision Activities

Adopting particular approaches and practices can act as scaffolding to help us include relevant decision-making activities and carry them out skillfully and successfully

We'll look at some frameworks in more detail in module for 3, but let's try one out now…

Pre-Mortem/ Back-casting

Helps people with the imagining possible worlds

In the process, can make the implicit factors explicit

Makes it easier for people to speak up and voice concerns

Pre-Mortem

A post-mortem is good for learning the causes of a bad outcome, with one tiny limitation: the patient is already dead.

Pre-mortem: imagine yourself at some time in the future, having **failed to achieve a goal**, and looking back at how you arrived at that destination – it is an autopsy **before** the patient dies.

Steps:
1. identify goal to achieve, or decision being considered
2. pick a timeline for achieving that goal.
3. imagine it is the day after the deadline and you are looking back from that date; give 5 reasons "within your control" and 5 reasons "outside of your control" for why things didn't work out

Example Scenario:

Pretend it is December 2025.

The AI-powered analytics platform, named "Project Insight," that your team had been developing for the past two years has, regrettably, failed.

The goal of Project Insight was ambitious: to create a single, unified analytics platform that would harness the power of AI to analyze data from various government departments and aid in decision-making processes.

Looking at everything that happened since 2023 answer the question: why did it fail?

What are the reasons in your control and outside of your control?

Backcasting

Backcasting: imagine yourself at some point in the future, having **succeeded in achieving a goal**, and looking back at how you arrived at that destination.

The process is like the one for pre-mortems (directions changed, of course).

Benefits (pre-mortem/backcasting):
- get outside view
- wisdom of the crowd
- avoid group think
- eliminates the risk of people "not wanting to be the squeaky wheel"
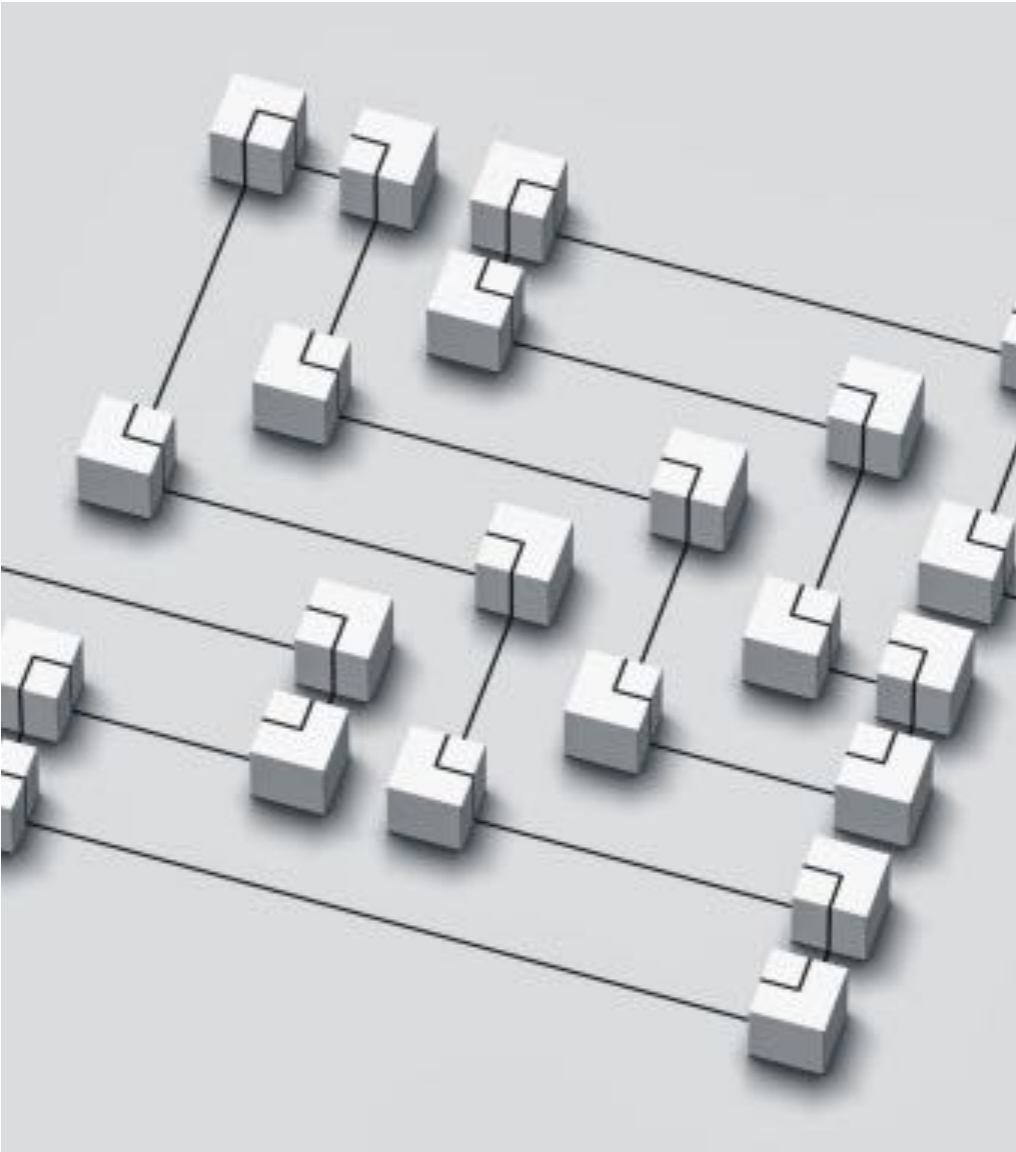
Decision Exploration Table

	Pre-mortem	Backcasting
3 reasons **within** control/skill	1. 2. 3.	1. 2. 3.
3 reasons outside control/skill	1. 2. 3.	1. 2. 3.

Section 2: Data Plus Concepts Deep Dive

Introducing Data

Three Levels of Data Supported Decision Making

Recall our three categories of data driven decision making:

- Armchair decision making
- Data Inspired Decision Making
- Data Driven Decision Making

All three involve problem (or goals), choices, and outcomes

Information and data are incorporated differently for each category.

Our position: data inspired is more common than data driven AND it may also be more appropriate. But – will you agree?

Armchair Analysis

Think about a talk show with a bunch of talking heads

Where are their opinions coming from? They seem to be relying on the "Facts" (or beliefs, opinions) in their brains.

They could be subject matter experts. But are they?

What about bias and other thought errors (e.g. mis-remembering facts)

How common is this?

Data Inspired Decision Making

Is this what we really mean when we say "Evidence Based Decision Making"?

What is "evidence"? Is it a substance?

According to Kozyrkov: "That's where we, like whales encountering plankton, swim around in some numbers, and then reach an emotional tipping point and... decide. There are numbers near our decision somewhere, but those numbers don't drive it."

Data is *adjacent* to the process.

(We may be more of a fan than Kozyrkov...)

(quote from: https://kozyrkov.medium.com/data-inspired-5c78db3999b2)

Just the Facts, Friend

A key ingredient for data inspired (evidence based) decision making is statements, or facts.

Where do facts come from? Some possibilities:

- Observations
- Data Analysis
- Reasoning over other facts (input facts into a reasoning engine, get new facts)

Giant Grab Bag of Facts

Whenever you think of data, analytics and decision making, we want you to think about "The Giant Grab Bag of Facts*".

In a nutshell, analytic activities add more facts, aka "Decision Making Materials" to the "Giant Grab Bag of Facts".

*In practice could be located in your head, as a collection of reports on a hard drive, etc.)

Random Facts vs Useful Facts

Left to their own devices analysts and analytics techniques may produce a bunch of "random facts".

You need relevant facts for specific decision-making situations.

More on this in the analytics section.

Decision Making Informed by Facts

It seems pretty clear that we want our decision making to be informed by facts.

Data inspired decision making captures this idea.

We want that giant "grab bag of facts" to draw on.

Do we always need data sets and analytic activities to achieve this?

Do we need a dataset and an analytics engine in order to choose which sandwich to buy for lunch?

Data Driven Decision Making

Kozyerkov:

"For a decision to be data-driven, it has to be the data — as opposed to something else entirely — that drive it. If the first thing we do is poke around in our data, our decision will be, at best, something I like to call *data-inspired*... **Solution:** set the goalposts in advance and resist temptation to move them later."

(quote from: https://kozyrkov.medium.com/data-inspired-5c78db3999b2)

Data Driven Decision Making

At its most extreme – automated decision making? I will buy whatever sandwich my dataset tells me most other people bought.

Process is set up, decision point is determined, data/information pours in.

The decision is taken (choice made, action taken) essentially *automatically* based on this data.

(quote from: https://kozyrkov.medium.com/data-inspired-5c78db3999b2)

Analytics: Analysis Paralysis

We may need to make a decision with less than complete information. What is the risk of not deciding vs. the risk of making a less-than-perfect decision?

Analysis paralysis is caused by overthinking a situation and worrying about the outcome at the expense of decision-making. It is perfectionism, taken to an extreme.

Antidote perspective: "It doesn't matter in which direction you choose to move when under a mortar attack, just so long as you move. Decisions are never final for the simple fact that change is never absolute. Rather, change is ongoing. To stay competitive and progress at the rate of change requires adaptive decisions that can be iterated and improved upon on the fly." [Jeff Boss, Forbes]

Getting Further into the Elements of Decision-Making
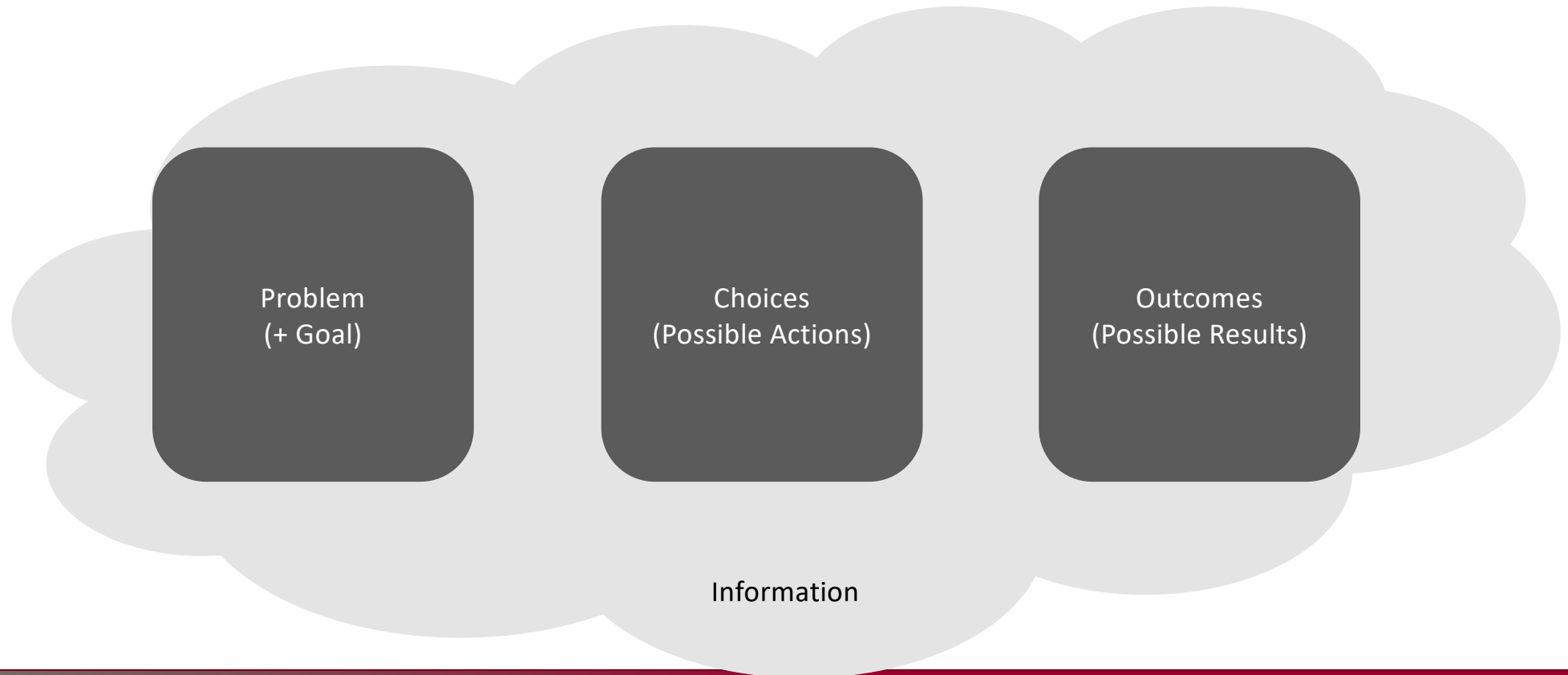
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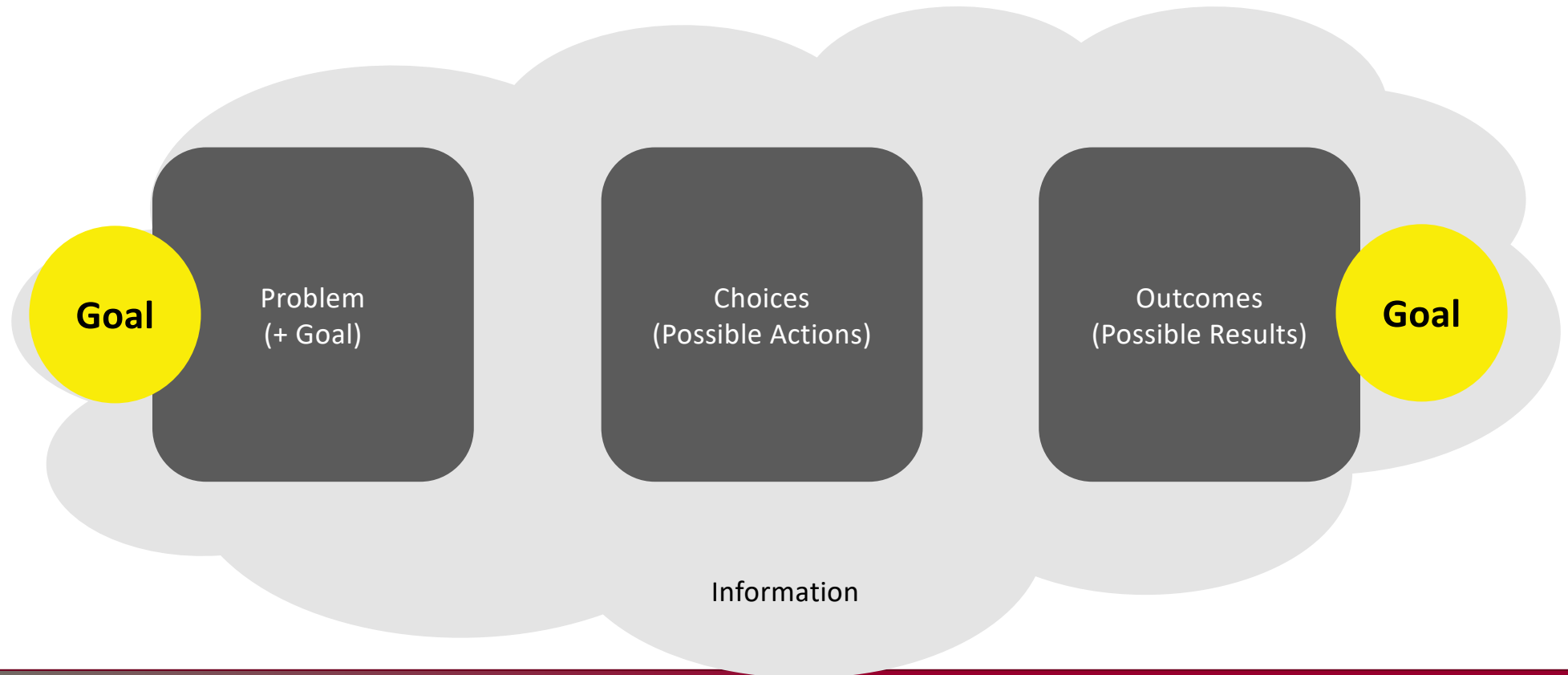
PRE-DECISION MAKING   DECISION MAKING   POST DECISION MAKING
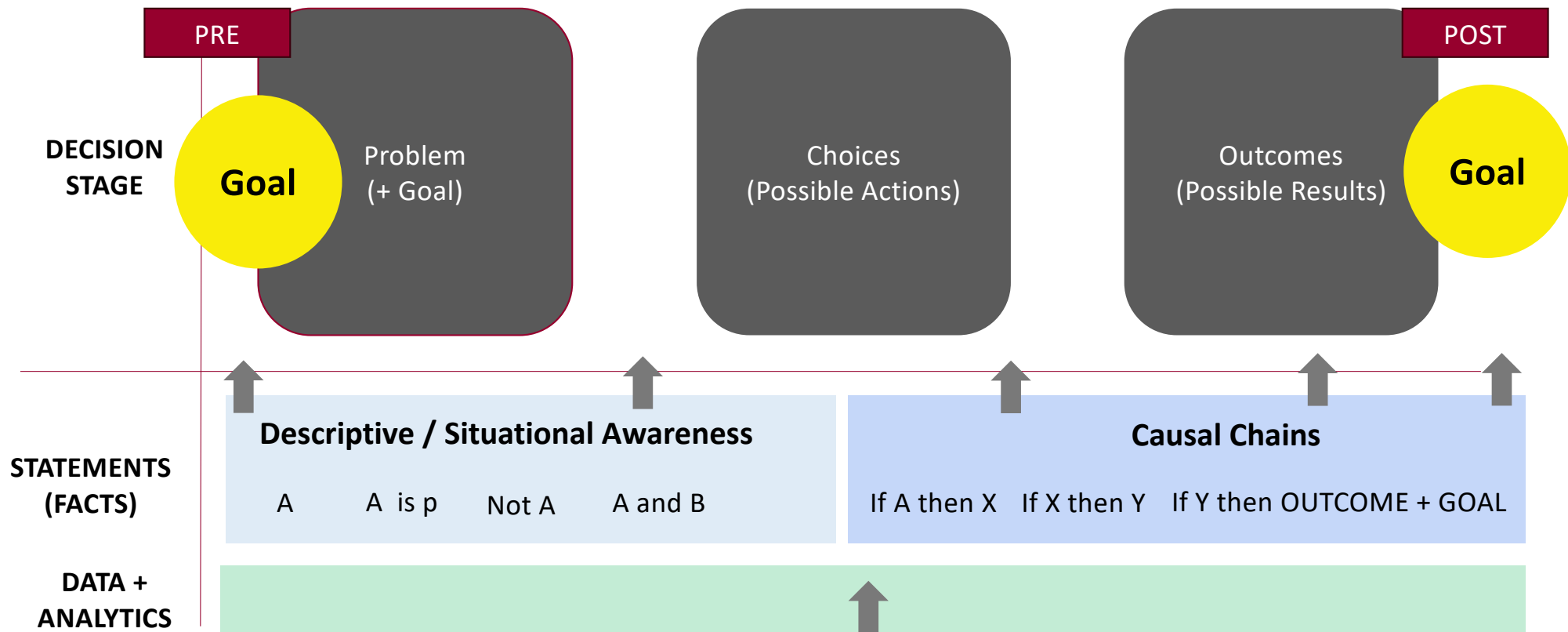
Core Elements of Decision Making

Problem
(+ Goal)

Choices
(Possible Actions)

Outcomes
(Possible Results)

Information

Core Elements of Decision Making

Goal

Problem
(+ Goal)

Choices
(Possible Actions)

Outcomes
(Possible Results)

Goal

Information

Where Does the Data Fit?

Data work must first **fit** somewhere into one or more of our decision making activities.

Specifically, **it must be some type of input** into one or more of the core elements/activities decision making.

Sneak Preview: Where the Data Fits In

DECISION STAGE

PRE

Goal

Problem (+ Goal)

Choices (Possible Actions)

Outcomes (Possible Results)

Goal

POST

STATEMENTS (FACTS)

Descriptive / Situational Awareness

A   A is p   Not A   A and B

Causal Chains

If A then X   If X then Y   If Y then OUTCOME + GOAL

DATA + ANALYTICS

Illustrative Case Study 1: A Hike

You're on a hike. You come to a folk in the road, with one branch to the left and one branch to the right.

Illustrative Case Study 2: Canada Arts Funding

You must determine the 2022 arts program funding strategy for Heritage Canada.

Data available:

- Funding breakdown relative to type of events and regions (from 2016-2017)
- Survey of attendance of events across regions and event types (for 2021)

Additional information available:

- Goals and Mandate of Heritage Canada, additional departmental information

(all of this information is actually available on the GoC data portal)

Illustrative Case Study 3: Your Case Study!

Follow along by choosing a situation where you may need to make a decision – you could be in the pre-decision stage.

Take a moment now to write a short description of that situation for yourself

Take another moment to identify any data, evidence or information sources you have available that seem like they could be relevant – make a quick list of these sources

Four Core Elements of Decision Making

Problem/Goal

Choices
(Possible Actions)

Outcomes

Information
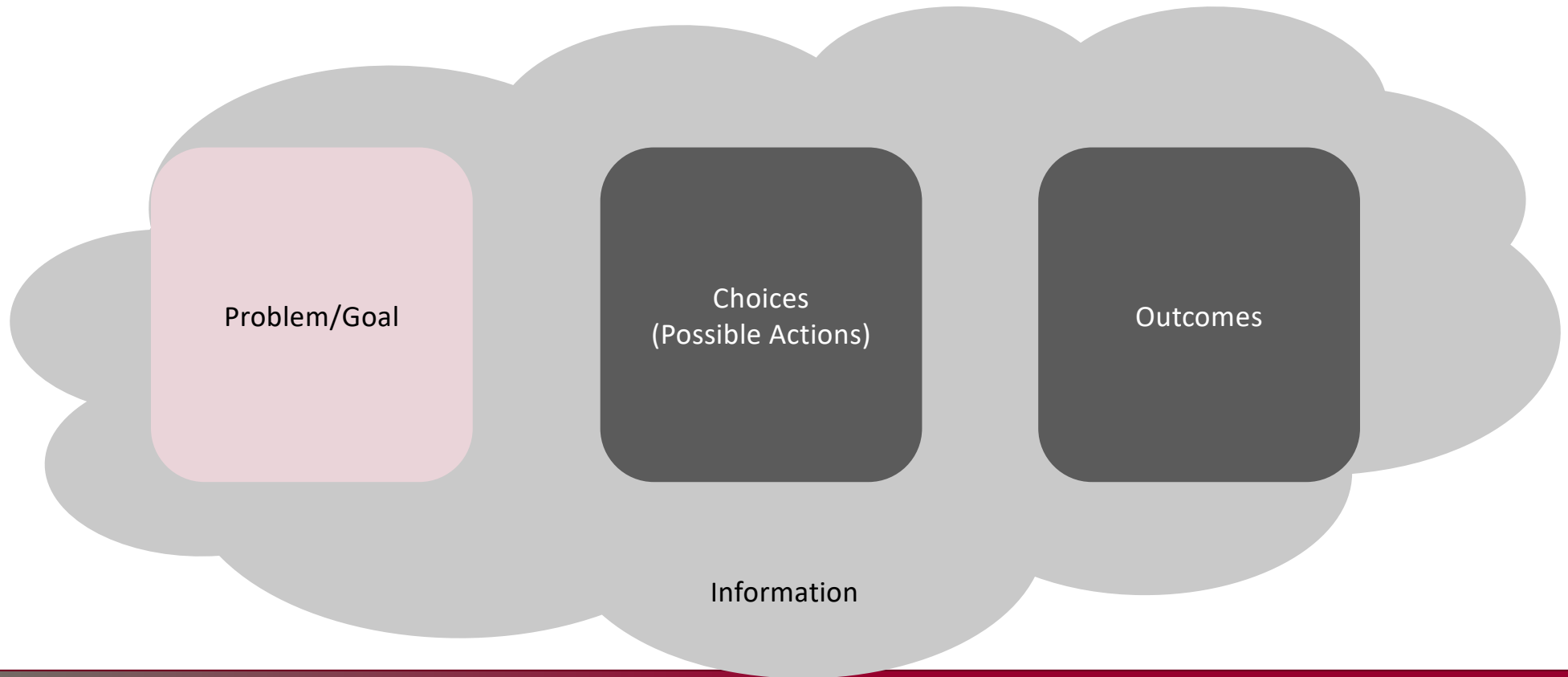
Problem or Goal or Target

This is the element that kicks off the decision-making process proper

We are moving from the pre-decision making into decision making space.

We find ourselves in a state that is not stable or satisfactory – we want things to be better, or at least not get worse.

We may be in a situation that simply must evolve in some direction – and we want to have agency.
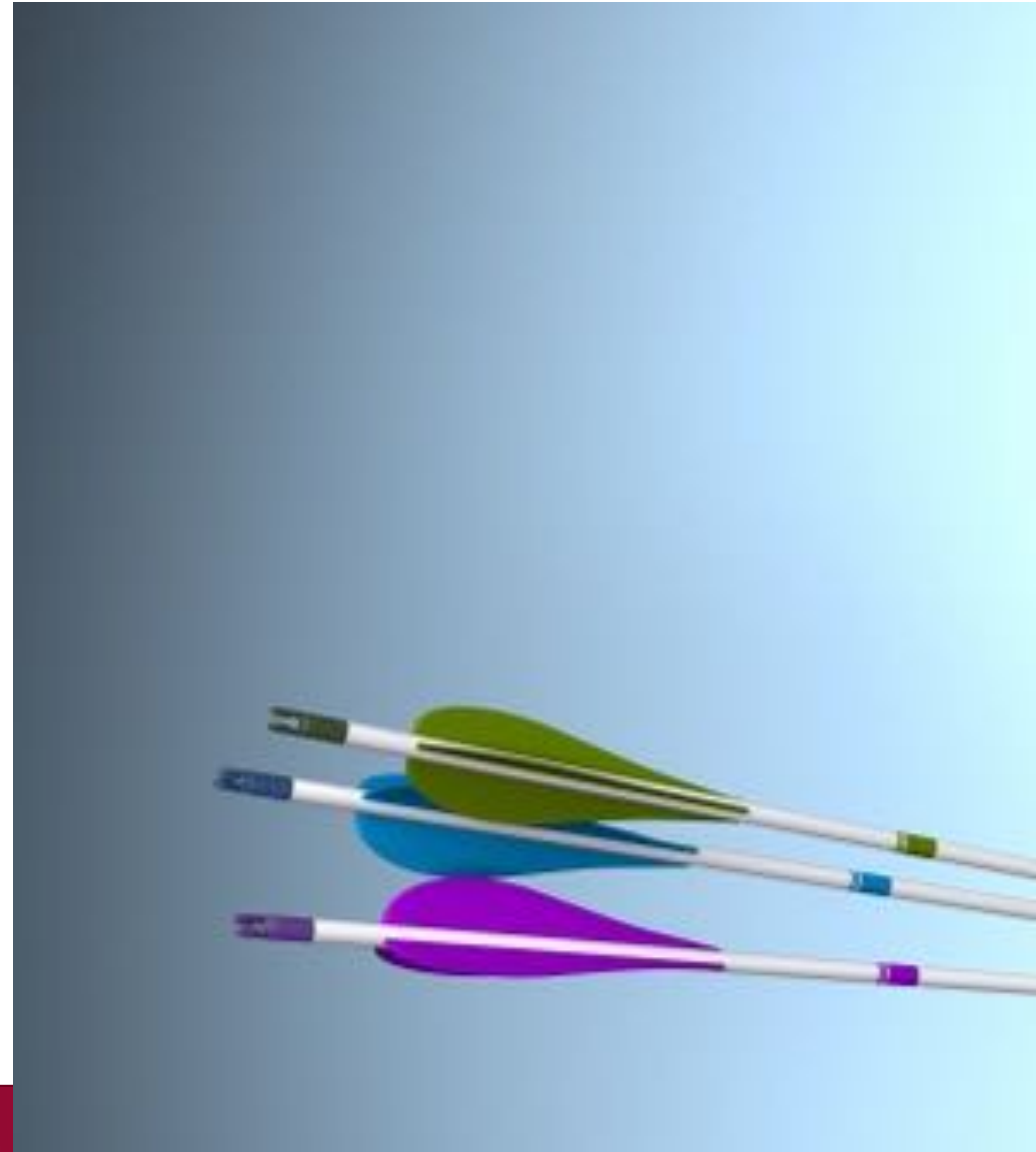
Problem or Goal: Relevant Activities

<u>Describe</u>: the current state. What state are you in now? What do you want to change, or stay the same?

<u>Define/State</u>: the problem or goal clearly.

Note: Might be more value driven than "data driven". Critical nonetheless.

Situational Awareness During Pre-Decision Making

We may not know about problems unless we've been monitoring in the pre-decision state.

As well, if we arrive at active decision making with no relevant data, the pressure will be towards arm-chair decision making.

Hiking Scenario: Problem, Goal, Situation

Problem: We're walking through the woods. We don't know a lot about the trail system. Eventually it's going to get dark and cold. We're faced with a fork in the road. State – stopped. On the trail.

Goal: We want to finish our hike by ending back at the parking lot before dark.

Situational Awareness: What time is it, how tired am I, what is the temperature?

(Do I need facts? Do I need a dataset?)

Canada Arts Funding Scenario

In the case of the Canada Arts Funding scenario, what is the state that is not stable? What is the state that must evolve?
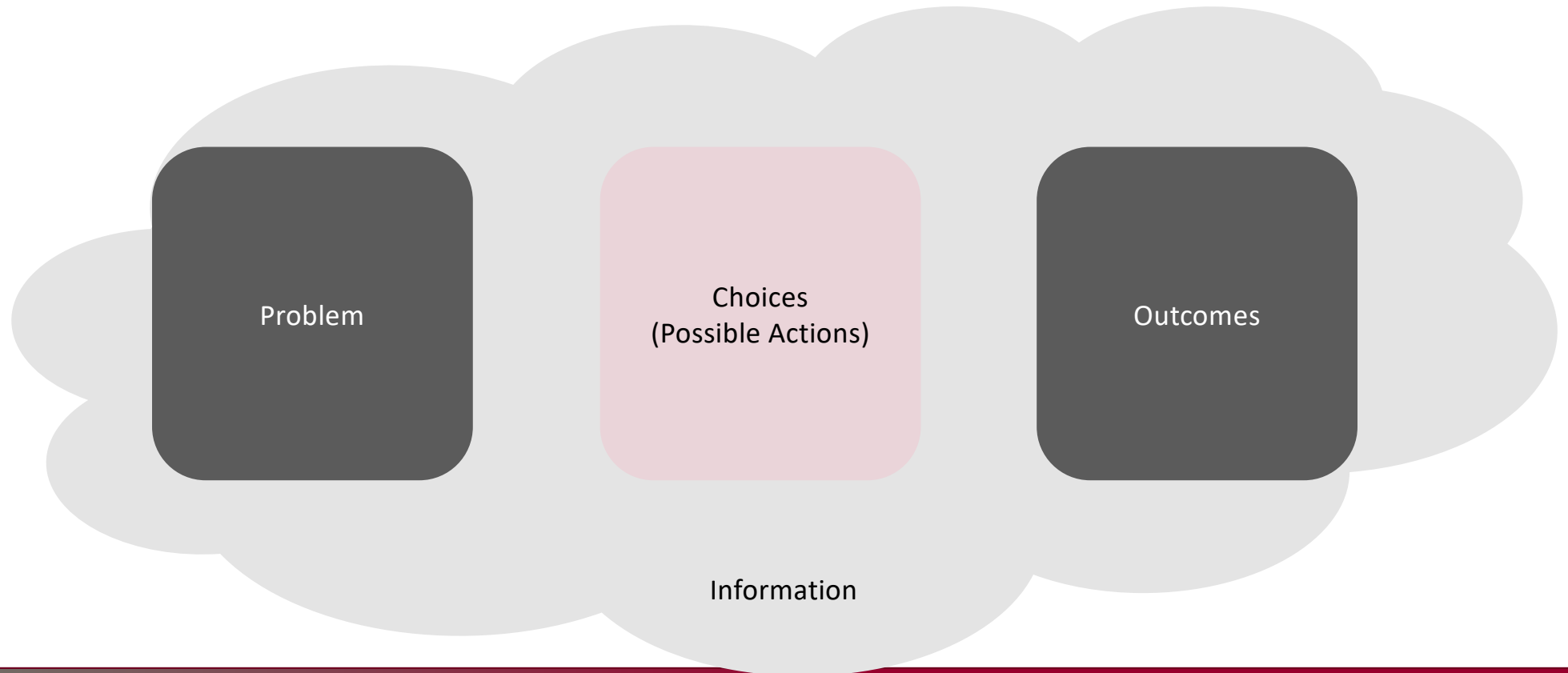
What is the goal that has not yet been achieved, and for which action is required?

Situational awareness considerations?

Your Case Study!

Problem?

Situation?

Goal?

Data or Information?

Core Elements of Decision Making

Choices – Possible Actions

If we agree that we must, or wish to, act:

- What are possible actions?
- What are constraints on these actions?
- What are the *factors* at play? How do they differentiate one possible course of action from another?

Choices: Relevant Activities

Imagine	Imagine possible choices
Identify	Identify relevant factors – what impacts or influences choices?
Identify	Alternatively, identify constraints on our choices
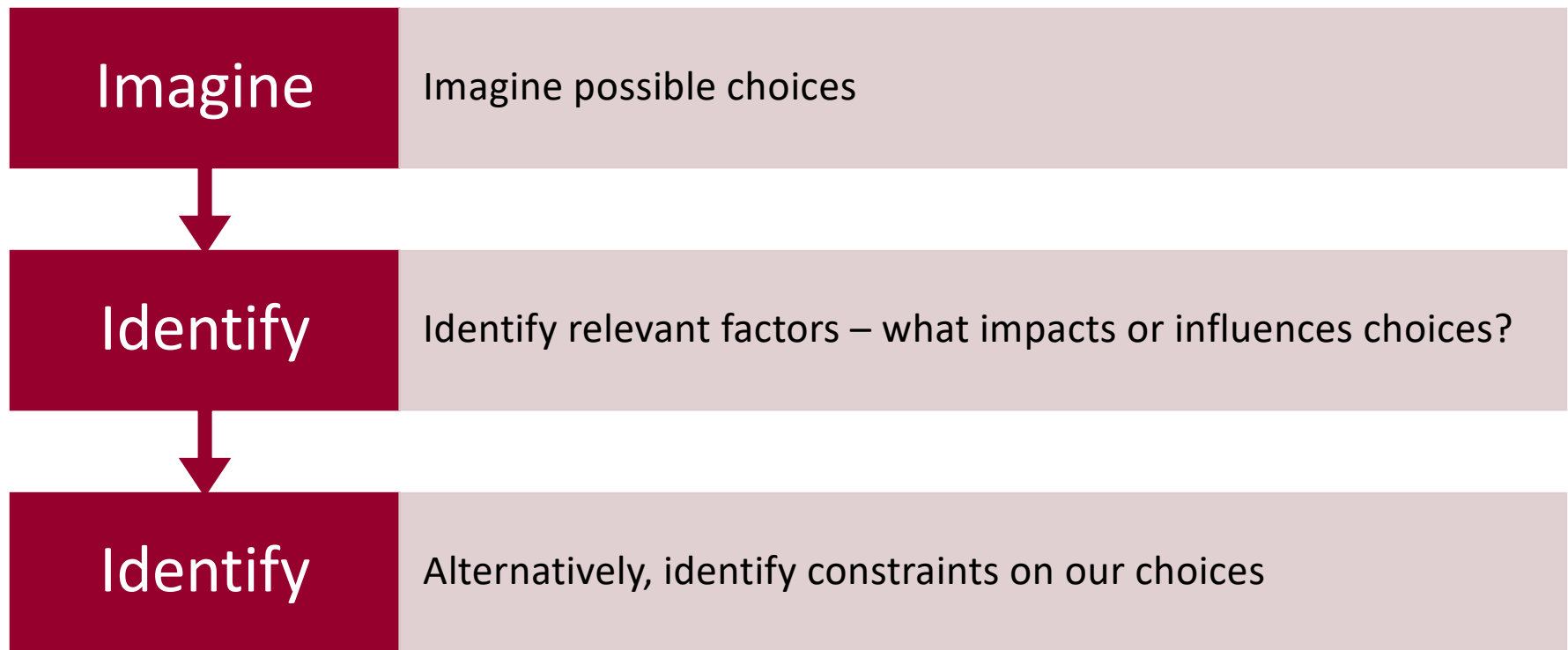
Avoiding Forced Choices: Effects Based Planning

Consider a scenario – what is a pain point (decision point)

Brain storm: How do you characterize the choices

Did you throw yourself into a forced choice?

Hiking Scenario

Faced with a fork in the trail, what are possible courses of action?

- Go left
- Go right

Can you think of any more?

What are common factors (or variables) across all of these? What differentiates one choice from another? What could *influence* choices?

- Direction of movement. Anything else?

Canadian Heritage Scenario

In the case of the Canadian Heritage example, choices of action will involve several elements:

- Total amount of money available
- How money is to be allotted across regions and types of artistic activity
- What type of funding programs
- Infinite choices? What are constraints?

Factors and Questions: Canada Arts Funding

In our Canada Arts Funding case study, factors or influences could include:

- How much funding different regions have previously received
- The success of previous types of programs, measure by:
  - Attendance
  - Positive Press
  - Positive impact
  - Improved opinions of the arts

Do we need a bag of facts? Do we need datasets? Do we need answers?

Case Study 3: Your Scenario

Take a moment to consider, for your scenario:

Possible choices of action

Factors that influence available choices of action

Constraints

Data that could help identify sources of influence or constraints

Core Elements of Decision Making
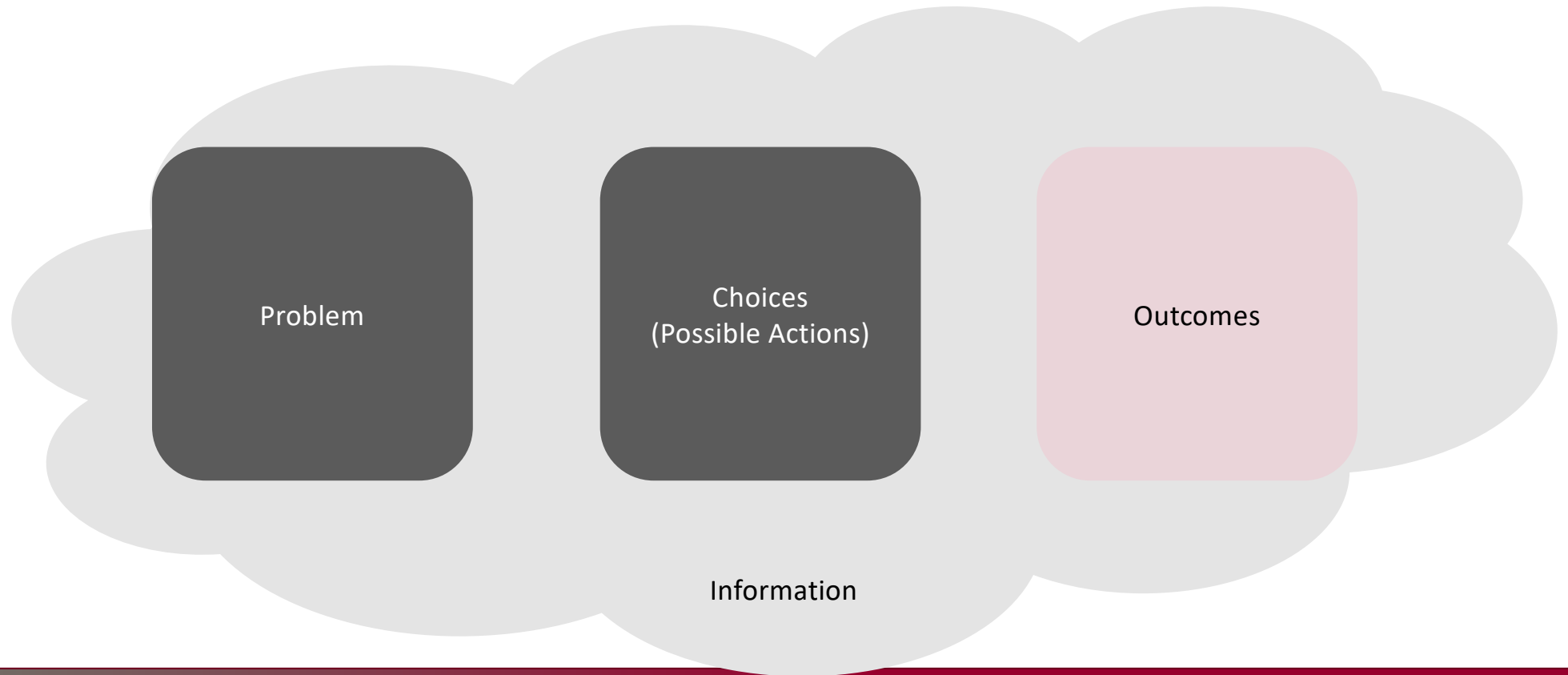
Outputs, Products or Results

In-between our choices of action and possible outcomes, we can think about the output, product or immediate result of our choice of actions.

In our simple trail example, some specific concrete results could be:

- We walk down the left fork and…
- We walk down the right fork and…

In our Canadian Heritage example, the product (output, result) is a budget.

Outcomes, Consequences

Outcomes and consequences are broader and more contextual.

When considering outcomes, consequences or results, we need to consider possible worlds

In our straightforward example:

- Outcomes: We make it back to the trail head warm and happy. We make it back, but it's cold and dark. We get lost and people must try to find us. We have to stay overnight in the park!

- Consequences: We have a sense of our own agency, we feel like we know what we're doing, we have to deal with exposure, we feel afraid, we get in trouble with the park and charged for a rescue.

Risks and Benefits, Pros and Cons

For each pair - possible course of action and imagined outcome - we can consider pros and cons, risks and benefits

This also returns us to our consideration of factors, but in a different sense – what are the factors (effects) that differentiate outcomes?

Outcomes: Relevant Activities

Imagine	Imagine possible outcomes
Identify	Identify factors – impacts or effects
Identify	Identify constraints
Identify	Identify probabilities of each outcome (probability, cause and effect)
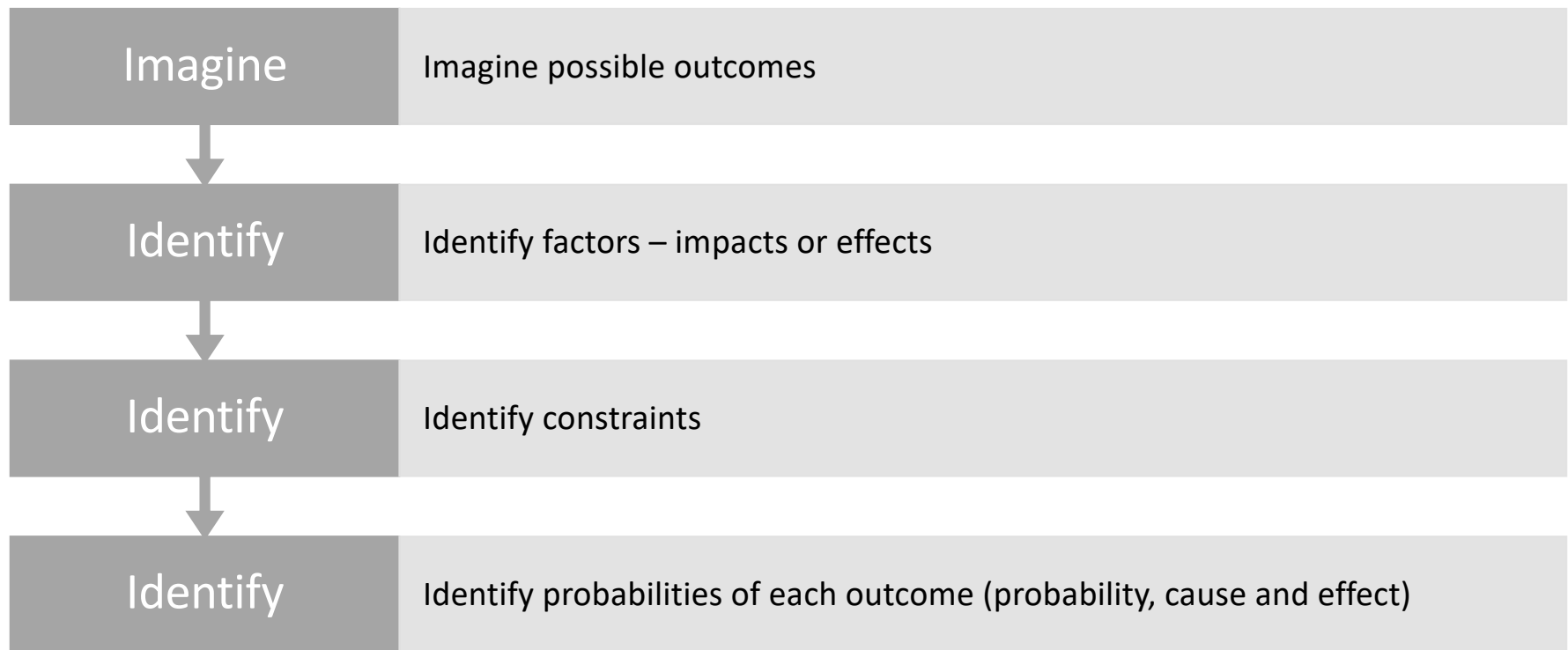
Canadian Arts Funding Scenario

Consequences:

- If we distribute the money well, we can have a positive impact on artists and Canadians who are participating in the art in some way (e.g. as audience)
- If we distribute the money poorly, we might have a freezing effect on arts in certain part of the country, we might contribute to a negative perspective of arts, we might cause some art forms to decline

Risks and Benefits:

- a risk could be undermining some types of artistic endeavour, a benefit could be ensuring the enduring presence of a marginalized art form.

Core Elements of Decision Making

Information, Data, Knowledge
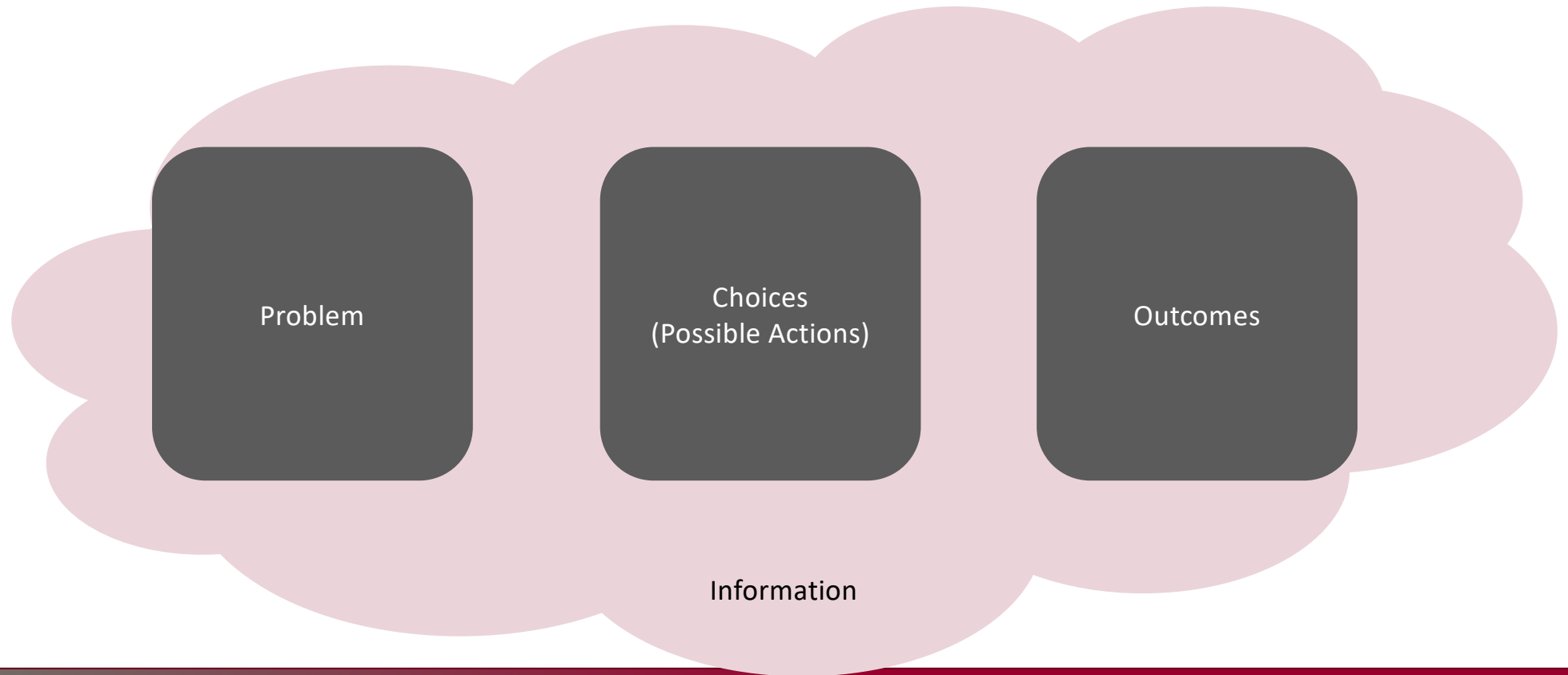
Information: broad term to refer to _statements_ of all kinds (may be true or false, correct or incorrect, actual or possible)

Data: Structured collection of measurements

Knowledge: Justified True Belief – true statements, facts

The Pervasive Role of Information

How does information (evidence, data) come into play at different points in the decision-making process?

Remember the "Grab Bag of Information". **At each point in the process, what type of information would you like to be able to pull from the bag?**

Information: Relevant Activities

Identify	Identify sources of information and data
Turn	Turn this into statements with certain structures.
Identify	Identify which parts of the decision-making process would benefit from which statements.

Sources of Information in the Hiking Scenario

Consider the simple fork in the trail situation.
What types of information are available to us?

The Form of Information in Decision Making

What's the most useful form that information takes during decision-making? how can we transform it so that it is most useful.

We suggest that the statement* is a fundamental form for information.

(*Fact = True Statement)

We might think of statements as the raw material for each aspect of decision making: problem/goal, choices, possible outcomes

Different analytics engines (techniques) produce different forms of statements.

Our Position: Understanding the *Form* of Statements is Critical to Using Analytics for Decision Making
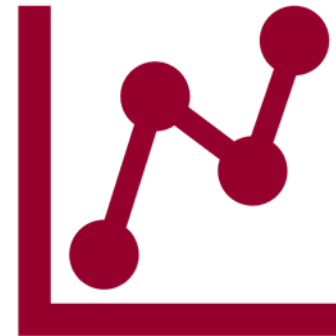
In General, What Structure Do Statements Have?

Three main types:

DESCRIPTIVE: It is the case that A.

CAUSAL STATEMENTS: If A then B.

VALUE STATMENTS: A is good.

Many Variations on These Basic Types

DESCRIPTIVE:
- A, It is the case that A, A is happening, A is the situation
- NOT A
- EITHER A OR B but NOT BOTH, A AND B
- As are x, some As are x, As are often x

CAUSAL STATEMENTS:
- IF A THEN B
- As are x
- IF A goes up, then B goes down
- When A goes up, B goes up
- It seems like A causes B
- It seems like A doesn't influence B

VALUE STATMENTS: A is good, B is bad, We want A, we don't want B

Possible Statements in the Hiking Example

- A basic statement of fact:
  - I have 1 liter of water.
- IF A THEN B
  - IF it has been raining a lot this week THEN low lying trails could be washed out
  - When I walk for longer than 30 minutes, I get hungry.
  - Walking a lot causes me to be tired.
- NOT A
  - I don't have any food.
- EITHER A OR B but NOT BOTH
  - Either I go forward or I go back.
- As are x
  - Trails are busy during the day
- Value Statements:
  - Getting back to the parking lot is good

Matching Statement Structure to Decision Stage

PRE

POST

DECISION STAGE

Goal

Problem (+ Goal)

Choices (Possible Actions)

Outcomes (Possible Results)

Goal

TRUE STATEMENTS

Descriptive / Situational Awareness

A   A is p   Not A   A and B

Causal Chains

If A then X   If X then Y   If Y then OUTCOME + GOAL

DATA AND ANALYTICS

Matching Statement Structure to Decision Stage

DECISION STAGE

Problem
(+ Goal): Get to the parking lot before dark OR see amazing nature, OR have a challenging but rewarding hike, OR…?

Choices: Take Trail A, Take Trail B (other options)

Outcomes:
Get back to the parking lot before dark, get back after dark, get lost, have a good time, have a bad time, have a good workout…

TRUE? STATEMENTS

Descriptive / Situational Awareness

I have 1 liter of water. It's 2:00

Trail A is longer than Trail B, according to my map. More people like Trail A according to RateMyTrail

Causal Chain

If [I take the shorter trail] AND [the trail that has better ratings for inexperienced hikers], then my most likely outcome is [to make it back to the parking lot before dark].

DATA AND ANALYTICS

Amount of food and water (observation), time of day (cell phone/observation), length of trails (map) trail ratings (cell phone), level of hiking ability (prior experience)

Finally Taking the Decision

- In our three scenarios (hiking, arts funding, your scenario):
  - What would it look like to make an armchair decision?
  - What would it look like to make a data inspired decision?
  - What would it look like to make a data-driven decision?
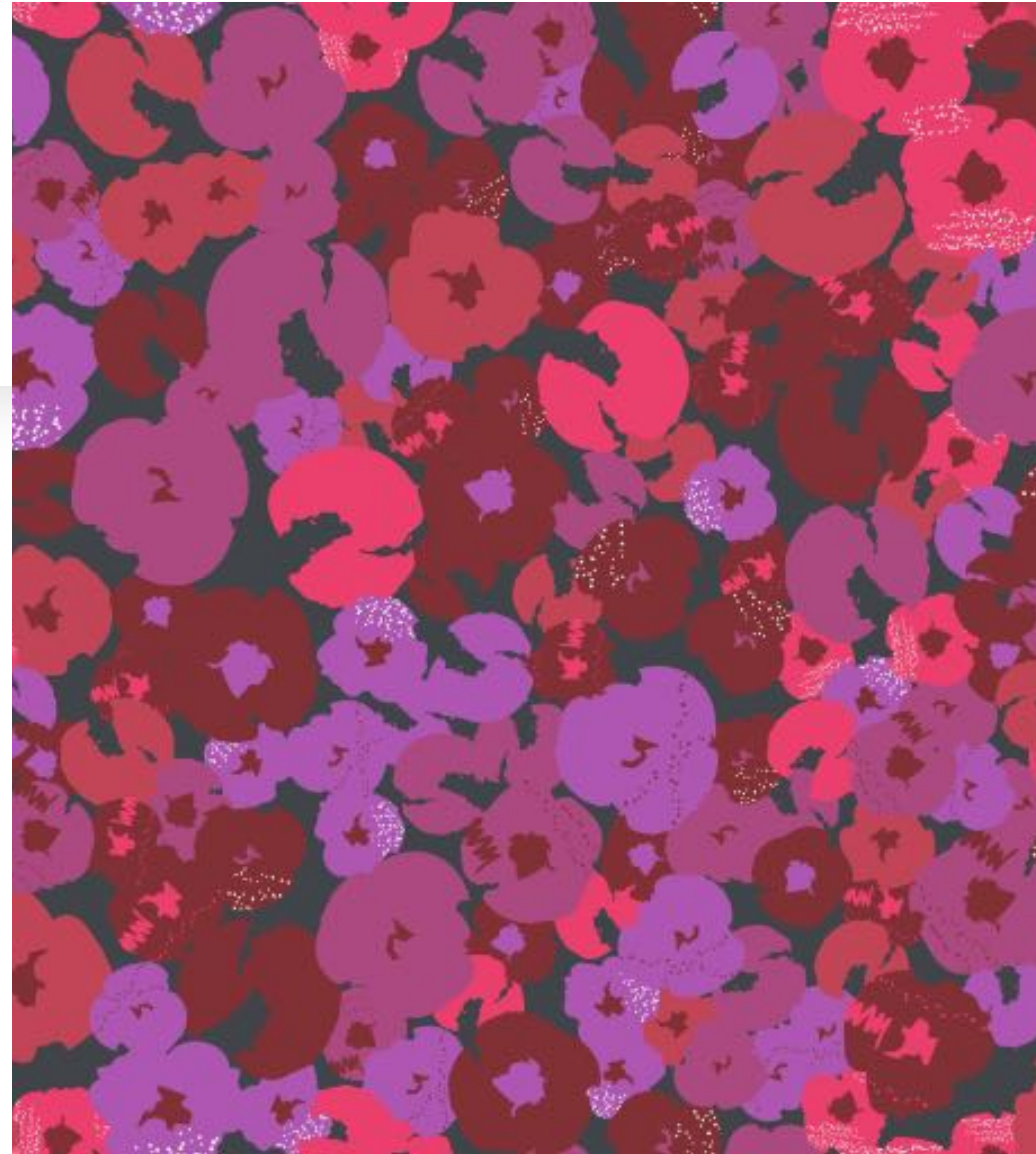
Where can we get more useful statements?

In the hiking example, where could we get (1) more useful and (2) more likely true statements?

Short answer – bag of facts!

Bigger answer – analytics + data

Small Group Analysis Exercise – Part 1
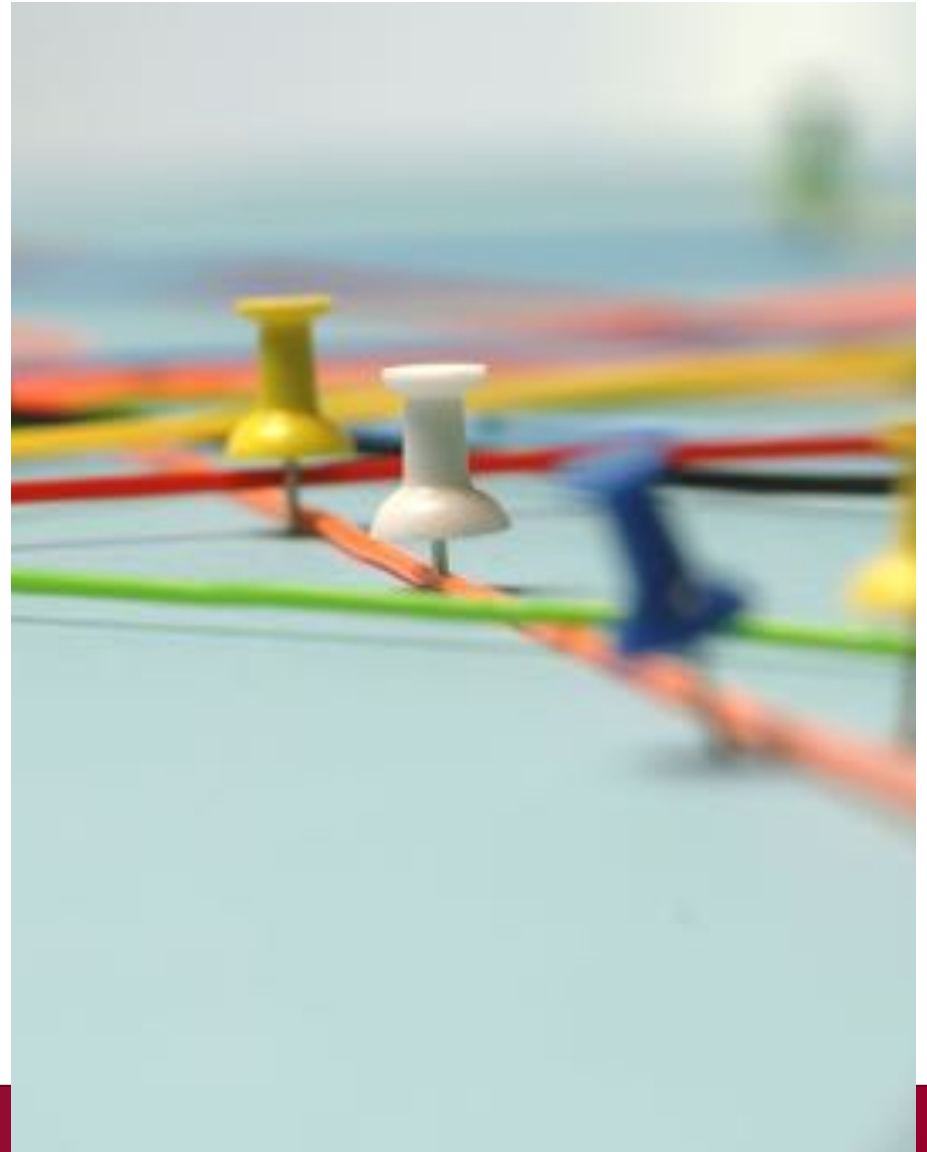
Analysis Exercise Part 1

In this exercise, you will work with a partner to consider what type of statements you might be able to extract from the provided "pocket data set" – the hiking reviews dataset.

This will be exploratory – any statements you can come up with are good!

How Analytics Come Into Play

How can we get useful statements from analytics?

Different analytics techniques provide different types of statements, with different structures.

These can act as input into different parts of the decision-making process

Analytics Engines: Statements Generators

Effectively, analytic techniques use data as fuel to generate statements.

If applied 'naively', analytics can result in a grab bag of statements.

If applied in a more focused manner, can lead to statements relevant to a particular decision.

The Role of Experts

Our take – subject matter experts are still important

Experts can suggest which type of statement would be most useful.

Experts can interpret the 'concentrated' statements generated by data and put them into relevant context.

They answer the question "So what?".

The Role of Values (Priorities)

Facts generated by data can't directly help with the value (or priority) part.

However, facts can connect to the value part:

A is good, If B then A, C usually leads to B

Conclusion – Let's Act – Specifically, let's do C!

Mapping Analytics Techniques to the Decision Landscape

WITHIN ANALYTICS ITSELF, THERE ARE MANY (MANY) TECHNIQUES

HOW DO THESE INFORM EACH PARTS OF THE DECISION-MAKING PROCESS?

Considering Five (Plus One) Types of Analytics

Data Visualization and Basic Analytics

Metrics

Statistics

Optimization

Classic Machine Learning

Generative AI?

Keep Using Your Scenario!

As we go through each type of analytics technique, ask yourself – is this relevant to my scenario?

Analytic Technique 1: Data Visualization and Basic Analytics

Data visualization techniques show many pieces of data at once (data are the parts, we want to see the whole picture)

What type of statements can be extracted from data visualizations? Lots!

These statements can be useful, BUT they may not be very rigorous. Jumping off point. May not be good for prediction.

Basic analytics provides useful summary numbers produced from raw data (e.g. we sold 56 books in 2012).

Before and After Example
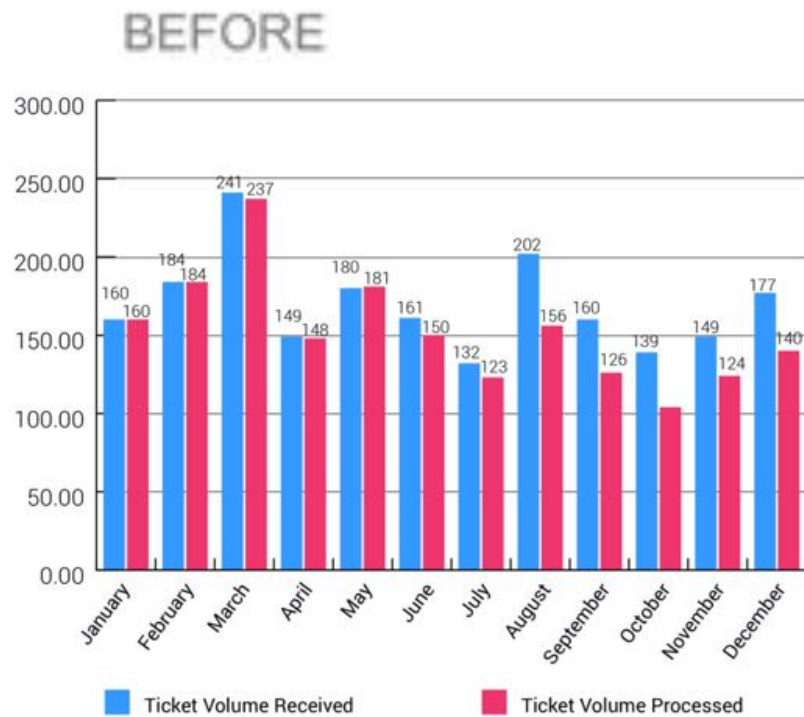
BEFORE

Before and After Example

BEFORE

TICKET TREND
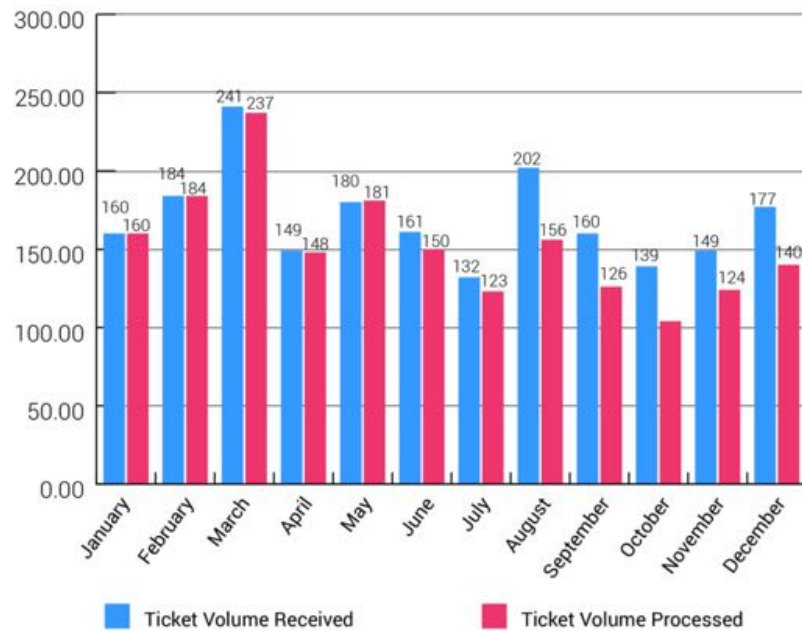
AFTER

Lag in Tickets Processed Since May Layoffs

We **have not been able to keep up** with **tickets received** since two employees were let go in May.
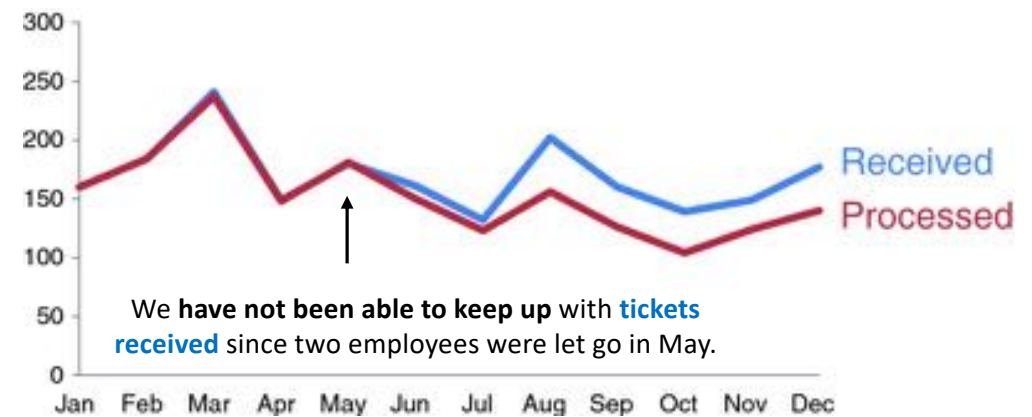
Analytic Technique 2: Metrics

Metrics are simple combinations of raw measures using math operations Intended to capture more abstract or complex concepts (mini math models)

Usually used in a business context.

Often ad hoc experimentation – if we change our organization like this, does the metric go up?

Can generate either descriptive statements OR causal statements (A causes B, if A then B) depending on the context.

Metrics Uses

Pre-decision making: goals, situational awareness

During decision: impact evaluators – outcomes of interest or value

Post decision: evaluation of decision

Metrics Examples

Key performance indicators (KPIs) are the classic example.

Related to index in statistics (e.g. Gross National Happiness index)

For some interesting reading, best practices see "The Tyranny of Metrics" Jerry Z. Muller

Analytic Technique 3: Statistics

From a decision-making perspective, statistics typically provides generalized statements based on collections of very specific statements (i.e., data)

Common forms of statements are:

- When A, then typically B (e.g., When people eat sandwiches, their mood improves)
- A's often x (e.g. Vegetarians often have low cholesterol)
- As have the property x (e.g., Canadian women are 164cm tall)

How and where might these types of statements feed into the basic decision-making architecture?
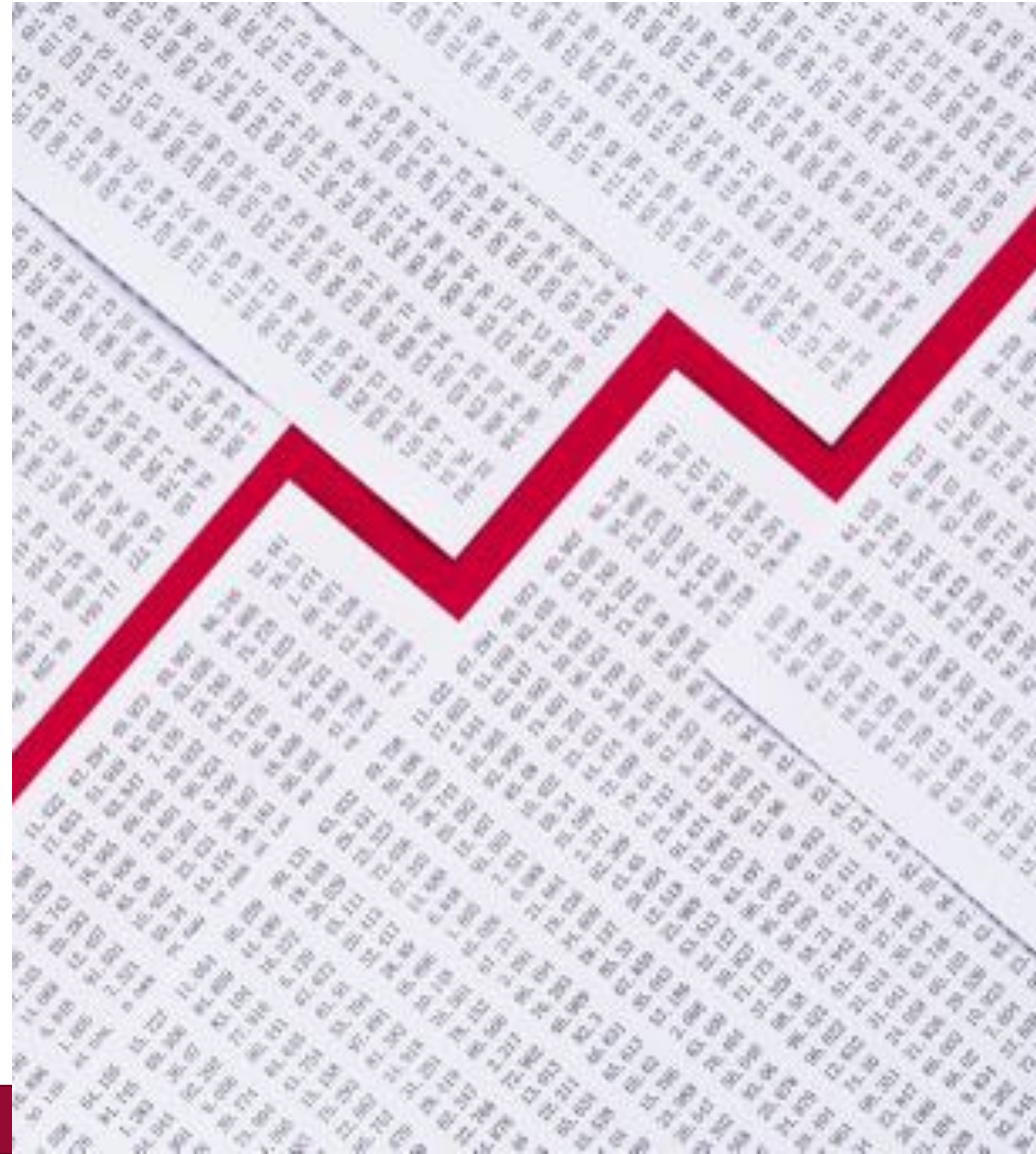
What about "Correlation not Causation!"

There's a lot of upheaval going on in statistics right now!

Particularly, frequentists are "under attack" from Bayesians and causal modellers.

It's a problem if we erroneously conclude causation from correlation, but its also a problem if we never admit that correlation is a very strong clue that there could be something causal at play.

Analytic Technique 4: Optimization

Given a set of constraints and relationships, what is the best possible solution?

What is the maximum or minimum possible in a certain circumstance?

Statements of the form: "The best possible x is (approximately) y, and that happens when z"

But what counts as "the best"? Techniques aside, optimization is all about organizational values/goals and metrics that measure these.

Very relevant to imagining possible outcomes.

Optimization: Video Explainer

Introduction to Optimization: What Is Optimization?

https://www.youtube.com/watch?v=Q2dewZweAtU

Analytic Techniques 5: Classic Machine Learning

The most classic and common technique of classic machine learning is labelling: could be classification and categorization

Classification provides as an output a statement of the form "A is an x"

It is different from previous approaches: It often focuses on the individual. It doesn't necessarily provide statements in a more general form.

As a result, it is typically applied in what might be called "local" or "specific" decision making. "I need to decide whether or not to grant this particular individual a loan".

Machine Learning Video Explainer

Computer Scientist Explains Machine Learning in 5 Levels of Difficulty | WIRED

https://www.youtube.com/watch?v=5q87K1WaoFI&t=12s

Is Generative AI an Analytics Technique?

Can we use Generative AI engines (e.g. ChatGPT) for analysis? This is difficult to answer in a straightforward manner!

Traditional "plain jane" Large Language Models (the technique used to create the original GPT engine) are not good for analysis.

Right now commercial products are very black box – we can't easily evaluate their likely behaviour or quality based on how they are constructed.

Many of the front running providers of these engines may also be using them as interfaces to more classic analysis techniques

This means we may need to take a "test kitchen" approach.
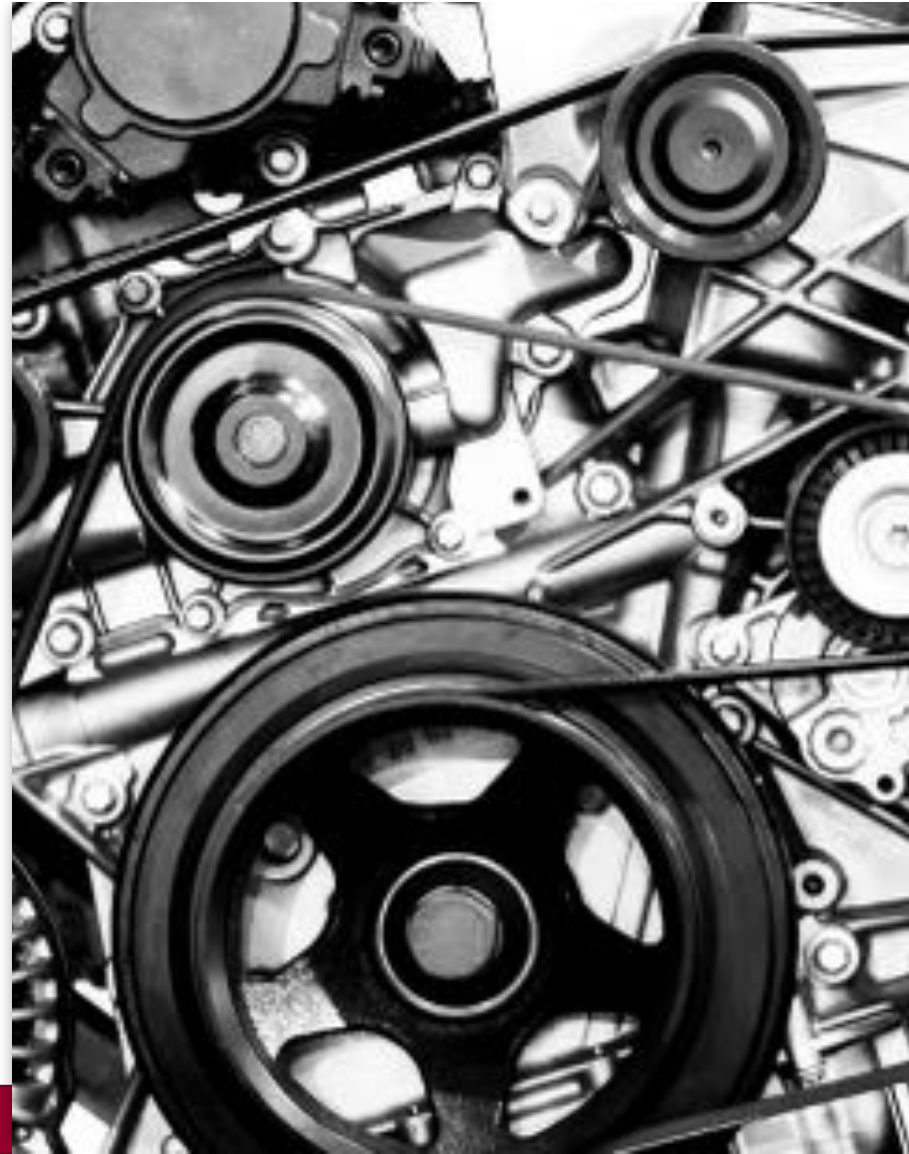
Small Group Analysis Exercise – Part 2

Exercise Part 2

What analytics techniques could you use on the hiking dataset?

How could the results of your analysis and the statements you extracted influence your decision about which part of the trail to take?

End of Section 2 Check In

How does what you've learned so far apply to decision making in your current work situation?

Section 3:

Human Factors

Group Decision Making with Data

Group Decision Making Challenges

Issue: Cognitive Biases – Very Powerful!

Solutions:

Storytelling With Data

Group Decision Making with Data: Decision Making Frameworks

Human in the Loop: Cognitive Biases

Dealing with the Human in the Loop

Humans are (still) an integral part of the decision-making process – at the very least they provide the values and take responsibility.

An obstacle that can prevent these approaches from having the desired impact – cognitive biases

Key steps in dealing with the cognitive bias obstacle – awareness and recognition at each stage of the decision-making process.

Remember Kozyrkov's Take on When Data Should Get Involved

If you already have your preference, and there is nothing that would change your mind*, there is no need to turn to the data! Make your decision and call it a day.

*or if there is only a low probability that the results will change your mind…

Data Inspired Decision Making

According to Kozyrkov: "That's where we, like whales encountering plankton, swim around in some numbers, and then reach an emotional tipping point and... decide. There are numbers near our decision somewhere, but those numbers don't drive it."

(quote from: https://kozyrkov.medium.com/data-inspired-5c78db3999b2)

Armchair Analysis Version of Decision Making

Problem

Choices
(Possible Actions)

Outcomes
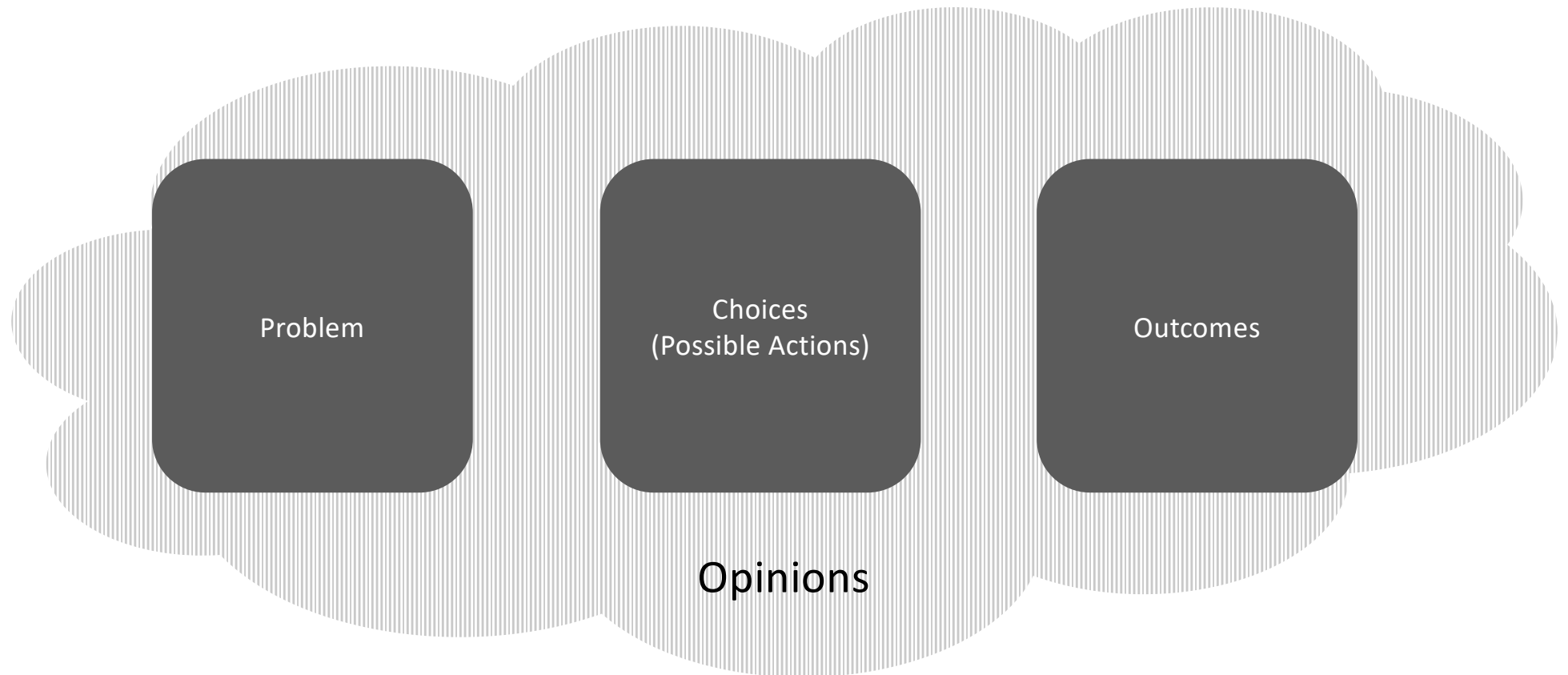
Opinions

How can analytics help mitigate this?

We can use analytics to convert "bag of opinions" into "bag of knowledge"

How?

- Validate opinions
- Challenge opinions
- Expand and Enhance opinions

What can prevent this from being successful? Cognitive Biases!
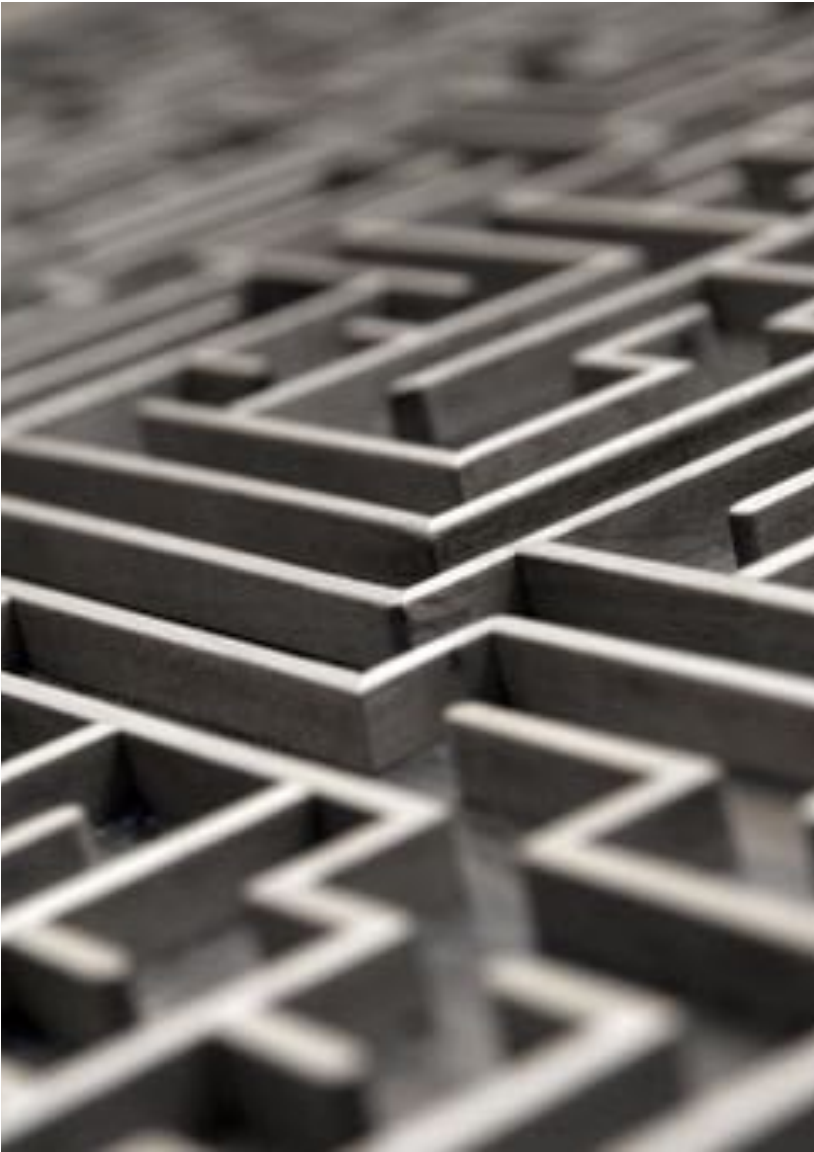
Biases / Heuristics

- Though they may have adaptive origins, their adaptiveness to all situations should be deeply questioned.

- Be warned! They feel very powerful. They are instinctual.

Cognitive Biases/Properties that affect Decision Making

Anchoring Bias: Why do we compare everything to the first piece of information we received?

Action Bias: Why do we prefer doing something to doing nothing?

Bandwagon Effect: Why do we support opinions as they become more popular?

Confirmation Bias: Why do we favour our existing beliefs?

Belief Perseverance: Why do we maintain the same beliefs, even when they are proved wrong?

Bounded Rationality : Why are we satisfied by good enough?

Choice Overload: Why do we have a harder time choosing when we have more options?

Commitment Bias: Why do we favour our existing beliefs?

Decision Fatigue: Why do we make worse decisions at the end of the day?

Empathy Gap: Why do we mispredict how much our emotions influence our behaviour?

Framing Effect: Why do our decisions depend on how options are presented to us?

IKEA effect: Why do we place disproportionately high value on things we helped to create?

The Sunk Cost Fallacy: Why are we likely to continue with an investment even if it would be rational to give it up?

Zero Risk Bias: Why do we seek certainty in risky situations?

Source: https://thedecisionlab.com/biases

Cognitive Biases Can Affect All Three Phases

PRE DECISION MAKING   DECISION MAKING   POST DECISION MAKING

Showcasing Three Cognitive Biases

Anchoring Bias

Bandwagon Effect

Sunk Cost Fallacy

Phase-Bias Mappings

PRE DECISION
MAKING

DECISION
MAKING

POST DECISION
MAKING

Anchoring Bias

Bandwagon
Effect

Sunk Cost
Fallacy

Anchoring Bias

PRE DECISION
MAKING

Anchoring Bias

The Anchoring Bias: What is it?

The first piece of information we receive on a topic acts as a reference point from which we interpret new information.

Example : If a customer first sees an item at its "original price", and then subsequently sees the item at a discounted price, they will evaluate the new price as a good deal, separate from the actual amount.

Can prevent us from adjusting our plan when we discover that our initial time/cost estimations were inaccurate.

Anchoring Bias: How Can We Mitigate its Effects?

Recognize the existence of the anchor.

Come up with reasons why that anchor is inappropriate. This has been shown to reduce the anchor effect in experiments.

Considering multiple options

Red teaming - where people are designated to play "devil's advocate" and challenge the ideas of the group).

Exercises that expose the weaknesses of alternatives can inoculate them against any hidden anchoring influence (remember that biases are unconscious!).

Source: https://thedecisionlab.com/biases/anchoring-bias

Bandwagon Effect

DECISION
MAKING

Bandwagon
Effect

Bandwagon Effect: What is it?

- Refers to our tendency to go along with the majority opinion/behaviour ("go along to get along", "if you can't beat'm, join'm,", etc).

- Overrides reasoning faculties that are essential for critical thinking.

- A helpful heuristic perhaps, evolutionarily, but not always adaptive.

- The spread of AI awareness and perceived AI needs. Will AI really help you in this instance?

Source: https://thedecisionlab.com/biases/bandwagon-effect

Bandwagon Effect: How to Mitigate its Effects?

- Allow some time and space before you make your decision to take your stand when the information was conveyed to you in such a way where it is clear what the majority opinion is.

- Try to put yourself in an environment where social pressure is reduced.

- Make it a habit to also "think for yourself"!

Source: https://thedecisionlab.com/biases/bandwagon-effect

Sunk Cost Fallacy

POST DECISION
MAKING

Sunk Cost
Fallacy

Sunk Cost Fallacy: What is it?

- Our tendency to persist in an endeavour simply because we have already invested resources into it (e.g., time, money, energy, etc.)

- We cannot do anything about past irrecoverable costs, but we can do something about the future.

- We are biased away from looking rationally at current alternatives.

- Example: The Concorde

- Can you think of any examples in your own work or life?

- Do we think AI will help or hinder?

https://thedecisionlab.com/biases/the-sunk-cost-fallacy
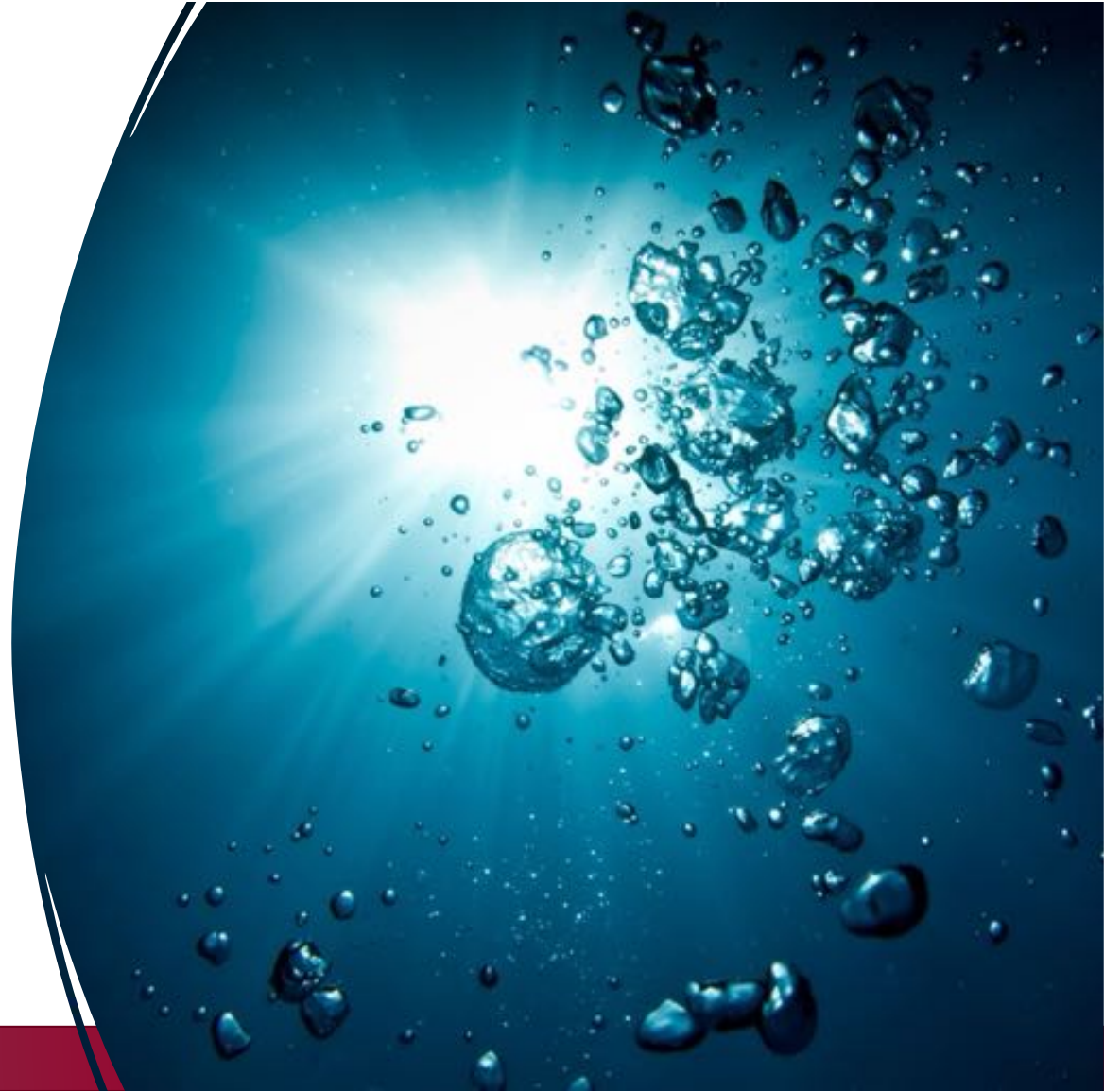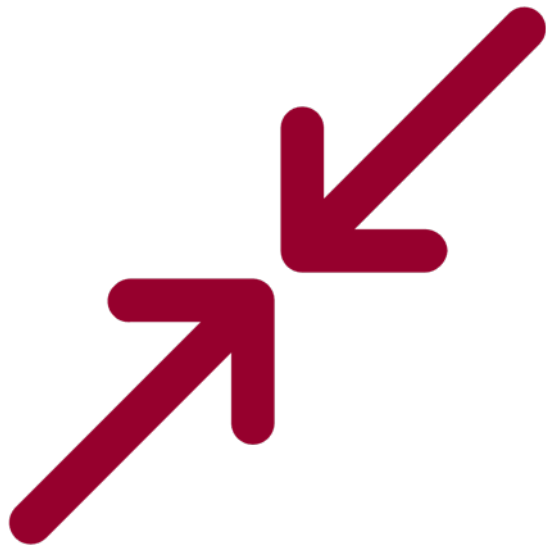
Sunk Cost Fallacy: How to Mitigate its Effects?

- Rather than fixating on irrecoverable past losses, focus on the present and the future with a fresh perspective.

- Studies have shown that when we are deterred from making decisions based off emotions, this bias is significantly reduced.

- Turn to AI / automated decision making?

Bias and the Decision Making Process Discussion

Taking in new statements (beliefs/facts)

- Anchoring Bias
- Bandwagon Effect
- Base Rate Fallacy

Handling Currently held statements

- Confirmation Bias
- Belief Perseverance
- Commitment Bias

Choosing/Selecting among options

- Action Bias
- Choice Overload
- Bounded Rationality
- Decision Fatigue
- Empathy Gap
- Zero Risk Bias

Decision Evaluation

- IKEA Effect
- The Sunk Cost Fallacy

What can be done?

Is there an approach that can increase the influence of data relative to biased opinions and choices?

Is there a way that data support roles can combat bias – maybe fight fire with fire?

Data & Storytelling

Nov. 19, 2022

What's the first thing you see in the following image…?

FLATTENING THE CURVE

A look at the importance of slowing the spread of a virus, so that the rate of infection doesn't outpace the resources to fight against it.

No intervention

HEALTHCARE SYSTEM CAPACITY

With intervention

Daily new cases

Days since first case
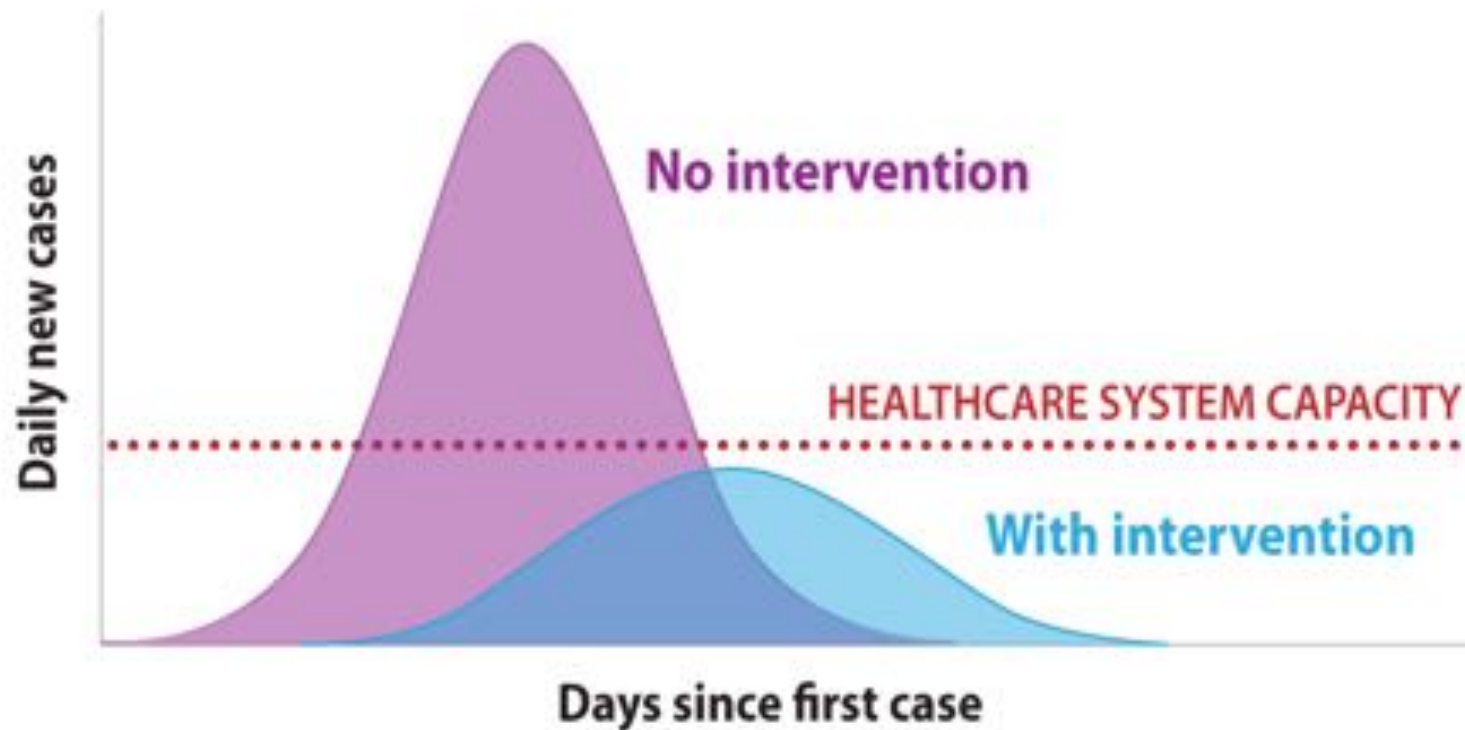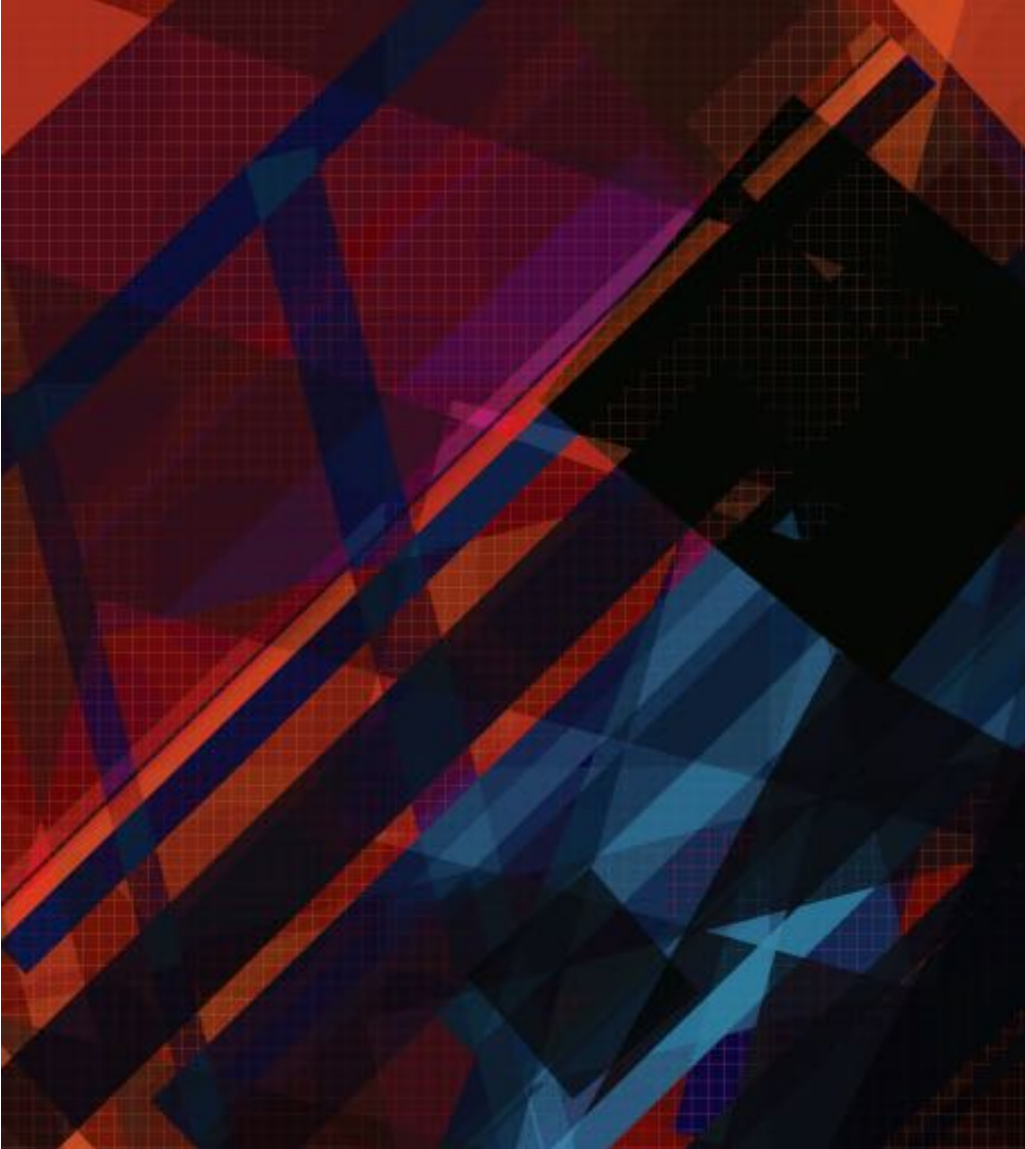
Some reasons to tell stories

- Explain

- Persuade

- Build trust
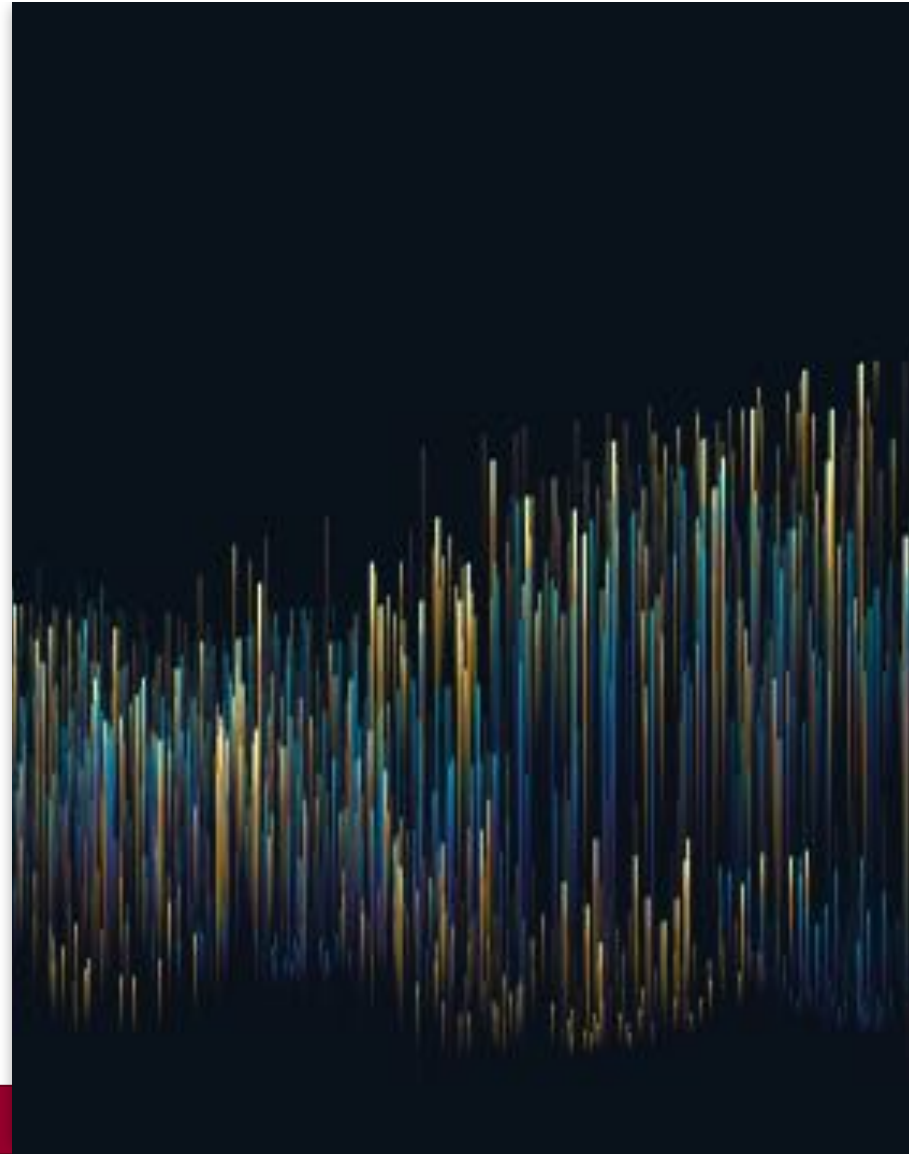
What is hard about briefing up?

Being succinct without omitting key details?

What do you wish Senior Management Knew

- How are things going?

- Something new or interesting ?

- Something problematic or unfair?

Why Does Storytelling Work?

Humans think in stories

Start with your Audience

What are they buying?

Confidence

- Peace of mind that they are making the right decision.

Opportunity

- Chance to be the "hero" in their own story.

Foresight

- Early warning of risks.

Understanding Your Storytelling Context

Who are your audiences?

What are their needs?

What are they seeking?

Why are they seeking this?

What decisions do they need to make?

Understanding Your Storytelling Content

What data and analysis can you provide?

(Why is data visualization and data storytelling important to you?)

What is Data Storytelling?

Data storytelling is the ability to effectively communicate insights from a dataset using narratives and visualizations. It can be used to put data insights into context for and inspire action from your audience (Catherine Cote).

There are 3 key components:

1. data: foundation of data story (descriptive, diagnostic, predictive, prescriptive analysis)

2. narrative: storyline used to communicate the insights gleaned from data and context, and recommended actions

3. visuals: representations of data, analysis results, and narratives, which are used to communicate stories clearly and memorably (charts, graphs, diagrams, pictures, or videos)

What is a Data Story?

Data stories help us successfully explain the actual stories that exist, or to articulate stories we want to tell.

(Note that we might not have all the data required to do this.)
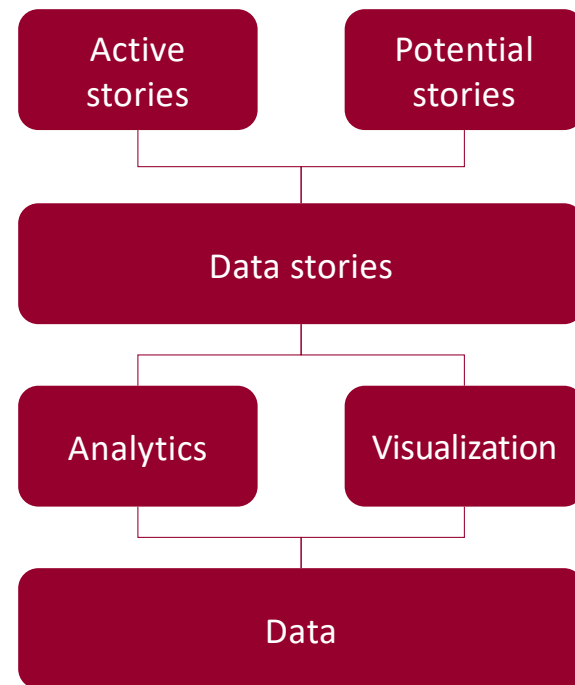
Scoping – Exploration – Explanation – Persuasion

When working with data, we do analysis and create visualizations at **multiple stages** in the process.

This is reminiscent of the process behind **investigative journalism**:

1. initially, we **scope out** the area of investigation (data collection, story);
2. then we **explore** the situation and then **explore** the data we have collected about it
3. we may use the outcome of this exploration to **explain** the situation to our satisfaction;
4. and/or to **persuade** others about some course of action that should be taken with respect to the situation.
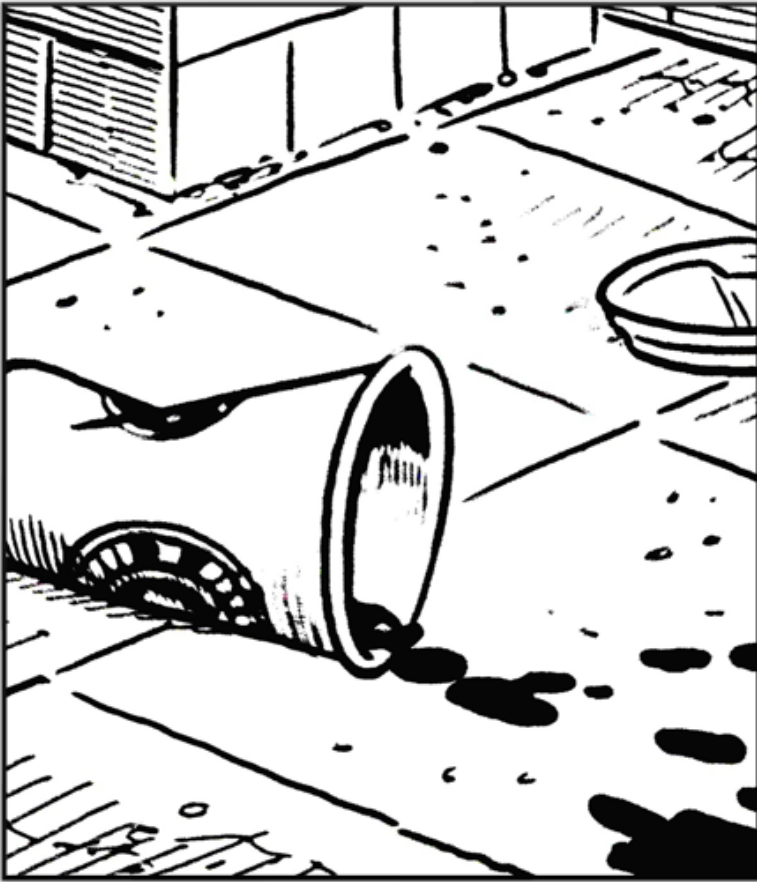
When it comes to communication, visualizations are the illustrations to your story, not the story itself.

Exploration - Situational Awareness - Storybook

Exploration: using visualizations as a tool to explore data

- high level of interactivity
- high level of detail
- **all** aspects of data should be represented (tables, columns, calculations etc.)
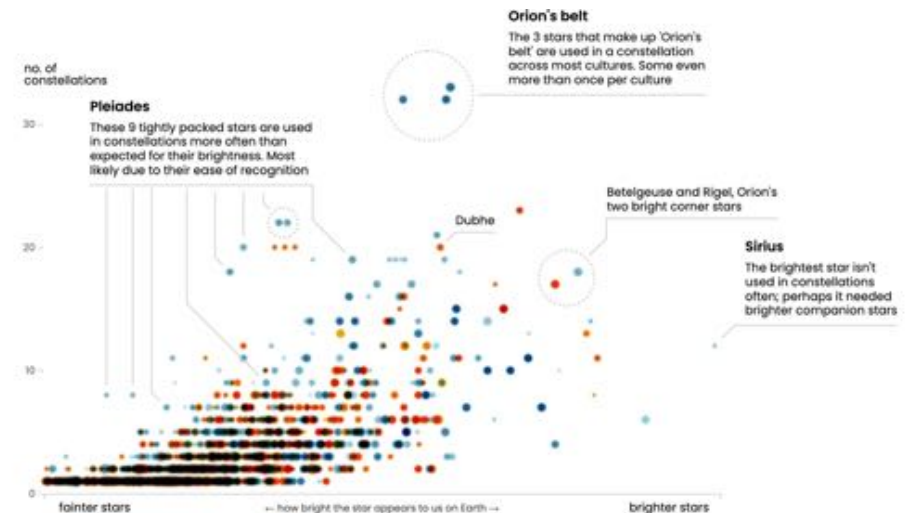- no annotations or explanations required

Exploration - Situational Awareness - Storybook

Storybook: using visualizations as a tool to explain data

- low level of interactivity
- low level of detail
- key aspects of data should be represented
- annotations and explanations drive the "story"

Impact of Choices When Storytelling with Data

Data analysts have **agency.** They select:

- the question to answer;
- what data to collect;
- how to clean that data;
- which analytical method(s) to use;
- on what part(s) of the data to focus, etc.

This impacts the stories that **can be told** with data, relative to the stories that **could be told** about the situations and events represented by the data.

Our Assumptions

- You've done your analysis.

- Looking to influence decision-makers.

- Facing decisions about what to include, and what to omit.

Structuring the Storyline

Situation

Why is this important?

What you need to know to understand the problem.

Complication

What went wrong?
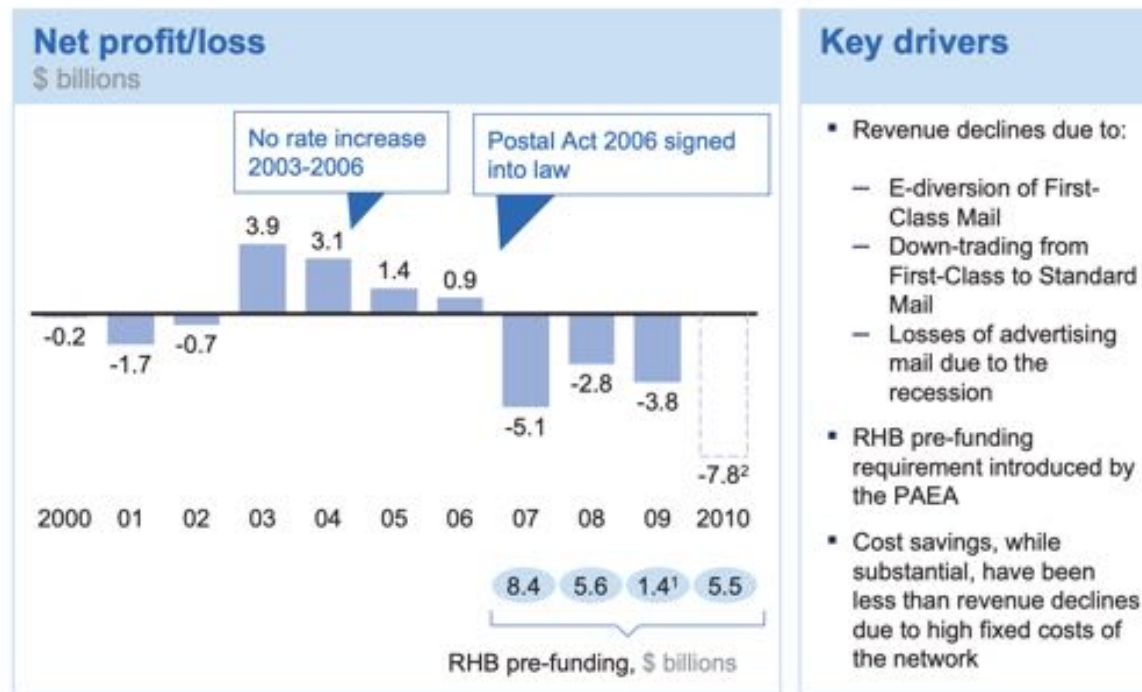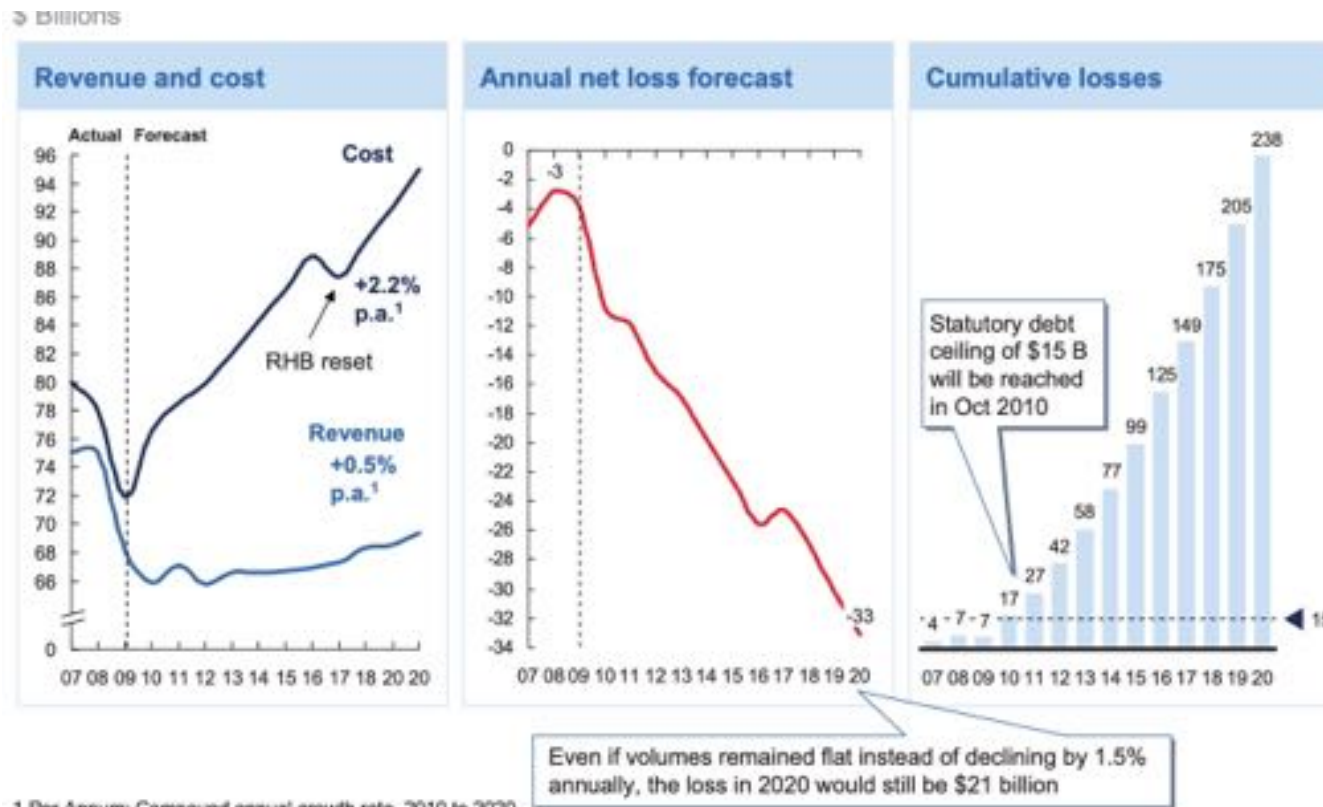
Why the problem is a terrible thing

Resolution

What is the solution?

Situation: the USPS is experiencing unprecedented losses

Net profit/loss
$ billions

No rate increase 2003-2006

Postal Act 2006 signed into law

3.9 3.1 1.4 0.9

-0.2 -1.7 -0.7 -5.1 -2.8 -3.8 -7.8²

2000 01 02 03 04 05 06 07 08 09 2010

8.4 5.6 1.4¹ 5.5

RHB pre-funding, $ billions

Key drivers

- Revenue declines due to:

  - E-diversion of First-Class Mail
  - Down-trading from First-Class to Standard Mail
  - Losses of advertising mail due to the recession

- RHB pre-funding requirement introduced by the PAEA

- Cost savings, while substantial, have been less than revenue declines due to high fixed costs of the network

Complication: Unless we do something, things will worsen

Resolution: There are 4 things the USPS can do

Net annual income benefit (2020)	
1 Product and service actions	~$2B
2 Productivity improvements	~$10B
3 Workforce flexibility improvements	~$0.5B
4 Purchasing savings	~$0.5B
Avoided interest due to reduced debt	~$5B
Total	~$18B
Cumulative impact 2010-2020	~$123B

Sample Generic Structure

Situation
- **The stable era.**

Complication
- **Discovery of a problem.**
- **Identification of root causes.**
- **Projected impact if root causes not addressed.**

Resolution
- **Plan to solve the problem by addressing root causes.**

How to Write the Presentation

- Start in Word, not PowerPoint

- It is easier to see the storyline, and see logical connections, on a single page, instead of flipping through slides.

- Drafting is an iterative process, and Word is easier to modify.

Use the Dot/Dash Method

Dots
- Slide title
- The key statement

Dashes
- The supporting data

PowerPoint Skeleton

Horizontal: Can understand the argument by just reading the Title (Dots).

Vertical: Data & Visualizations (Dashes) supports the Title
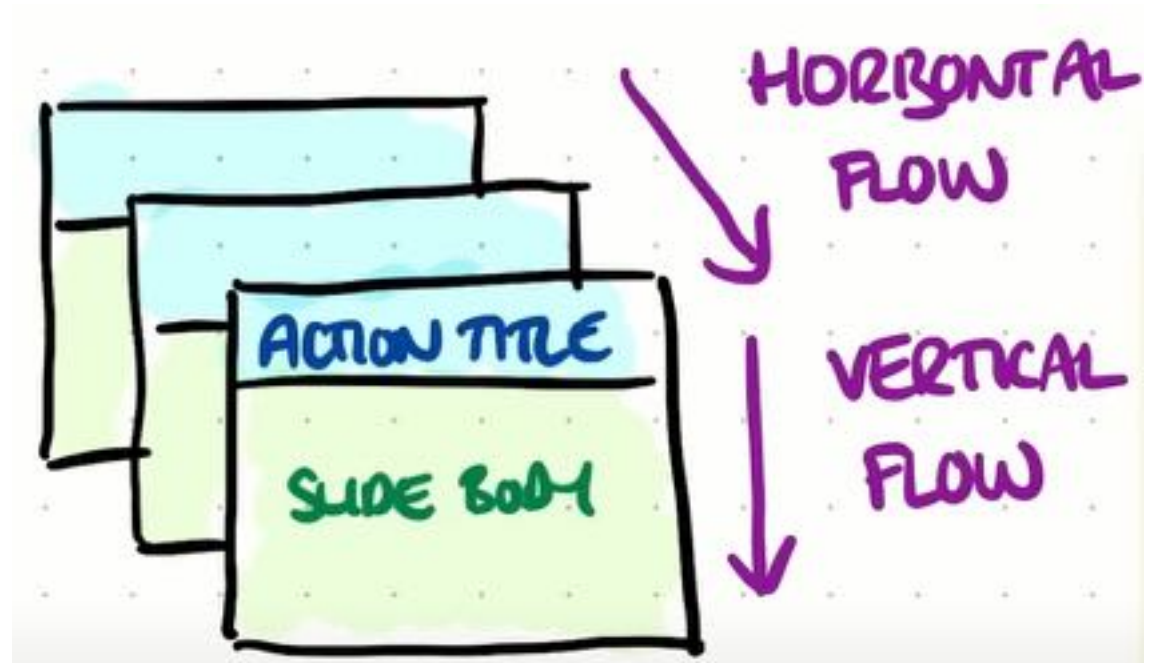
How Does This Apply?

In groups, think about your files. Can you distill one of your recent presentations into this framework?

We want at least one dot (a title) and one dash (piece of evidence).

Storytelling Risks

Storytelling Risks

A good story can help shed insights on a situation, but storytelling requires **choices**, and the outcome is affected by what is **included** and what is **omitted** in the telling.

It is easy to mislead by **accident**; it is also easy to mislead by **design**.

With data stories, there is an additional complication: we usually only have access to the **available data**. The data that was not collected is, by definition, not available. Some of the data that was collected may also be unavailable for a variety of reasons.

This implicit bias can lead to compelling yet **fundamentally flawed** data stories.

During WWII, mathematician **A. Wald** undertook a study to help protect British bombers flying over enemy territory.

Data included: the **number** and **location** of **bullet holes** on returning aircraft, and the goal was to use this information to determine where to add armor to best protect the plane's structure.
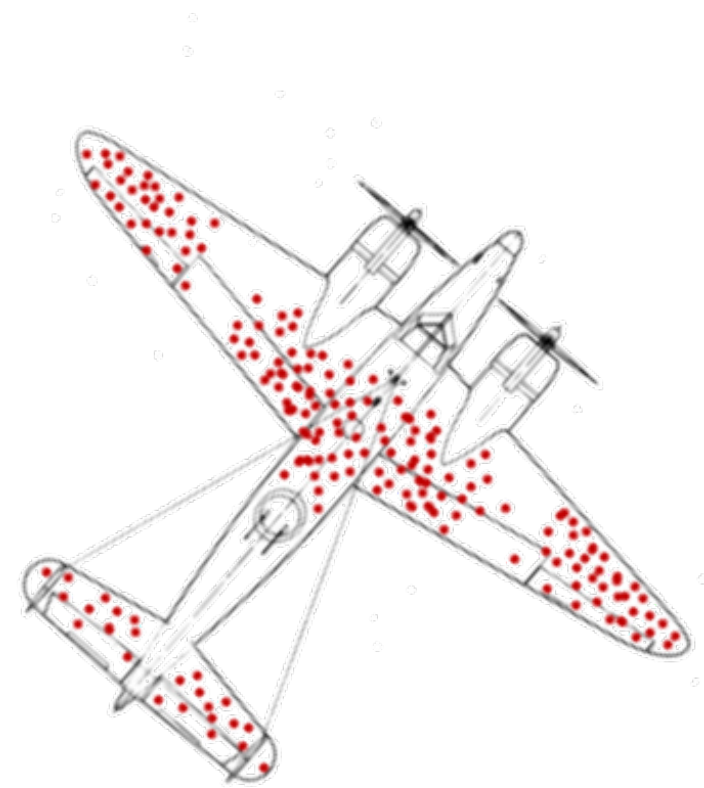
A chart was created to show where the maximum number of bullet holes were located on **returning aircraft**. This chart showed greatest damage on the **aircraft extremities**, not on the main wing and tail spars, engines, and core fuselage areas.
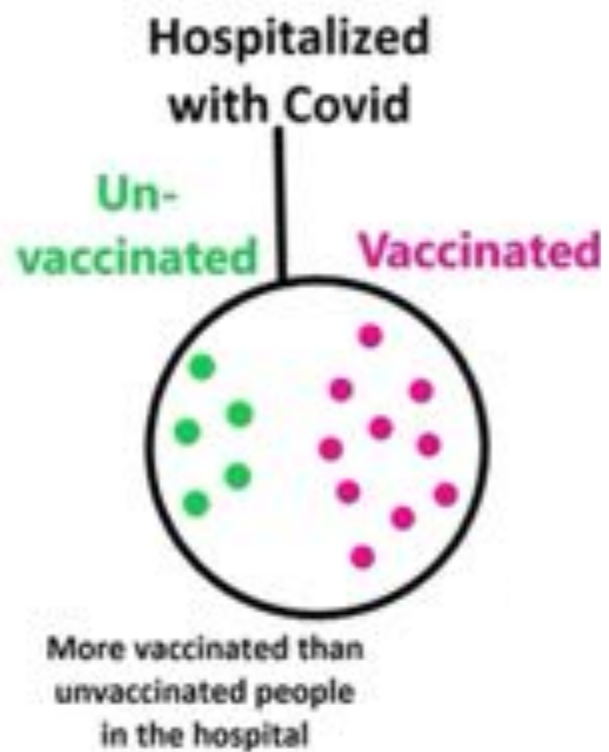
Storytelling Risks

As such, the Air Ministry wanted to add armor to the **extremities**. Wald suggested they were **dead wrong**.
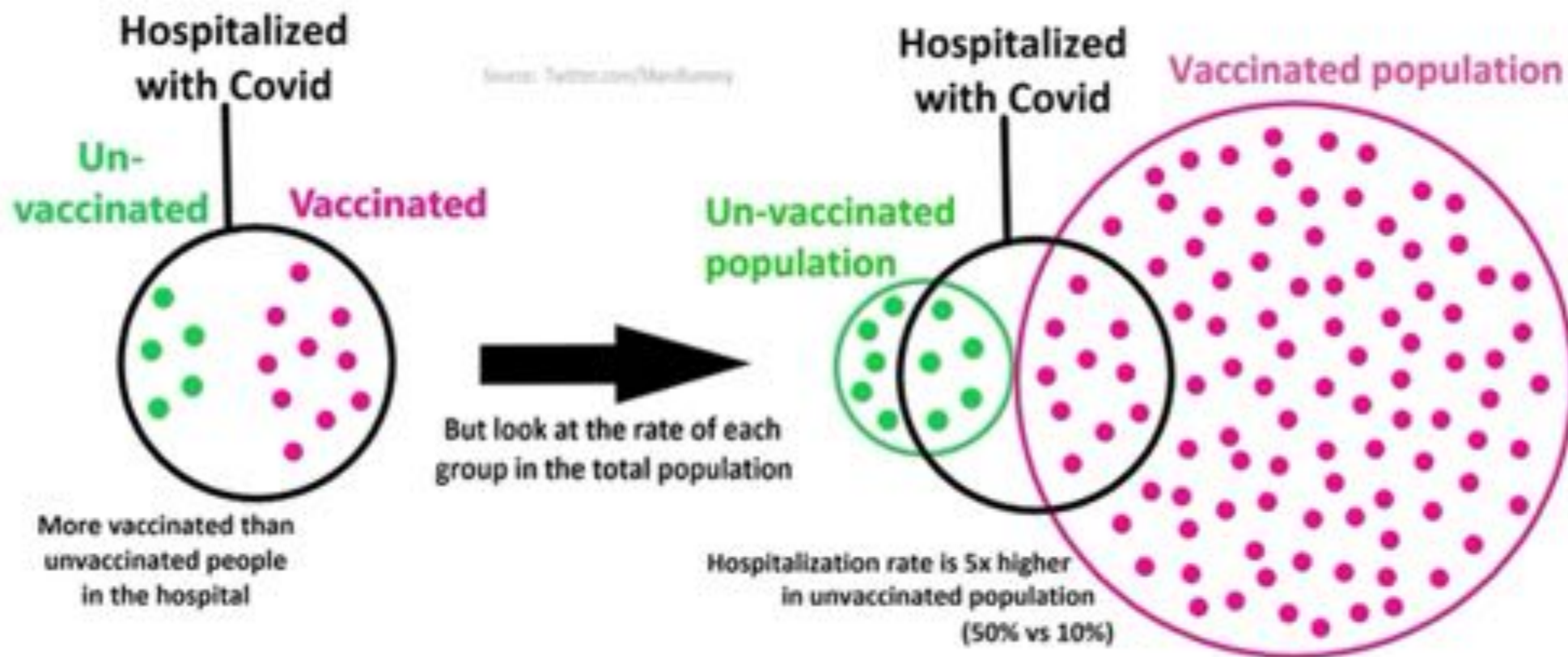
To avoid **"survivorship bias",** armor should be added to the areas with the **fewest holes**: if no returning planes had holes in their wing spars and engines, then even a few holes in those locations were **deadly**.

Take-Away: the data that is missing may be as important to story than the data that is there. Storytelling is not always an obvious endeavour.

Hospitalized with Covid

Un-vaccinated

Vaccinated

More vaccinated than unvaccinated people in the hospital
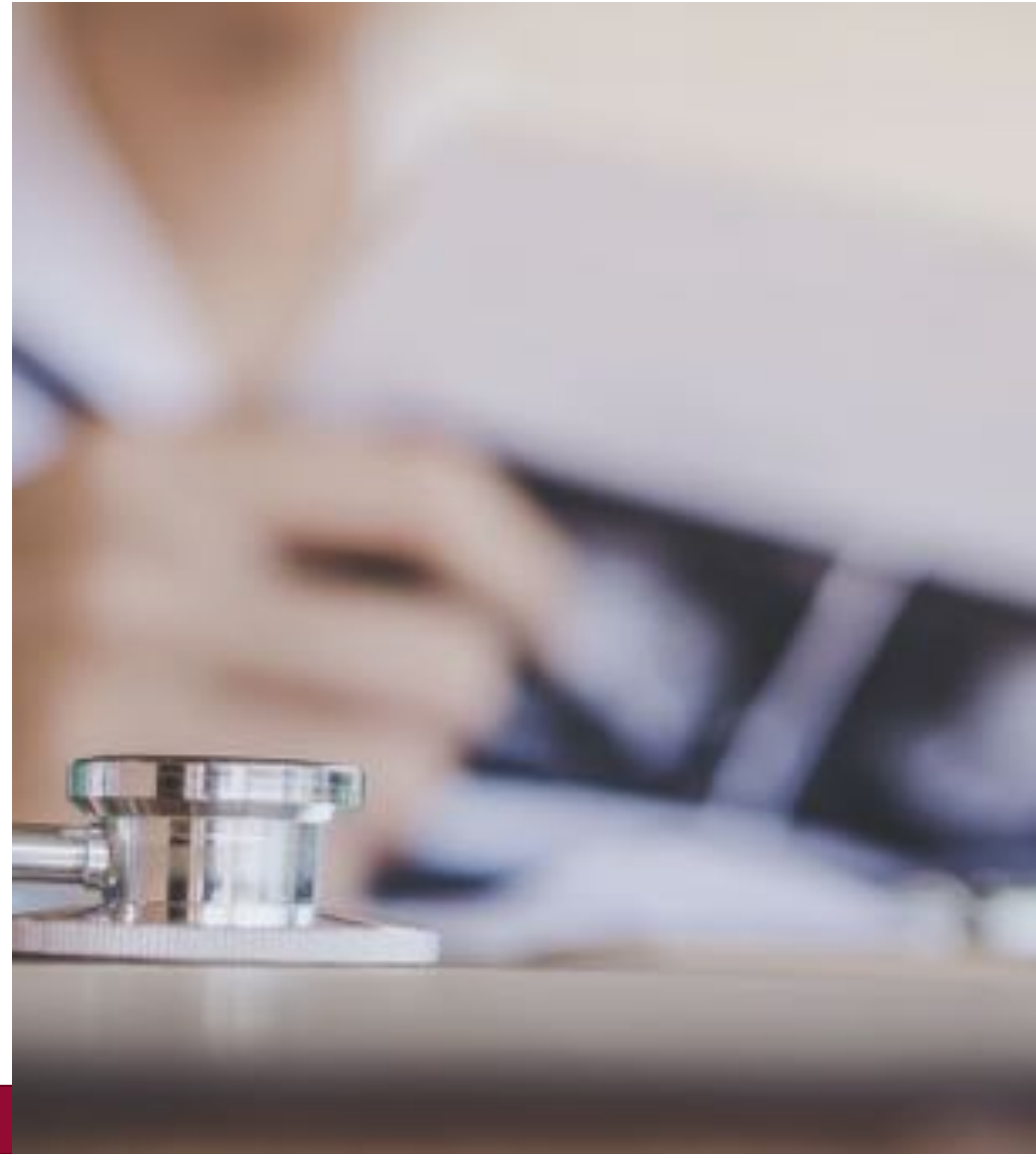
Decision Making Frameworks

Having Responsibility Without Expertise

We often must make decisions in situations where we don't have expertise.

e.g., A doctor asks us to choose a treatment.

An expert or experts come to us, providing facts we don't understand, but we are the ones with the authority to make the decision.

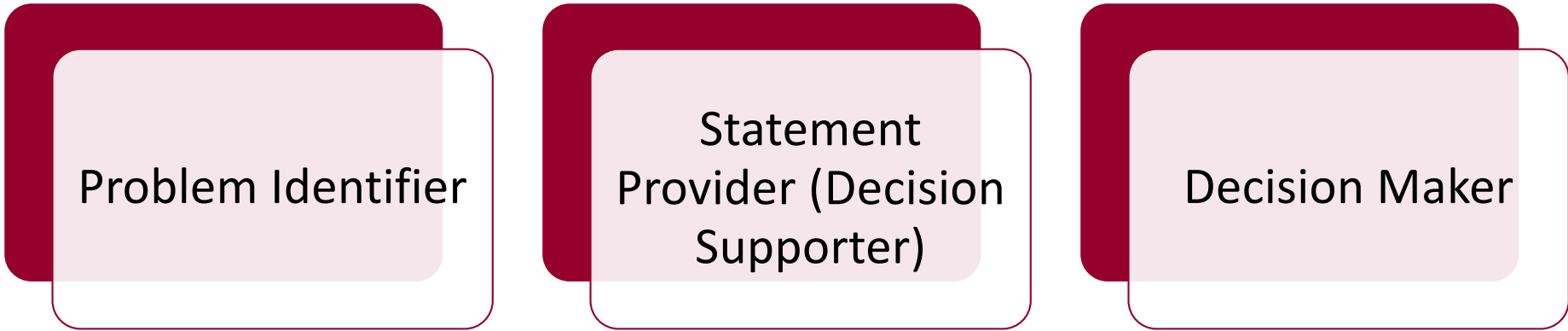# How do we successfully get more people involved?

How can decision making frameworks help with this?

How can the expert help with this? What is their decision support role?

How can data help with this?

Core Roles

Problem Identifier

Statement Provider (Decision Supporter)

Decision Maker

Decision Making Styles/Personalities

DIRECTIVE: DECISION-MAKERS RELY ON RATIONALITY AND PERSONAL KNOWLEDGE, DISREGARDING OTHER OPINIONS.

CONCEPTUAL: DECISION-MAKERS EXPLORE MULTIPLE ANGLES, BRAINSTORM ALTERNATIVES, AND SEEK CREATIVE SOLUTIONS, THOUGH THIS APPROACH MAY BE TIME-CONSUMING.

ANALYTICAL: DECISION-MAKERS GATHER EXTENSIVE INFORMATION FOR WELL-INFORMED AND OBJECTIVE CHOICES, SOMETIMES LIMITING INNOVATION FOR THE SAKE OF DATA-BACKED DECISIONS. CHOICES, DECISIONS ARE WELL-INFORMED AND OBJECTIVE.
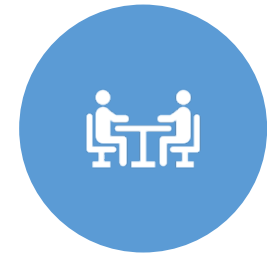
BEHAVIORAL: GROUP-ORIENTED DECISION-MAKERS PRESENT OPTIONS FOR DISCUSSION, REQUIRING A DECISIVE LEADER TO CONCLUDE DELIBERATIONS EFFECTIVELY.

Decision Making Frameworks

These can add rigour, consistency.

Act as a checklist – did I miss any crucial stages

Act as a guide – here are the stages to go through, here are the stages where I can add in evidence, information, data

Can help if you are in a situation where you must make a decision with little expertise or knowledge.

Reviewing Decision Making Frameworks

Academia:

- DECIDE : Define problem, Establish criteria, Consider alternatives, Identify best, Develop plan, Implement plan.
- GOFER: Goal clarification, Options generation, Facts-finding, Effects, Review.

Source: https://thedecisionlab.com/reference-guide/psychology/decision-making-process

Private:

- ACE: Assess, Choose, Execute
- The 7 Steps: Identify decision, Gather info, Identify alternatives, Weigh evidence, Choose, Take action, Review.

Source: Lee, H. (2023). *The art of clear thinking: A stealth fighter pilot's timeless rules for making tough decisions.* St. Martin's Publishing Group

Source: https://www.lucidchart.com/blog/decision-making-process-steps

Public:

- Health Canada: Issue Identification (Identify issue and context), Risk assessment (Assess risks and benefits), Risk management (identify and analyze options, select a strategy, implement the strategy and monitor and evaluate the results)

Source: https://www.canada.ca/en/health-canada/corporate/about-health-canada/reports-publications/health-products-food-branch/health-canada-decision-making-framework-identifying-assessing-managing-health-risks.html

DECIDE

D efine the problem

E stablish the criteria

C onsider the alternatives

I dentify the best alternative

D evelop a plan and implement the plan of action

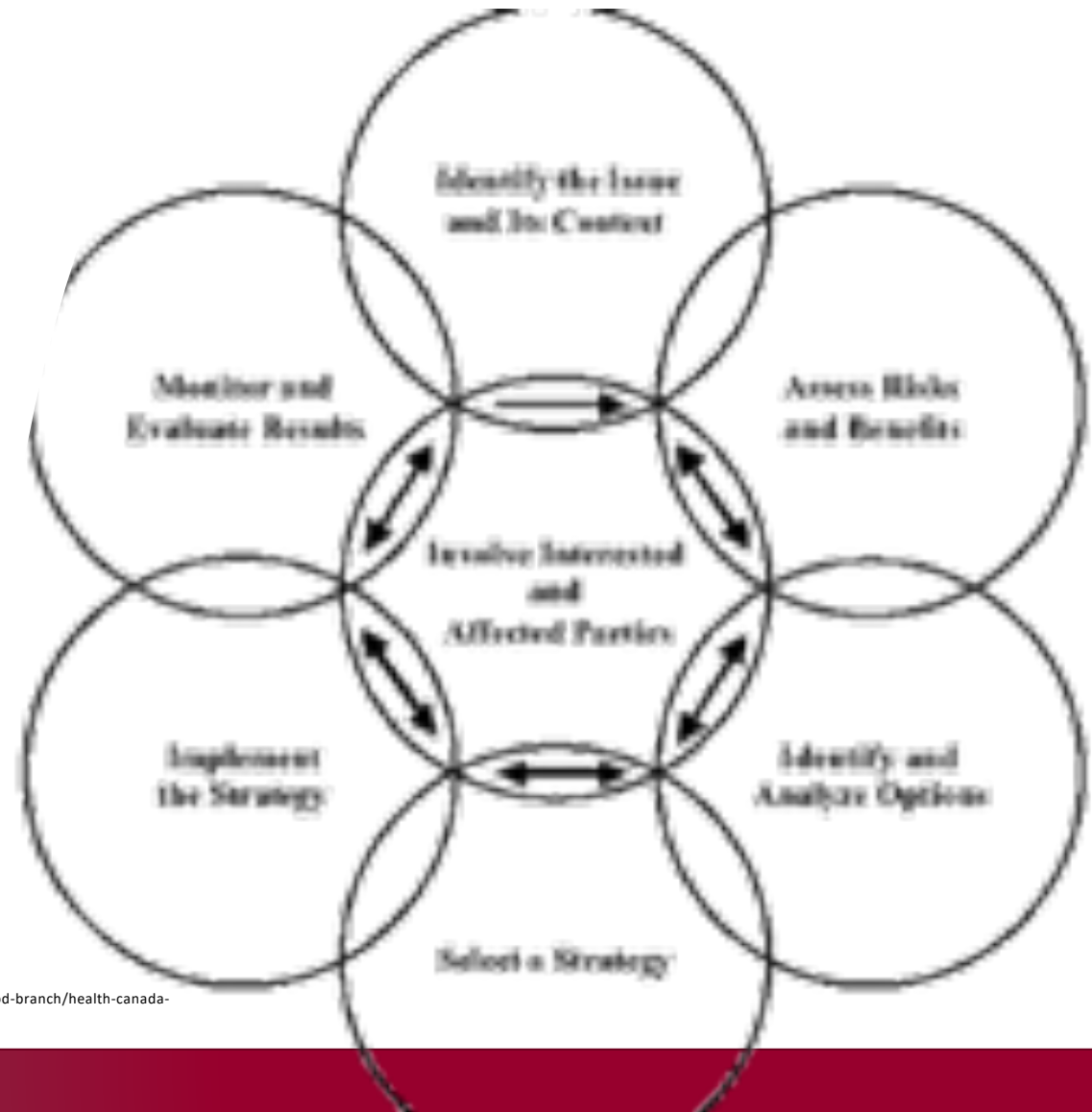E valuate and monitor the solution and feedback

ACE

A ssess

C hoose

E xecute

Source: Lee, H. (2023). *The art of clear thinking: A stealth fighter pilot's timeless rules for making tough decisions*. St. Martin's Publishing Group

Health Canada

Identify the Issue and Its Context

Assess Risks and Benefits

Identify and Analyze Options

Select a Strategy

Implement the Strategy

Monitor and Evaluate Results

Involve Interested and Affected Parties

You Might Remember...
"The Bigger Picture"

PRE DECISION MAKING

DECISION MAKING

(GOALS, CHOICES, OUTCOMES)

POST DECISION MAKING

Synthesizing Decision-Making Frameworks

Pre-Decision Making

Knowledge, Culture, Goals

Recognize Problem/Decision, Values, Past Experience

Decision Making

Develop/Recognize Options

Simulate Worlds of Consequences

Choose, Problem/Goal, Choice, Outcome

Post-Decision Making

Outcome, Evaluate

Re-Start (if necessary)

Exercise: Analysis and Critique of Decision Making Frameworks

Each group will get a particular framework

What are the strengths and weaknesses of this framework?

How does data and analytics fit into this framework?

Section 4: Lab
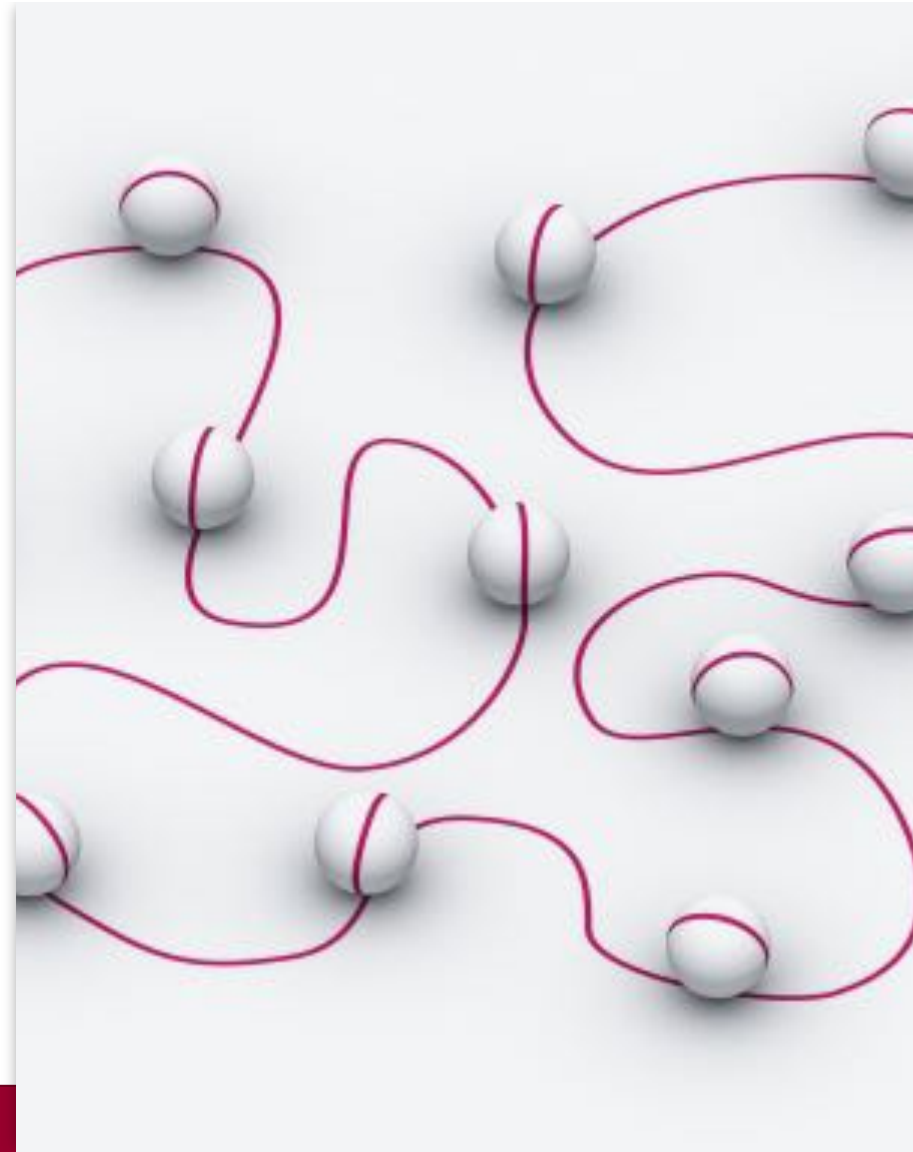
Introduction To Lab Exercise

You are tasked with making a decision (see manual for details)

Work in Groups of 5-8

Within these groups, two smaller groups – the analysts/SMEs and the decision makers

At the end of the exercise, each group will make a decision

We'll follow this up with an opportunity for each group to discuss their experiences during the exercise

Lab Structure

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

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

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

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 Results Discussion

Wrap Up

Key Question(s) We Aimed to Tackle

How do I make evidence,data,information-based decision making?

When should I use evidence, data, information-based decision making?