"A problem well stated is a problem half solved."

Charles Kettering

Introduction

Your plane touches down in a foreign country. You don't speak the language, don't have any contacts in the area, and don't know your way around. How do you find your way? What steps do you take to begin making your way through a totally incomprehensible landscape? Most of us would begin by looking for context clues, then develop some educated guesses about our surroundings and begin drawing conclusions based on what we've observed.

That's essentially what's happening in many of our careers as work becomes more data-driven. Data may not be a completely foreign country, but for many of us, it's not an entirely familiar one. Fortunately, the fundamentals of data analysis are not that different from the tools we always rely on to make sense of new situations.

When we spot a pattern that seems promising—one that might yield new information and help us understand our surroundings better—we pursue it. We dig deeper, develop theories, identify variables, and frame, model, and test our hypotheses until we're sure we understand what's happening. Once we know what we're looking at, the next series of doors unlocks.

In this Field Manual, we will focus on how to investigate our initial hypotheses and expand on them. We will learn the difference between correlation and causation, and why it's important to be skeptical of our data. We'll discover how an offhand comment from a milkmaid led to a life-saving insight in medicine. Finally, we will learn how to follow up on the initial insights we develop, and challenge our own most basic assumptions.

Key Questions Posed by this Field Manual:

- [x] What's the difference between correlation and causation?
- [x] How can external factors skew our data? And what can we do to mitigate those variables?
- [x] How does a healthy skepticism about our data lead us to better conclusions?
- [x] How can questions help us interrogate and think more deeply about the patterns and trends we identify?
- [x] Once we think we're onto something, what steps come next? What else should we do?

0 0 0

Check-in: Discovering + Analyzing

Before we start exploring insights and patterns, take a moment to think about your current approach. Click submit to see what your fellow learners think. Your individual responses will remain anonymous.

1. When you spot a pattern or insight at work or in your day-to-day life, you:

- Immediately start investigating to understand it better
- Make a note in case someone else ever figures out why it's happening
- Discuss theories with friends or colleagues
- Mention it to someone with more expertise to see if it's worth pursuing
- Notice it and then forget about it
- None of the above

Submit

2. Once you have a theory or a hunch about something, how likely are you to change your mind based on new information? Answer on a scale of 1-5 where:

1= not at all likely

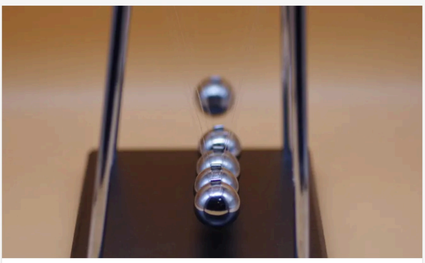
5= extremely likely

1 2 3 4 5

Submit

IDEA

Core Concept: Correlation or Causation



Untangling the relationships between events can help us make sense of patterns.

It's a long weekend in Beachtown, USA, and local residents are alarmed by a disturbing pattern: ice cream sales are way up and people across town are experiencing terrible sunburns. Could ice cream be causing the burns? Or do people with sunburns crave ice cream? The answer, of course, is neither: hot summer weather arrived for the season and triggered both trends.

There is a golden rule in data analysis: correlation does not imply causation. To find patterns and insights in data sets, we start by untangling the relationships that exist between events.

Correlation is the tendency for two or more things to happen at the same time.

Causation is when one event or set of events directly prompts another.

The relationship between ice cream and sunburns is correlative, while the relationship between summer weather and ice cream is causal.

But what if the situation becomes more complex? Take, for example, a department that's struggling to retain talent. The department has a high rate of turnover, a high rate of promotion, an average age of 25, and slightly lower-than-average salaries. Which of these variables are coincidental and which have causal relationships?

We might jump to an instinctive conclusion about what's happening—low salaries are driving employees to greener pastures—but maybe that's not the case at all. Maybe the relative youth of the group means that people tend to leave for graduate school or another career track, even if they're on track for a promotion. Or maybe there's a factor we haven't examined at all, like an ineffective manager or a hyper-competitive team culture. We won't really know until we take a closer look at where employees are going, what their past performance looked like, and more.

The summer weather example is an easy one to puzzle out; the talent management problem less so. The human brain is good at figuring out logical relationships, especially when we have enough context and background. But the deeper we dive into data sets, the more complicated these relationships become, particularly when they take place in less clear-cut environments. Only by thoroughly investigating the data can we determine which variables in a pattern are simple correlations—and which are actually driving outcomes.

0 0 0

Quick Quiz

Take the following quiz to test your understanding of the Core Concept. Answer carefully: you can only take the quiz once, and the results will contribute toward your position on the Leaderboard.

1 An increase in a child's height and an increase in a child's vocabulary best represents:

- Correlation
- Causation

2 An increase in one's salary and an increase in one's checking account balance best represents:

- Correlation
- Causation

3 A decline in population in a town and a decline in sales at the local grocery store best represents:

- Correlation
- Causation

4 A drop in water levels at a reservoir and a decline in crop yields at a nearby farm best represents:

- Correlation
- Causation

Submit

Core Concept: Be Skeptical of Your Data

Don't believe everything the data tells you. Every pattern or insight that we identify in the data could be skewed by conscious or unconscious bias, variables we haven't accounted for, or even simple human error. In the video below, Dan Kopf, Data Editor at the *San Francisco Chronicle*, explains some of the ways data can mislead us—and how to work around them.

Trouble viewing the video? Read the transcript here.

0 0 0

Challenge: Trustworthy Data Sources

When it comes to identifying trustworthy data sources, we all have different methods. What are some ways, conscious or unconscious, that you decide data is credible? Do you "trust your gut"? Are there particular people or sources that you routinely trust or have come to trust over time? Why do you believe a particular data source is credible or not? Share your thoughts in 420 characters or fewer. After you post, be sure to vote and/or comment on your fellow learners' responses. Remember, any up votes you receive and any conversations you start will contribute to your position on the Leaderboard.

Add comment or @mention

420 characters remaining

View by Newest

0

STORY

Stories from the Field: The Milkmaid Mystery

Noticing the right pattern can lead to world-changing innovations. Photo credit: Annie Spratt

In 1763, a 14-year-old boy named Edward Jenner made an observation that would define his life. Jenner was an apprentice, working with a country doctor named Daniel Ludlow who ran a surgery in the Gloucestershire region of Britain. At the time, smallpox was among the most deadly diseases in existence, accounting for around 10% of all deaths worldwide. Most people were terrified of the threat of smallpox, but Jenner noticed that patients in Ludlow's practice—mostly farmers and milkmaids—didn't seem particularly concerned about the disease, and for good reason. They hardly ever caught it.

They also responded strangely to preventative measures. In the 18th century, most doctors relied on variolation, a precursor to vaccination, to prevent smallpox. Doctors would infect children and healthy adults with strains of smallpox that others had survived, hoping that the patients would experience mild symptoms and develop immunity. Variolation eliminated some smallpox deaths, but many patients still died or were left disfigured and unwell from the treatment. But not farm workers. Historical records kept by another local doctor, John Fewster, show that farm workers inoculated with live smallpox often experienced no symptoms at all, or very mild ones.

According to some accounts, Jenner began to put the pieces together when he overheard a milkmaid bragging to a friend, "I shall never have smallpox for I have had cowpox. I shall never have an ugly pockmarked face." He likely also studied John Fewster's records, which similarly observed that farmers with mild reactions to variolation often had a history of cowpox.

Jenner, Fewster, and a handful of other country doctors were among the first in the medical community to take serious note of a pattern that was common knowledge among farmworkers. People who were exposed to cows and cowpox didn't tend to catch smallpox. But a question remained: was the relationship between the two diseases a correlation caused by some unknown factor, or did cowpox really prevent smallpox?

For Jenner it would become a life-long obsession. He became an established doctor with his own well-regarded practice and, in 1796, finally proved causation. He inoculated an eight-year boy named James Phipps with cowpox collected from a milkmaid. The boy was mildly ill for a few days before recovering. Jenner then inoculated him with smallpox; Phipps remained perfectly healthy.

The procedure is widely regarded as the first modern vaccination. Subsequent attempts produced the same result. Soon, Jenner was vaccinating his own children. The practice caught on, becoming so widespread and so successful that, in the late 1960s, smallpox became the first disease functionally eradicated by modern medicine.

That first vaccination is at the root of all modern inoculations, from measles to whooping cough to Covid-19. At this very moment, tens of thousands of people around the world are working together to test, produce, and distribute Covid-19 vaccinations—and none of it would be possible without Edward Jenner and the farmers and milkmaids of Gloucestershire.

0 0 0

Challenge: Just a Hunch

Like Edward Jenner, we all notice patterns and develop theories. Reflect on a trend that you've noticed—in the workplace, in current events, or elsewhere. What do you think it means?

Share your thoughts in 420 characters or fewer. After you post, be sure to vote and/or comment on your fellow learners' responses. Remember, any up votes you receive and any conversations you start will contribute to your position on the Leaderboard.

Add comment or @mention

420 characters remaining

View by Newest

0

PRACTICE

Voices from the Field: Follow-Up Questions

When we find something in the data that looks like it might be an answer, it's often actually just a first step. To get where we're going, we'll mostly likely need to ask a lot of follow-up questions. In the video below, Matt Burr, Co-founder and CEO of Nomadic Learning, explains why asking the next question matters more than rushing to provide an answer.

Trouble viewing the video? Read the transcript here.

0 0 0

Quick Quiz

Take the following quiz to test your understanding of the video. Answer carefully: you can only take the quiz once, and the results will contribute toward your position on the Leaderboard.

1 According to Matt, which of the following is a common obstacle to effective brainstorming and questioning?

- People waste time pursuing tangential ideas when they should be focusing on answers
- People aren't willing to engage in brainstorming because it's too time-consuming and distracting
- People focus too quickly on ideas put forward by the most influential team members
- People feel pressure from above to get the "right answer" too early in the process

2 In the video, Matt says that there aren't really "good" or "bad" questions, just questions. What is the underlying point that he's making?

- It's best not to establish a precedent for judging questions because the fear of asking "bad" questions can stifle creativity
- Passing judgment on questions can be used as a way to silence constructive disagreement
- We can only know that a question is "wrong" in hindsight, so making the judgment before we explore answers is premature
- It's important to just ask questions because even questions that don't give us answers still get us closer to the knowledge we need

Submit

Framework: Insights, Investigated

We can take steps to prove whether our insights are true. Photographer: Lai Man Nung

The more questions we ask, the closer we get to seeing the big picture and, ultimately, solving problems. Asking question after question was the process that gradually turned a piece of folk wisdom—milkmaids don't get smallpox—into the proven, field-tested foundation of modern immunology. We can apply the same process to our own insights, asking more and better questions until we arrive at the truth.

Here are a few places we can start:

Questions that define:

- [x] What is the pattern I've noticed?
- [x] What do I think is happening to cause this outcome?
- [x] Can I clearly articulate my hypothesis? If not, what's missing?

Questions that support:

- [x] Can I prove my theory?
- [x] What data do I have and what more do I need?
- [x] Where can I get that data? How do I know it's accurate?

Questions that contradict:

- [x] Are there any alternative explanations? Can I test for them?
- [x] What variables might impact my results? Do my outcomes change when variables shift?
- [x] Have others reached different conclusions?

Questions that look forward:

- [x] What are the implications of these outcomes?
- [x] What might happen next based on what we've learned?
- [x] How can I measure what happens next?

0 0 0

Learn More:
See how J.C.R. Licklider used data to optimize the way he worked in this Resource
Learn how one mathematician saved countless lives in WWII by asking a different question than everyone else in this Resource
Think about the impact variables might have on your data in this Resource

Field Manual References

ACTION

Project: Challenge Yourself

Think of a hunch you have or assumption you hold. Now, challenge it.

What question can you ask to push back on that belief or assumption? Can you try looking at it from a completely opposite perspective? Is there data that backs up the opposing idea?

In the space below, tell us about the question and how you challenged your own assumptions. Did you learn anything in this process? Did you change your assumption?

Share your thoughts in 560 characters or fewer. After you post, be sure to vote and/or comment on your fellow learners' responses. Remember, any up votes you receive and any conversations you start will contribute to your position on the Leaderboard.

Add comment or @mention

560 characters remaining

View by Newest

0