A Brain-Friendly Guide

# Head First
# Data Analysis

**A learner's guide to big numbers, statistics, and good decisions**

Predict your raise with linear regression

Experiment to discover who your customers *really* are

Load important statistical concepts directly into your brain

Sell more toys by optimizing your business model

Overcome your cognitive biases

Clean messy data for efficient analysis

O'REILLY®

Michael Milton

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# Table of Contents (the real thing)

## Intro

**Your brain on data analysis.** Here *you* are trying to *learn* something, while here your *brain* is doing you a favor by making sure the learning doesn't *stick*. Your brain's thinking, "Better leave room for more important things, like which wild animals to avoid and whether naked snowboarding is a bad idea." So how *do* you trick your brain into thinking that your life depends on knowing data analysis?

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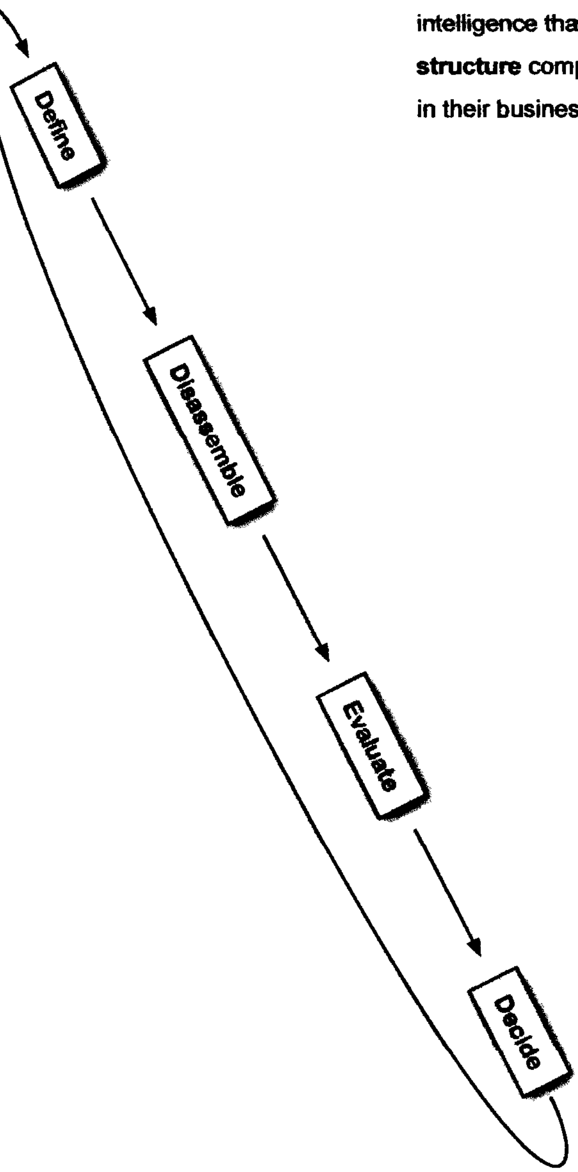
# introduction to data analysis

## 1 Break it down

### Data is everywhere.

Nowadays, everyone has to deal with mounds of data, whether they call themselves "data analysts" or not. But people who possess a toolbox of data analysis skills have a **massive edge** on everyone else, because they understand what to *do* with all that stuff. They know how to translate raw numbers into intelligence that **drives real-world action**. They know how to **break down and structure** complex problems and data sets to get right to the heart of the problems in their business.



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## 2 experiments

# Test your theories

### Can you show what you believe?

**In a real empirical test? There's nothing like a good experiment to solve your problems and show you the way the world really works. Instead of having to rely exclusively on your observational data, a well-executed experiment can often help you make causal connections. Strong empirical data will make your analytical judgments all the more powerful.**

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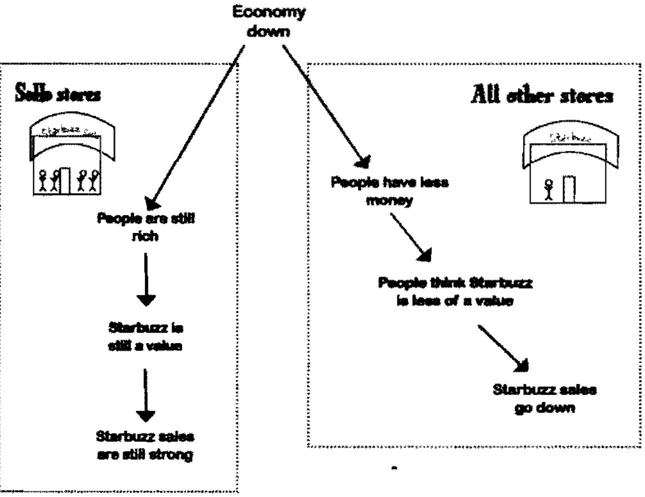

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optimization

# 3 Take it to the max

## We all want more of something.

And we're always trying to figure out how to get it. *If* the things we want more of—profit, money, efficiency, speed—can be represented numerically, then chances are, there's an tool of data analysis to help us tweak our *decision variables,* which will help us find the **solution** or *optimal point* where we get the most of what we want. In this chapter, you'll be using one of those tools and the powerful spreadsheet **Solver** package that implements it.

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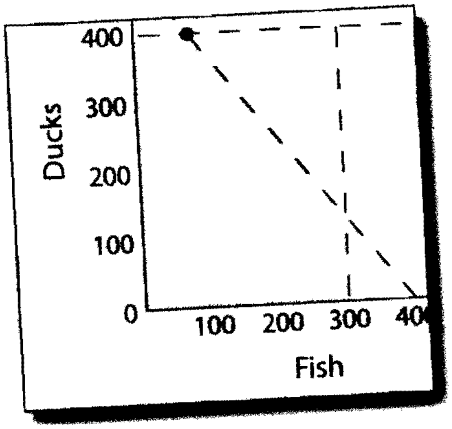

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## data visualization

# 4 Pictures make you smarter

### You need more than a table of numbers.

**Your data is brilliantly complex, with more variables than you can shake a stick at. Mulling over mounds and mounds of spreadsheets isn't just boring; it can actually be a waste of your time. A clear, highly multivariate visualization can, in a small space, show you the forest that you'd miss for the trees if you were just looking at spreadsheets all the time.**

New Army needs to optimize their website 112

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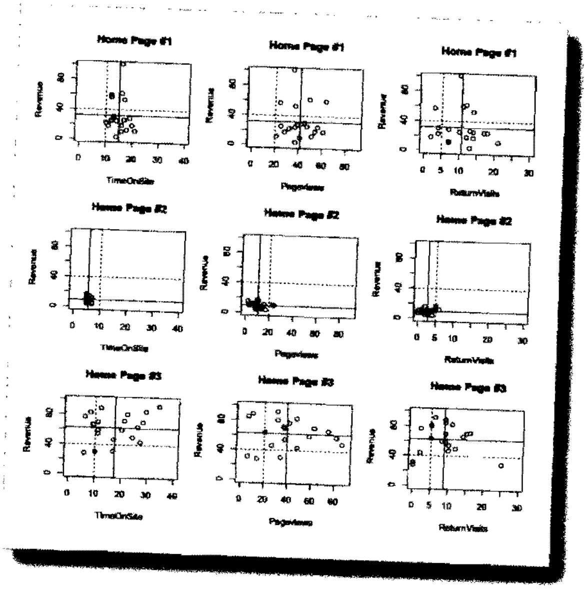

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# 5 hypothesis testing

## Say it ain't so

**The world can be tricky to explain.**

**And it can be fiendishly difficult when you have to deal with complex, heterogeneous data to anticipate future events. This is why analysts don't just take the obvious explanations and assume them to be true: the careful reasoning of data analysis enables you to meticulously evaluate a bunch of options so that you can incorporate all the information you have into your models. You're about to learn about falsification, an unintuitive but powerful way to do just that.**

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## 6 bayesian statistics

## Get past first base

### You'll always be collecting new data.

**And you need to make sure that every analysis you do incorporates the data you have that's relevant to your problem. You've learned how *falsification* can be used to deal with heterogeneous data sources, but what about straight up probabilities? The answer involves an extremely handy analytic tool called Bayes' rule, which will help you incorporate your base rates to uncover not-so-obvious insights with ever-changing data.**

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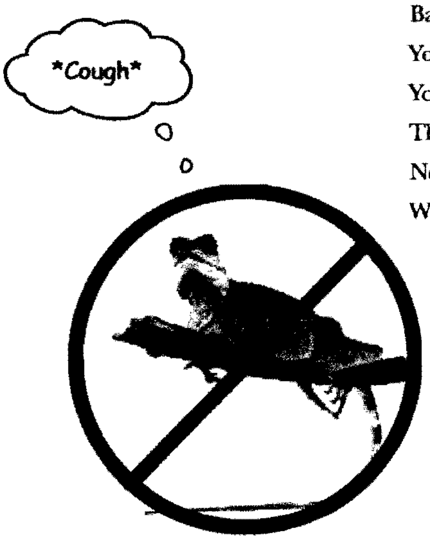

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