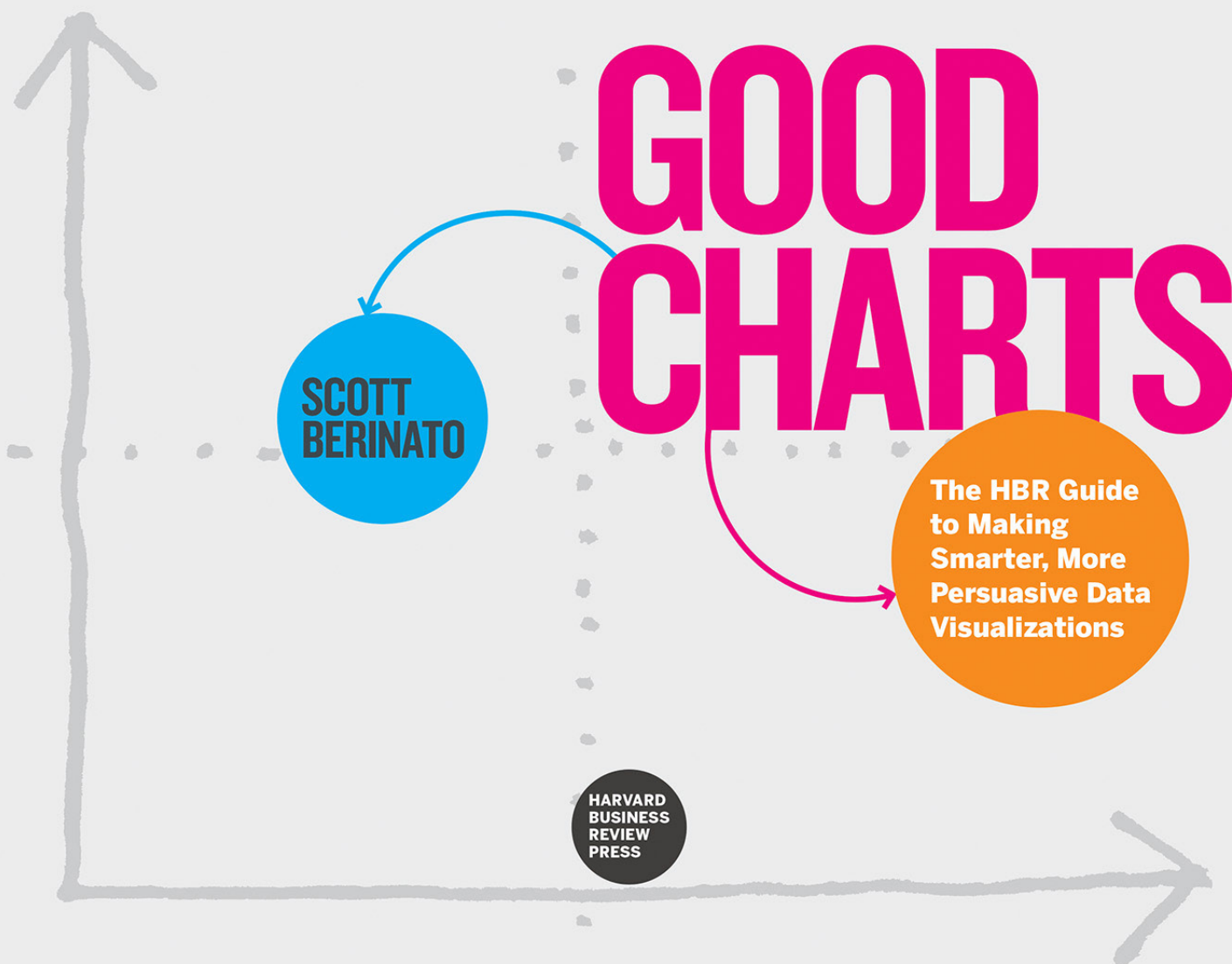




Learn how to show **key trends** in your data



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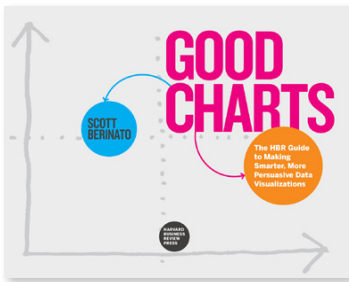
GOOD CHARTS

The HBR Guide to Making
Smarter, More Persuasive
Data Visualizations

KNOWLEDGE PACK

INTRODUCTION

Refine to Persuade

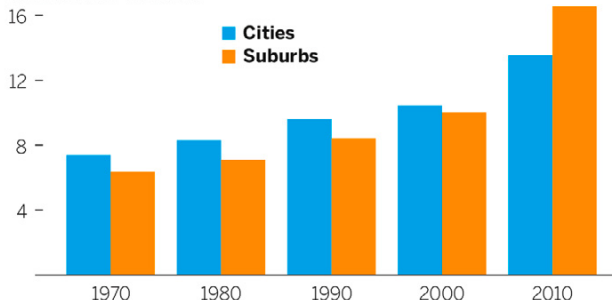


A MANAGER AT A NOT-FOR-PROFIT is preparing to stand in front of 20 potential donors with deep pockets and many options for where to take their philanthropy. She's launching

a program to fight suburban poverty, which she will tell them is a significant, growing problem. But she knows her audience will need more than that to be persuaded to back her initiative. She's already anticipating skeptical questions, such as "Why suburban poverty? It can't be as bad as urban poverty, can it?" These people will want to see evidence. She looks at a chart that will provide it:

POOR PEOPLE LIVING IN CITIES AND SUBURBS IN 95 LARGE METRO AREAS

MILLIONS OF PEOPLE



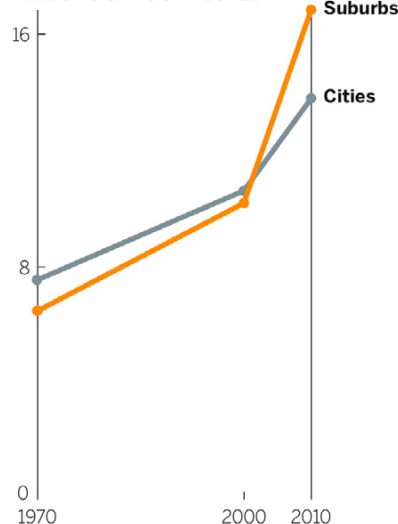
SOURCE: BROOKINGS DATA

A good effort. It's simple and well designed. All the information is there. Although poverty is growing in both cities and suburbs, it has grown more in the suburbs. Still, she's unsatisfied by her effort. The first thing she sees is that poverty is growing; it takes a minute to find the suburban poverty story.

So she tries to build a more persuasive visualization and comes up with this:

THE SURGING SUBURBAN POVERTY PROBLEM

MILLIONS OF POOR PEOPLE



SOURCE: BROOKINGS DATA

She's thrilled with this version, which is more accessible and far more convincing. The surge in suburban poverty comes through immediately, and almost directly after that, so does the idea that more poor people now live in suburbs than in cities. This will surprise and move her audience.

How did she get from her original, perfectly accurate but unsatisfying bar chart to something she's certain will help her line up donors for the program? ♦

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REFINE TO PERSUADE

Three Steps to More-Persuasive Charts

WHAT OFTEN MAKES A CHART PERSUASIVE is how easily you draw people's attention to the main idea so that they can process it.¹ Persuasion scientists refer to this as the availability of salient information. If you make an idea easy to access, viewers will often find it more appealing and persuasive.²

Which chart does a better job of persuading you that the West Coast sales team is a problem?

SALES PERFORMANCE BY REGION

AVERAGE SIZE OF SALE



SOURCE: COMPANY RESEARCH

WEST COAST SALES REPS UNDERPERFORM

AVERAGE SIZE OF SALE



SOURCE: COMPANY RESEARCH

The left chart may seem more informative because it includes more-detailed information. But as persuasion science shows, it's not about how detailed and precise you are; it's about how easy you make it to see the most important thing. That's why the chart on the right is more persuasive.

The manager who made this chart employed many of

the same techniques used by the manager at the not-for-profit who charted the growth of suburban poverty.

When you're trying to increase persuasiveness, focus on these three things:

- 1 Hone the main idea.
- 2 Make it stand out.
- 3 Adjust what's around it.

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Hone the main idea.

Look again at the two urban/suburban poverty charts on page 3 and try to imagine what statements might have been made during the talk and listen phase to inform the creation of those charts. **They might be something like this:**

NONPERSUASIVE

I want to compare suburban and urban poverty populations, decade by decade.

PERSUASIVE

I need to convince people that suburban poverty is a huge and growing problem that has rapidly overtaken urban poverty.

Sometimes, though, you won't be as fortunate as that manager in arriving at a statement that naturally leads to a persuasive chart design. To get there, you can go through a mini round of talk and listen with a counterpart. (If you're already at the talk and listen stage, add this in.) Change your prompt. Instead of asking *What am I trying to say or show?* try *I need to convince them that ...* The former is still the best first prompt for your conversations (and for more-objective visualization projects). You may arrive at a more persuasive approach from that question alone. But if you don't, and your charts aren't having the persuasive effect you hoped for, the statement may help. **Examples:**

WHAT AM I TRYING TO SAY OR SHOW?

- I am trying to show the distribution of costs of buying a beer at baseball stadiums.
- I am trying to show the relationship between increased automation in manufacturing and fewer jobs being available. Automation increases profits but creates a need for new jobs that are hard to fill.
- I am trying to show how increasing hours spent on work isn't increasing productivity and may be decreasing it.
- I am trying to show the relationship between unbundling products and declining revenue.
- I am trying to show that the gardening population is a large, growing, diverse, and underserved market.

I NEED TO CONVINCE THEM THAT ...

- I need to convince them that beer is unreasonably expensive at every single baseball stadium.
- I need to convince them that although profits are higher, robots are killing manufacturing jobs and creating a massive skills gap that offsets those short-term gains.
- I need to convince them that all this extra work we do is backfiring. It's hurting the company's productivity, not helping.
- I need to convince them that unbundling our software suite will devastate revenue streams.
- I need to convince them that growth in the gardening market is coming from gardeners who are hungry for apps, younger, and more technically savvy than they think.

Notice how the second prompt gives rise to more-emotional language. You've shifted from visualizing an idea (I want you to know something) to trying to persuade someone that the idea is good (I need you to believe something). Words that describe statistical trends (increasing, declining, underserved) naturally give way to words that describe feelings (hurting, helping, hungry).

One caveat: It's easy to slip into unhelpful editorializing when you prompt yourself with I need to convince them that ... The manager looking at the gardening market, for example, may have arrived at I need to convince them that they're wrong about gardeners and they're missing a major opportunity. That's not a useful starting place for sketching and prototyping. It reflects his feelings about his audience and the results he foresees if he fails—not the ideas he wants to communicate in his charts.

Still, talking through his frustration with a colleague might help steer him toward a more useful statement of persuasion, especially if the colleague asks that pesky question "Why?"

I need to convince them that they're wrong about gardeners and they're missing a major opportunity.

Okay, why are they wrong?

Because gardeners use apps and shop online. They're not these luddites who can't work an iPad. Hell, 7 out of 10 gardeners are under 55.

That's the missed opportunity?

Yes. Most of the growth in gardening is with people under 35. Obviously they use apps. Even older gardeners are more tech-savvy than people assume. They shop online more than the average person. That's what I need to show.

Now he has documented some usable information and found a revised, persuasive statement that he can begin to sketch.

Make it stand out.

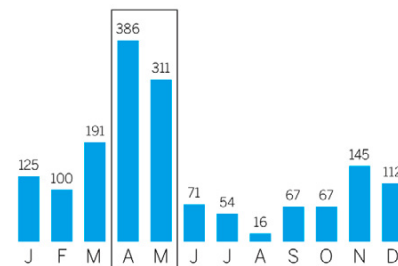
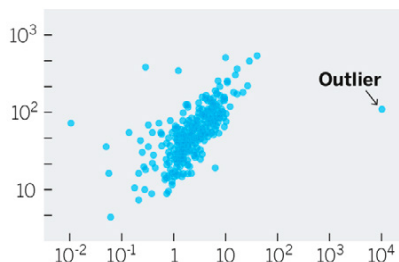
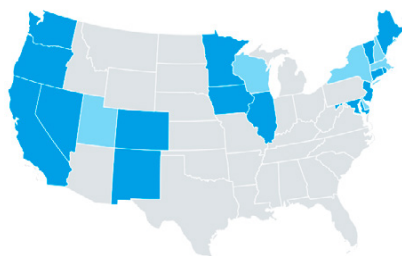
With a sharper statement, sketching and prototyping will naturally veer toward more-persuasive forms. But you can amplify the persuasive effect even further with a couple of design decisions and techniques. Specifically, you can emphasize and isolate your main idea.

Emphasize. There, I just did it. Boldface and color are a form of visual emphasis. Did you say to yourself, *This word is important; I should pay attention to it?* Probably not. But you did assign meaning to it. You treated it differently from

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It doesn't take much to emphasize an idea. Color, simple pointers, or demarcations will draw the eye

the words you're reading now. You're more likely to remember it because I emphasized it.

Just as text allows for multiple forms of emphasis, such as **boldface**, *italics*, ALL CAPS, underline, **color**, and **highlights**, visuals use a variety of techniques to emphasize key information and ideas: Color. Highlights. Pointers. Labels. Tell me what I'm supposed to see. Make it easy for me to get it.

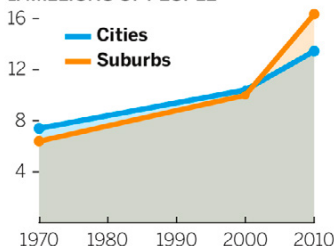
The most obvious and common form of emphasis is color. No need to overthink this: Use rich color to make important ideas come forward, and diminish other information with lighter or contrasting colors. The not-for-profit manager went through several color iterations in trying to make her main idea the most accessible one.

Each iteration attempts to make the surging suburban poverty trend the first thing we see and to use the comparative information, urban poverty, to support rather than

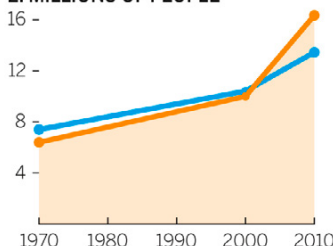
compete with that idea. **Here's why the manager rejected each previous iteration:**

- 1 The overlay of semitransparent colors creates a third color that dominates the chart and draws attention to the filled area, not the lines.
- 2 This clearly highlights suburban poverty more, but why is one shaded and one not? The shaded area is still distracting.
- 3 Darker and lighter hues of the same color suggest two variables in a group, not a comparison. She wants to contrast, not complement.
- 4 Black on white provides the most contrast, but black and blue don't contrast so much that the black line pops.
- 5 Better! But the blue is still fighting for attention.
- 6 Final color choice.

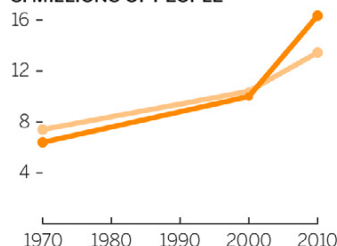
1: MILLIONS OF PEOPLE



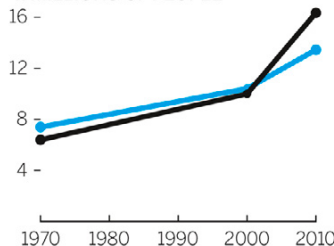
2: MILLIONS OF PEOPLE



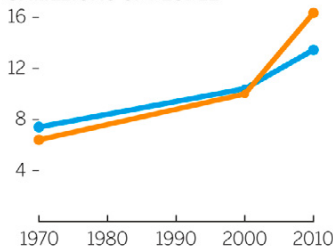
3: MILLIONS OF PEOPLE



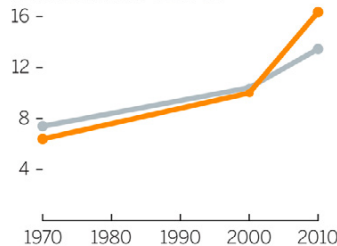
4: MILLIONS OF PEOPLE



5: MILLIONS OF PEOPLE



6: MILLIONS OF PEOPLE



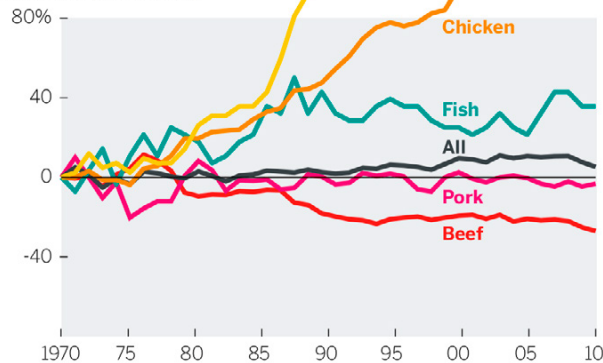
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THE RISE OF POULTRY

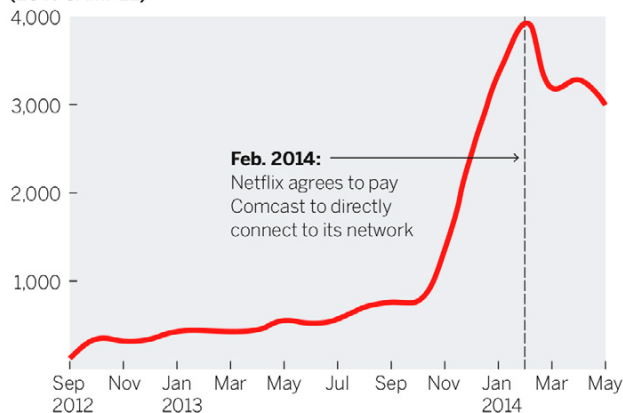
PERCENT CHANGE IN PER CAPITA
MEAT CONSUMPTION



SOURCE: USDA/ECONOMIC RESEARCH SERVICE

SLOW COMCAST SPEEDS WERE COSTING NETFLIX CUSTOMERS

NUMBER OF CALLS TO NETFLIX FOR REBUFFERING/SLOW LOADING
(20% SAMPLE)



SOURCE: FCC REPORT, NETFLIX VS. COMCAST & TWC

Demarcations may seem almost unnecessarily simple, but they can be extremely influential. The curved gray line of demarcation on the chart that maps West Coast sales performance on page 3 makes it impossible to see the team as anything other than performing below expectations.

Pointers can also nudge an audience toward the narrative we want to convey. Without the dotted line and label, it would be hard to understand what was happening in the Netflix Customers chart.

Demarcations can also be used to editorialize. By exceeding the border of the visual field, the author of the Rise of Poultry chart is making a value judgment about the reasonable limits within which the data should fall. The two lines that flout convention by going outside the border draw our eye immediately—they are meant to persuade us that the values represented by these lines are too much.

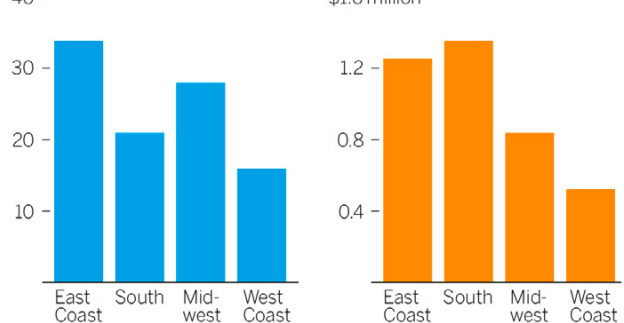
The West Coast sales-reps scatter plot uses another, less obvious way to make an idea more accessible. When charts are meant to represent some number of people or individual units, it's useful to show those units (or multiples of them) rather than a more abstract statistical representation of the whole set. In that chart, each dot represents a person.

The same information could be conveyed more abstractly but would be less persuasive:

SALES REP PERFORMANCE BY REGION

AVERAGE NUMBER OF SALES
40 -

AVERAGE SIZE OF SALE
\$1.6 million



SOURCE: COMPANY RESEARCH

Even if the relative smallness of the West Coast bars were emphasized, this chart would be less persuasive than the chart that plots individuals' performance. That's because statistics are abstract things, and our minds would prefer to focus on more relatable things.³ For example, which of these more convincingly shows the extreme unlikelihood that a high school basketball player will make it to the NBA, the pie or the unit chart?

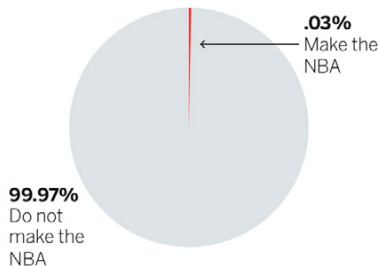
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HIGH SCHOOL BASKETBALL PLAYERS TO THE NBA

PERCENTAGE OF HIGH SCHOOL BASKETBALL PLAYERS

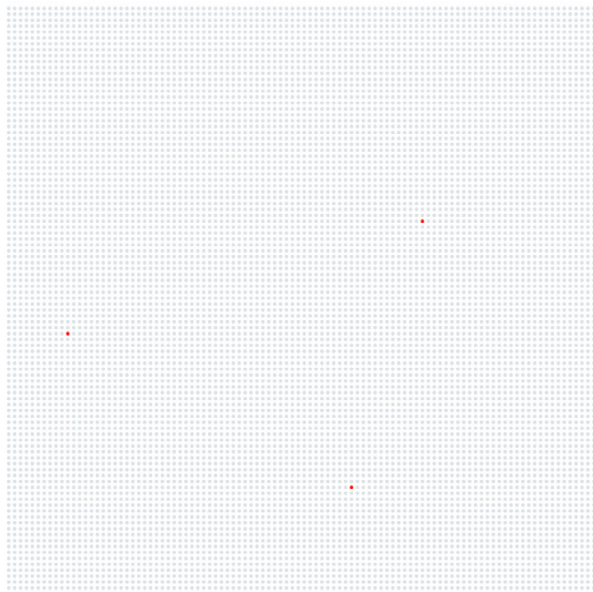


SOURCE: NCAA RESEARCH

The dots turn data into units that we can relate to—people—better than we can relate to a number like 0.03%. (It probably took you a moment to locate the three red dots. In this case, the lack of accessibility actually helps, illustrating as it does that those individuals are so rare that you must work to find them in the crowd.)

The way unit charts convey a sense of individuality have made them a popular way to communicate ideas about people. They're also effective when visualizing risk and probability (as in the NBA example, or in some other celebrated examples, death rates).⁴ Another potentially powerful use of unit charts is to represent money. We often show budgets and spending as proportional breakdowns. Showing individual units of money allocated to various groups might persuade us to think more carefully about where we put those dollars.

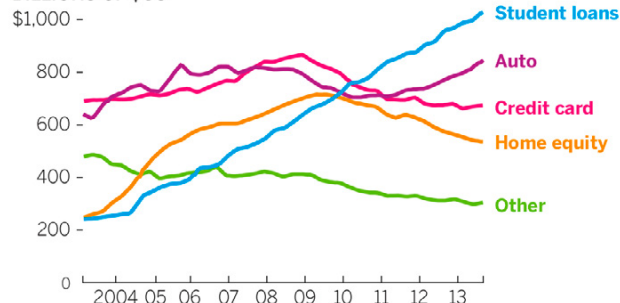
FOR EVERY 10,000 HIGH SCHOOL BASKETBALL PLAYERS, HOW MANY MAKE IT TO THE NBA?



SOURCE: NCAA RESEARCH

NON-MORTGAGE DEBT OUTSTANDING

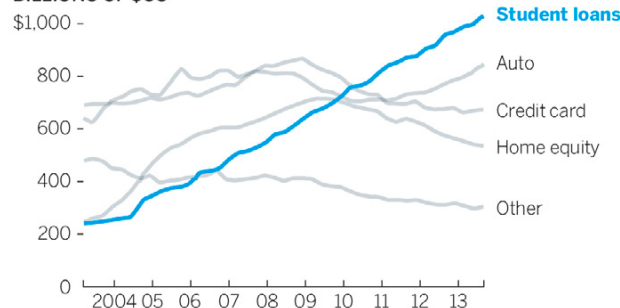
BILLIONS OF \$US



SOURCE: FEDERAL RESERVE BANK OF NEW YORK

NON-MORTGAGE DEBT OUTSTANDING

BILLIONS OF \$US



SOURCE: FEDERAL RESERVE BANK OF NEW YORK

High-resolution displays have also helped popularize unit charts, because they can display tiny points as clearly as print can. How such a chart will play on a large screen in a presentation is worth considering beforehand.

Isolate. As much as we can emphasize the main idea, we can also isolate it by de-emphasizing other aspects of the visual. De-emphasis comes from grouping elements and eliminating them. Every element that earns a unique attribute, such as color, is fighting for attention with the main idea to which we want to draw people's eyes. The fewer the unique elements, the easier it is for viewers to know where to look and to understand what they see.

Software programs that generate charts don't automatically create influential emphasis. They tend to assign colors to every variable without taking into account which ones you want your audience to focus on first, or how color and categorization can be used to create primary and complementary information.

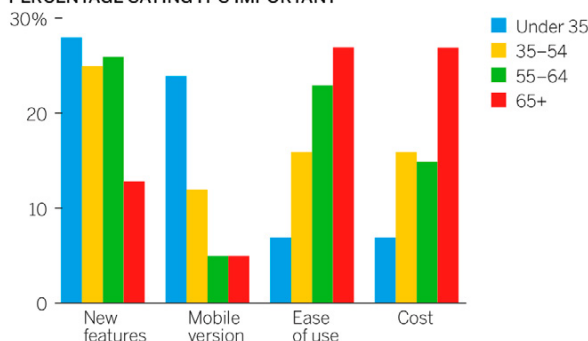
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WHAT ARE THE MOST IMPORTANT ASPECTS OF THIS PRODUCT THAT MAKE YOU WANT TO BUY IT?

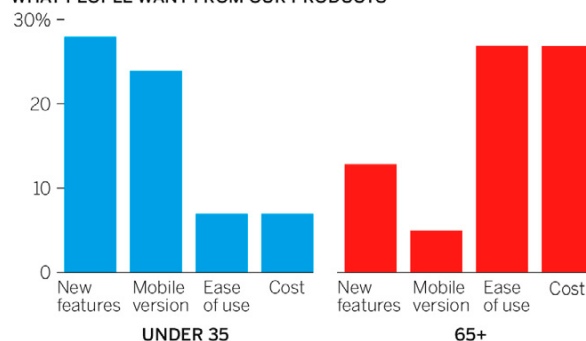
PERCENTAGE SAYING IT'S IMPORTANT



SOURCE: COMPANY RESEARCH

OPPOSING DESIRES OF THE YOUNGS AND THE OLDS

WHAT PEOPLE WANT FROM OUR PRODUCTS



SOURCE: COMPANY RESEARCH

When every variable gets a bright color; no one variable stands out. Which idea is most available in the first Non-Mortgage Debt Outstanding chart? Many people first see the green line, because it's somewhat separate from the others. But this chart is in fact meant to persuade us that there's a student debt crisis. Now you may see it, but that idea was less available than it should have been. Isolating that variable creates a more persuasive chart.

For all the power of software programs and online services to generate reasonably good looking visualizations, they're not yet capable of injecting such cues. That makes sense: software renders data, but good visualization is about presenting ideas. It's still up to us to intervene with decisions and techniques that bring our ideas into high relief. The writing program I'm using right now can't anticipate which words I want bolded or italicized. It's up to me to decide which need emphasis and then apply the right kind at the right time.

Adjust what's around it.

The most aggressive way to make the main idea pop is to change the reference points—the variables that complement or contrast with the main point. We can remove, add, or shift them.

Remove reference points. A chart similar to the one above was tweeted recently with the message “The age divide in what people want from products.”⁵

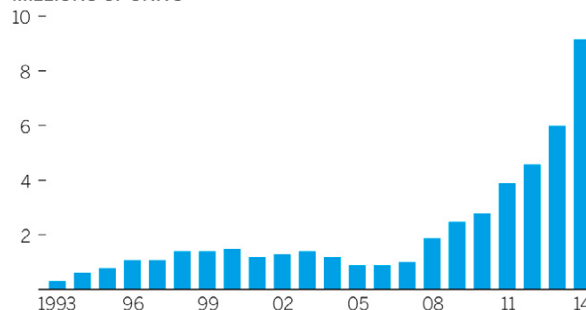
How available is the age divide in this chart? Do you see it? Are you persuaded there is an age divide? What about with the chart above right?

Removing reference points made the idea pop. Think of this as a more aggressive form of isolation. Instead of diminishing color or grouping elements together, you eliminate some information altogether. In the Opposing Desires chart, the middle two age groups have been removed because they don't help illustrate the idea of an age divide. This chart also groups bars by age rather than by feature requests. That makes sense because the main idea is an age divide; those are the categories we want to compare.

Add reference points. It may seem that removing information will always make the main idea more available because it has less visual information fighting with it. But sometimes adding reference points works too. For example, a case can be made that vinyl LPs are making a major comeback:

VINYL SALES SINCE 1993

MILLIONS OF UNITS



SOURCE: RIAA

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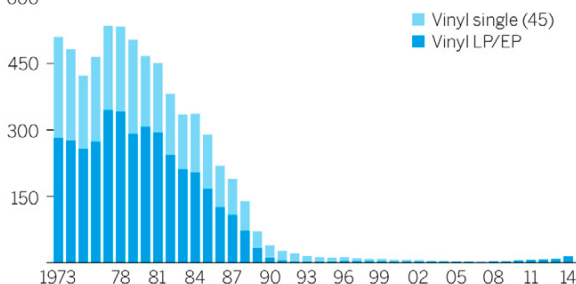
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There's also a persuasive case to be made that vinyl LPs are not making a major comeback:

VINYL SALES SINCE 1973

MILLIONS OF UNITS
600 -



New reference points incontrovertibly alter the persuasive message—in this case from one story to its opposite.

Shift reference points. Another way to change the narrative, and therefore the persuasive direction of the idea, is to shift a comparison entirely:

ALBUM SALES, 2014

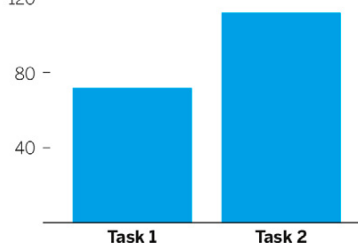


It may be true that vinyl is experiencing a minor resurgence within the context of vinyl albums. But when that trend is compared with a new reference point—total album sales in all formats—we can see right away that it's still only a tiny piece (1.2%) of the business.

Here's another example: A manager wants to make the case that the tech team should automate two menial processes. Each task takes only a few seconds, but both must be done constantly. He wants to show that performing the task

TASK 1 AND TASK 2

HOURS LOST PER YEAR
120 -



dozens of times a day adds up over time. So he simply adds up all the time and plots it, as shown on the left.

Hours per year is a respectable reference point, but it's not terribly dramatic—there are thousands and thousands of hours in a year, so about a hundred doesn't seem like that many. But if the manager shifts the reference point as below, his boss may be persuaded to take action.

Workdays—now that's something the boss gets right away. What's more, rather than focusing on hours lost to the tasks, the manager is focusing on who loses the hours. A new narrative forms: *Susan spends almost three weeks a year just on these menial tasks.* (Notice, too, that the manager changed the bars into a unit chart, with five-day blocks composing a week. This creates another easily accessible unit—a workweek—to help persuade.) ♦

DAYS LOST TO TASK 1 AND TASK 2: TIME SINK

WORK DAYS LOST PER YEAR



Footnotes:

- 1 Daniel Kahneman and Richard Thaler, "Anomalies: Utility Maximization and Experienced Utility," *Journal of Economic Perspectives* 20 (2006); Amos Tversky and Daniel Kahneman, "Availability: A Heuristic for Judging Frequency and Probability," *Cognitive Psychology* 5 (1973).
- 2 Petia K. Petrova and Robert B. Cialdini, "Evoking the Imagination as a Strategy of Influence," *Handbook of Consumer Psychology* (Routledge, 2008), 505-524.
- 3 We tend to react more viscerally to the unit chart than to a statistically driven chart. This is related to a phenomenon known as *imagining the numerator*. In a notable study that demonstrates this effect, experienced psychiatrists were given the responsibility of deciding whether or not to discharge a psychiatric patient. All the doctors were given an expert analysis, but some were told by the expert that 20% of patients like this one were likely to commit an act of violence upon release. Other doctors were told that 20 out of every 100 patients like this one were likely to

commit an act of violence.

In the group that was told "20%," about 80% of the doctors decided to release the patient. In the group that was told "20 out of every 100," only about 60% suggested releasing him. The likelihood of recidivism was the same for both groups, so why the great disparity? The latter group was imagining the numerator. In the minds of those doctors, 20 out of 100 turned into 20 people committing acts of violence. The former group didn't react the same way because percentages don't commit acts of violence.

This phenomenon occurs because the experiential part of the brain—the part that relies on metaphor and narrative to create feelings—quickly and powerfully overrides the rational part that analyzes statistics. Unit charts take advantage of this. See Veronica Denes-Raj and Seymour Epstein, "Conflict Between Intuitive and Rational Processing: When People Behave against Their Better Judgment," *Journal of Personality and Social Psychology* 66 (1994); and Paul Slovic, John Monahan, and Donald G. MacGregor, "Violence Risk Assessment and Risk Communication: The Effects of Using Actual Cases, Providing Instruction, and Employing Probability Versus Frequency Formats," *Law and*

Human Behavior 24 (2000), 271-296.

- 4 I should note that imagining the numerator in evaluating risk is considered a negative phenomenon. For example, in the original study Denes-Raj and Epstein showed that when people were offered a chance to win money by picking red beans from a jar, they chose to pick from a jar that had more red beans even if red beans were proportionally fewer in that jar. Thus they were picking from a jar in which their odds of getting a red bean were lower. Imagining the numerator can also make us inflate risks. Paul Slovic noted in one study that when trying to communicate how infinitesimal parts per billion were, researchers told people to imagine one crouton in a 1,000-ton salad. Unfortunately, although the numerator (the crouton) was an easily understood concept, the massive salad was not. People ended up thinking that risks stated in parts per billion were more significant than they actually are. So although unit charts can persuasively convey individuality and help connect us to values by making statistics less abstract, they can also backfire or artificially exaggerate the data.
- 5 I kept the design and the data but changed the subject.

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REFINE TO PERSUADE

Recap

IT'S OFTEN NOT ENOUGH

to make a chart that's simply accurate. Managers may need to reveal truths that are dormant in the data to help make a case—to compete for attention, resources, and money; to pitch clients; to recruit new customers; to sway an opinion or help form one.

To make charts more persuasive, use these three techniques:

1 **Hone the main idea.**
Adjust your prompt. Instead of asking *What am I trying to say or show?* start by saying *I need to convince them that ...* This will expose where and how you can focus your energy on persuading an audience. For example:

WHAT AM I TRYING TO SAY OR SHOW?

I am trying to show the relationship between unbundling products and declining revenue.

I NEED TO CONVINCE THEM THAT...

I need to convince them that unbundling our software suite will devastate revenue streams.

2 **Make it stand out.**
Use simple design techniques to reinforce your main idea.

- **Emphasize** the main idea by adding visual information that calls attention to it. For example, use unique colors, pointers, labels, and markers to draw the audience's focus.
- **Isolate** the main idea by reducing the number of unique attributes for all other elements. For example, group them together, make them gray, or otherwise de-emphasize them to bring the main idea into high relief.

3 **Adjust what's around it.**
Manipulate the variables that complement or contrast with the main point to make it pop.

- **Remove reference points.** Eliminate plotted data that distracts or dilutes the main idea.
- **Add reference points.** Add plotted data to the chart to expose otherwise hidden context.
- **Shift reference points.** Change the plotted data used in comparison with the main idea to create new context. ♦

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