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BUSINESS (/BUSINESS) 8/08/2013 @ 10:59AM | 4,355 views

6 Ways Numbers Can Lie To Us

SAP Guest (http://blogs.forbes.com/people/sapguest/) , SAP

By Christopher Kim, Director of Strategic Programs, SAP (/companies/sap/)

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One of my few pet peeves in life is when I hear someone say “the numbers don’t lie!” While I understand and appreciate the use of fact-based information to support an argument, its application has become overly generalized.

People often use numbers as a crutch to support weak arguments, presuming that *any* stat is a good one, capable of automatically validating their position. The truth is that numbers can and do lie to us every day. This is especially important to keep in mind as the hype around Big Data (http://www54.sap.com/solution/big-data.html) and Analytics (http://www54.sap.com/pc/analytics/strategy.html)reaches a fever pitch.

As a reminder to all of us who use data in work and life to make decisions, I’ve put together some examples of how numbers can often lie or mislead. Feel free to add more that I’ve missed!

1. Small sample size

Description: These conclusions based on a small number of data points, yet portrayed as an accurate reflection of the truth. When seeing any data, this is the first question I will always ask.

Example from daily life: Baseball statistics. Volumes have been written about the use and misuse of baseball stats

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(http://www.amazon.com/Baseball-Between-Numbers-Everything-About/dp/0465005470), but one of the most common mistakes is to judge a player based on a few weeks or months of performance. In reality, even the worst baseball players can look like All-Stars for short periods of time. It takes multiple years of data to validate the true talent level of a player. To illustrate, here are some recent players who have had great 3-4 week stretches but are no longer in the Major Leagues:

Player	Recent Award	Current Playing Status
Dee Gordon	MLB Rookie of the Month - Sept 2011	AAA - Minor Leagues
Jemile Weeks	MLB Rookie of the Month - June 2011	AAA - Minor Leagues
Jair Jurggens	MLB Pitcher of the Month - May 2011	AAA - Minor Leagues
Bryan LaHair	National League All-Star - 2012	Playing in Japan

(http://b-i.forbesimg.com/sap/files/2013/08/baseball-chart.png)

2. Big meaningless numbers

Description: These large numbers are meant to imply a significant trend, but do not provide any context. Therefore its meaning is of limited or no use.

Example from daily life: Social media stats. A lot of Twitter followers or Facebook (/companies/facebook/) FB +2.41% (/companies/facebook/) fans doesn't really mean anything, yet they are often used as a proxy of someone's level of "influence." There are easy ways to get a ton of followers in social media (http://thenextweb.com/twitter/2012/12/15/fake-followers-an-easy-game-

but-not-worth-the-risk/). What matters is whether those people actually care about what you're saying, if you're engaging them, and if it results in a real business benefit. I cringe when I see big social media "ego metrics" now.

3. Correlation, not causation

Description: Such figures state that Variable A *causes* Variable B, when in fact they are merely correlated.

Example from daily life: Taken from SAP CMO Jonathan Becher's recent blog (http://alignment.wordpress.com/2013/07/07/a-search-for-cause/) on this topic: *When male college students wake up with a headache, a large percentage of the time they are still wearing their shoes***.** Does sleeping with your shoes on really cause headaches? Of course not, they are only correlated. You could play this game all day long.

4. Selection bias

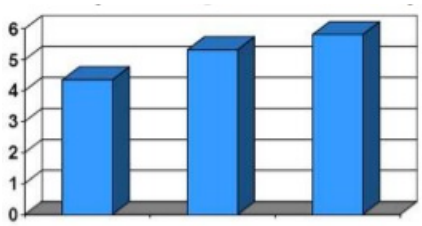
Description: These numbers imply that data came from a random sample when it actually came from a (systematic) non-random sample.

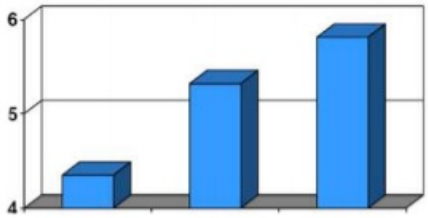
Example from daily life: Online voting polls. These are easy to discredit because by definition, all participants have access to the Internet, which automatically distorts the sample. Furthermore, the results will skew towards the readership profile of the host Web site. This is not a big deal for trivial topics like sports or entertainment, but political views extrapolated from online results can lead to truly misinformed decisions.

5. Visual trickery

Description: Some graphics deceive or mislead based on how the information is presented.

Example from daily life: Changing the Y-axis of a graph to magnify the difference in data points (see example below). You see visual trickery all the time on cable news channels. Keep an eye on how graphs are manipulated the next time you watch a news show.





(http://b-i.forbesimg.com/sap/files/2013/08/mislead21.jpg)

6. Arbitrary cutoffs

Description: This is another form of selection bias. Setting arbitrary start-and-end points that impact the meaning of data.

Example from daily life: Any "Top 10" list. Why is it 10 and not 11? Why does this blog have 6 bullet points instead of 10? Again, it's not a big deal for trivial topics, but if it's a list of Top Hospitals or Colleges, some people will make significant decisions based on that information. In addition to lists, any data that is time-bound could have arbitrary cutoff dates, so we should always keep that in mind.

So that's my list. What am I missing? Do you have other examples of "numbers that lie"?

Follow me on Twitter @ChrisKimSAP (https://twitter.com/ChrisKimSAP)

This story (http://scn.sap.com/community/business-trends/blog/2013/07/31/6-ways-that-numbers-can-lie) originally appeared on SAP Business Trends (http://scn.sap.com/community/business-trends).

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BUSINESS (/BUSINESS) 10/30/2014 @ 10:25AM | 4,473 views

The Future Is Arriving Sooner Than You Think. Are You Ready?

SAP Guest (http://blogs.forbes.com/people/sapguest/) , SAP

By Daniel Wellers, Senior Director, Strategy & Research, SAP

With the exception of mathematicians, we humans can't handle big numbers. The blame falls squarely on our ancestors. To survive, our knuckle-dragging ancient forebears needed to count how many people to feed, and estimate if enough animals were nearby to hunt. These were small numbers that changed

little over many generations. Since there was no evolutionary requirement to understand either large numbers or the concept of exponential growth, we humans never developed these abilities.

But we need to start.

Ever since the first microchip rolled off the line, digital technologies have been advancing at an exponential rate. So far, this has been apparent mostly in faster boot-up times when we get a new laptop. But soon we're going to experience exponential in a new way: it's going to change everything about the ways we do business. We need to better understand what these changes will mean to our complex world.

Photo: Shutterstock

To illustrate the power of exponential, futurist Ray Kurzweil (http://www.kurzweilai.net/ray-kurzweil-biography) tells a story about the inventor of chess, whose demo to the Emperor was such a hit that he was allowed to name his reward. This clever inventor was also a mathematician, and he requested his reward in rice; one grain for the first square of the chessboard, two for the second, four for the third, and so on, doubling at each square up to the board's total of 64 squares. The Emperor granted his request, viewing it as humble, and for a while things progressed as expected. However, after 32 squares, when the prize passed four billion grains, the Emperor started to take notice. By the 64^{th} square the sum had zoomed to 18,446,744,073,709,551,616 grains of rice, a pile that tops Mount Everest!

The Emperor's failure to foresee this result was completely human. What's more, this is pretty much where we are today; about 32 doublings since the first real computers were introduced during World War II. Indeed, exponential acceleration continues across the full range of digital technologies including raw compute power, data storage, bandwidth, transmission speed, miniaturization (http://fortune.com/2014/07/08/intels-vision-for-the-future-intel-inside-everything/) and myriad others. Three years ago, IBM's (/companies/ibm/) IBM -1.06% (/companies/ibm/) Watson supercomputer fit into a bedroom. Today it's the size of 3 pizza boxes (http://gizmodo.com/ibms-watson-is-now-the-size-of-3-pizza-boxes-its-als-1497914636).

But wait, there's more!

Here's where things get really interesting. Because digital technologies are designed to work together – to combine with each other in systems and networks that multiply value – the exponential growth occurring in individual technologies means that their power in combination is also increasing exponentially. In short, exponential growth is now increasing at an exponential rate (http://content.time.com/time/interactive/0,31813,2048601,00.html). For the mathematically inclined, this means the line on the logarithmic scale isn't straight, it's actually curved.

Under current trends the technological progress in this century could be of equal magnitude to all such progress over the last 200 centuries (http://www.kurzweilai.net/kurzweils-law-aka-the-law-of-accelerating-returns).

Consider that as recently as 2003 Facebook, Twitter, YouTube, the iPhone, Wikipedia and Skype either didn't exist or were practically unknown. The explosion in mobile devices had barely started. Yet today these have transformed business and society. Now the likes of neuromorphic computing (http://www.economist.com/news/science-and-technology/21582495-computers-will-help-people-understand-brains-better-and-understanding-brains), 3D bio-printing (http://www.techrepublic.com/article/new-3d-bioprinter-to-reproduce-human-organs/), robotic bacteria (http://www.fastcompany.com/3037594/scientists-experiment-with-robotic-bacteria), brain mapping (http://www.technologyreview.com/featuredstory/526501/brain-mapping/), and next-gen virtual reality (http://www.wired.com/2014/05/oculus-rift-4/) (to name just a few) are either here or just around the corner, with even greater potential to revolutionize.

Complexity holds us back

Advances in digital technology will march on at a mind-blowing pace, as will their potential to improve lives and help business run better. But a big problem has arisen which threatens to hinder, indeed derail, the path to a

brighter future. Up to now, complexity has been a manageable downside to progress. Today it's become a crippling issue of epidemic proportions. Research (http://global.sap.com/campaigns/digitalhub-runsimple/manifesto/index.html) shows that children think life is too complicated, working professionals are having health issues from the stress of information overload, and personal relationships are suffering. All this is a direct result of complexity. In addition, business executives say complexity increasingly impedes growth. Perhaps complexity is the reason that labor productivity since 1999 is essentially flat despite a 49% CAGR (http://d2mtr37y39tpbu.cloudfront.net/wp-content/uploads/2013/10/DUP401_Fig.7.jpg) in cost-performance of digital technology.

To win the future, Run simple today

If left unaddressed complexity will undermine our ability to benefit from the exponential innovations on, and over, the horizon. Here are three things organizations should do to prepare.

Shrink the layers of management that have built up over time. The result will be speedier decisions, less bureaucracy, and more time to focus on innovation.

Streamline existing processes and workflows that haven't kept up with the times or, if they can't be streamlined, redesign what the user sees in order to mask the complexity. New processes must meet expectations of the digitally native; intuitive and easy to use.

Reduce the complexity of IT infrastructure. CIO's can spend as much as two-thirds of their budget on running and maintaining existing systems. Consider moving to a platform (http://www.saphana.com/welcome) that frees up the ability to innovate quickly, and scales easily across your organization.

To win the future, running simple (http://discover.sap.com/runsimple?campaigncode=CRM-XH14-B2D-SOCRSDE&source=social-global-forbes-RS) today is the best way forward.

This story (http://scn.sap.com/community/business-trends/blog/2014/10/28/the-future-will-be-here-sooner-than-you-think-here-s-how-to-get-ready) originally appeared on SAP Business Trends (http://scn.sap.com/community/business-trends).

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