

# Four reasons you must tell your data story with pictures.

By Dan Roam

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*Abstract: In this paper, international bestselling author and visual-thinking leader Dan Roam (**The Back of the Napkin, Show & Tell, Draw to Win**) makes the case that all business and data presentations should rely on simple visuals to ensure clarity, insight, and persuasion. He describes the neuromechanics of vision and introduces a simple, six-picture approach to create and present complex ideas through visual storytelling.*

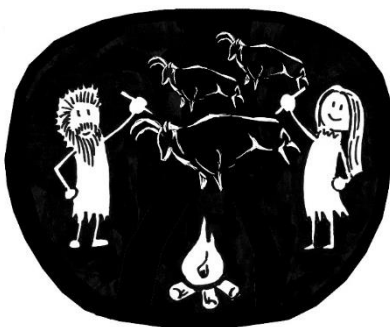
## Introduction: The Power of Pictures

As a management consultant and entrepreneur, I have spent thirty years helping businesspeople around the world clarify their thinking and improve their communications through the intelligent and intentional use of pictures. In this paper, I will share with you the top four lessons I have learned.

Based on successes at organizations as diverse as Google, GE, SAP, the US Navy, the United States Senate, and the White House Office of Communications, I am confident that if you apply these lessons in your data presentations, you will discover new insights in your own data, you will develop better problem-solving skills, and you will become a more effective presenter and salesperson of your own ideas.

### 1 Why you must tell visual stories.

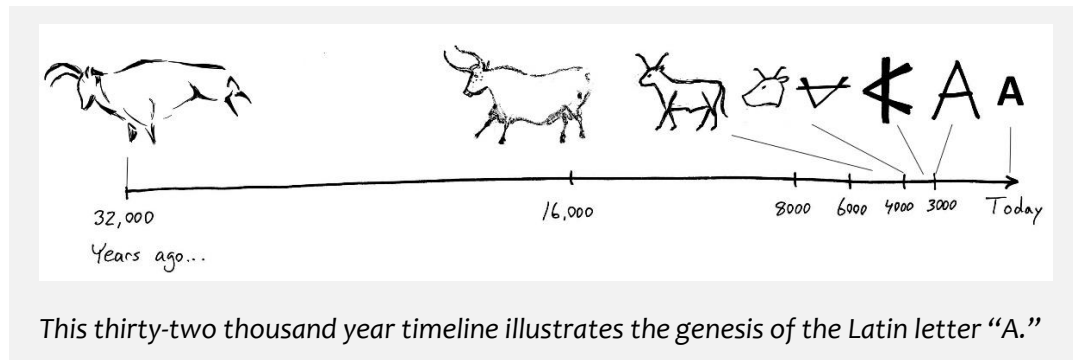
**VISUALIZATION IS OUR OLDEST TECHNOLOGY.**



Thirty-two thousand years ago, our ancient ancestors recorded their stories on the walls of caves throughout what is now France, Spain, and Indonesia. They drew bison, horses, tigers, rhinos, and occasionally, people. These drawings predate most weapons, pots, jewelry, and even clothing.

Our ancestors had knowledge they needed to share with each other and lessons that needed to be remembered – and they used pictures as the recording and sharing mechanism. Only much later – twenty-seven thousand years later – did those pictures begin to evolve into written language. Today, the phonetic letters of Indo-European

languages still show their origins as the pictures they once represented. (The same is true of Chinese-derived Asian languages, but with pictograms and logograms rather than individual phonetic letters.)



### VISUALIZATION IS OUR NEWEST TECHNOLOGY.

All of us involved in data analysis and business intelligence know that pictures have remained important to this day. Charts, tables, maps, and schematics are often the only way to make sense of the vast array of data available for decision-makers today. Thanks to years of experience and the talents of countless designers, developers, and data scientists, we today have many tools available to us to effectively create, analyze, and present these pictures, and in general they have served us well.

But that is about to change.

The last five years have seen a new visual revolution – and this one is of even greater potential impact to businesspeople than the arrival of charts. I am referring to the rise of visual social media.

I believe there is a simple reason that **Facebook**, **YouTube**, **Pinterest**, **Instagram**, **SnapChat**, **Tumblr**, and **Vine** have exploded into popular culture and are making their way relentlessly into the business world, and that reason can be summarized with one word: **pictures**.

Our newfound ability to instantly share images with friends and colleagues anywhere on earth is a watershed moment, bringing to fulfillment the dream first sketched by our cave-dwelling ancestors. The arrival of visually-driven social media isn't a millennials-powered fad that will fade as quickly as it arrived. On the contrary; it's the logical extension of that line first drawn 32,000 years ago. Today we just have better technology.

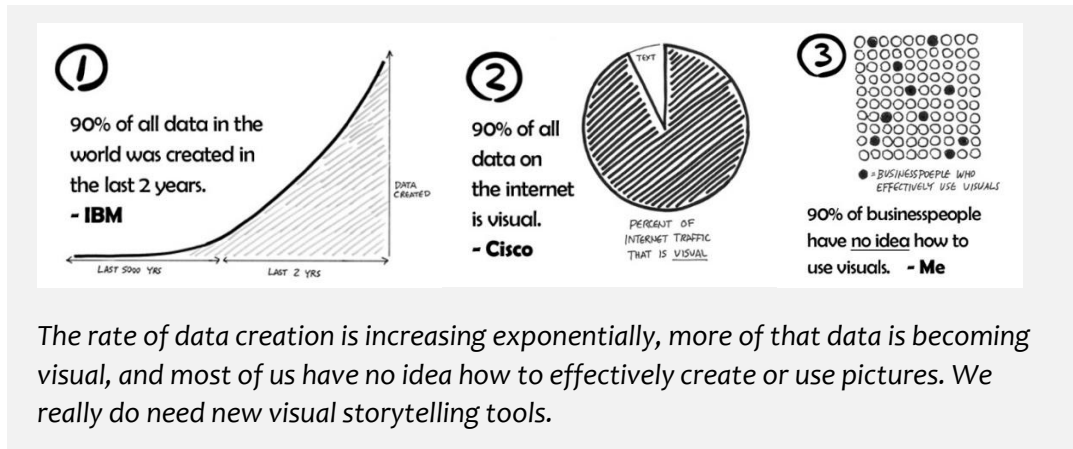
As a business-person living in a data-rich world, why is this important for you?

### THREE DATA-POINTS MAKE THE CASE.

*"90% of the data in the world today has been created in the last two years alone." – IBM Smarter Planet Report, 2015*

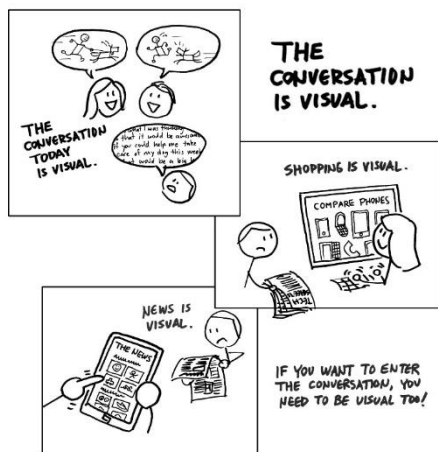
Here are three recent data-points to consider when you think about data visualization. The first is from **IBM's 2015 Smarter Planet Report**, which says that ninety percent of all data collected in history has been generated in the last two years. The second is from **Cisco's 2015 Visual Networking Index**, which states that ninety percent of all data transmitted online today is visual. The third comes from my own work training corporate executives in the power of visual communication, in which I realize that ninety percent of businesspeople have no idea how to effectively create or use visuals.

**The point is this:** We're generating more data more quickly than ever, that data is primarily visual, and most of us don't know how to use images to help present it. Clearly, there is an enormous opportunity for all of us to become better visual thinkers. The good news is that with a little understanding of how the human visual system works, it isn't that hard.



*The rate of data creation is increasing exponentially, more of that data is becoming visual, and most of us have no idea how to effectively create or use pictures. We really do need new visual storytelling tools.*

## THE CONVERSATION IS NOW VISUAL.



For many years now, it has been expected that any data – driven report contain a handful of charts. Properly created, the charts offer a quick way to parse vast datasets, spot trends and outliers, and guide solid evidence-based decision-making.

To prepare such a report, we spend our time collecting the appropriate data, generating visualizations, searching for underlying patterns of note, and then presenting our insights to colleagues or management.

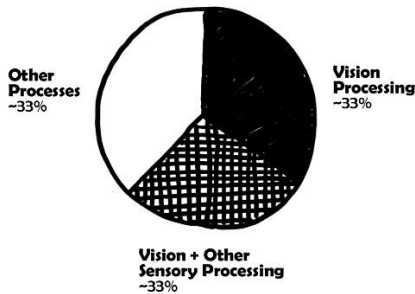
That's still true, but now there is an added twist. I call this twist the “pictures-first” movement. Think about it like this: outside the office, people tell their personal stories with

selfies posted to Facebook, shop by looking at pictures online and clicking the image that most intrigues them, and watch the news by scanning through video clips coming from outside the traditional news channels.

Today, in other words, the entire personal and business conversation is becoming visual. If you want to enter the conversation, you need to be visual too. Pictures are the expectation – not only for the data, but for the story itself.

### LET'S LOOK AT THE NUMBERS

## THE HUMAN BRAIN:

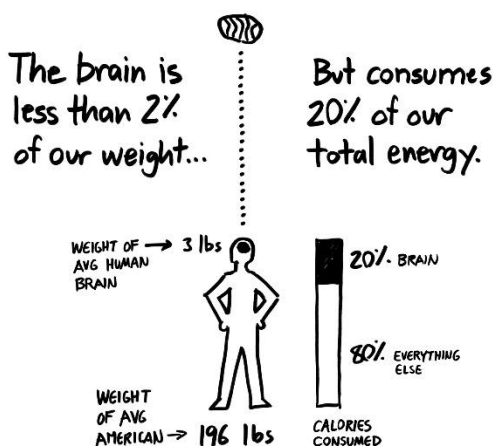


It is estimated that anywhere from one-half to two-thirds of your total brain activity is dedicated to vision; vastly more than to any other known function.

While it is impossible to assign fixed percentages, it appears that in terms of sheer numbers of neurological horsepower, roughly one-third of your brain is dedicated to visual processing and another third dedicated to combining visual inputs with those from your other senses.

While hard numbers are elusive, the theme is clear: of all the things that your brain does to keep you functioning and alive, more is dedicated to visual processing than to anything else you do.

***“More of the brain is devoted to vision and visual processing than to any other known function, including language. More neurons in the human brain are involved in vision than is the case of all other sensory modalities combined.” - Dr. Leo Chalupa, Distinguished Professor of Ophthalmology and Neurobiology at the University of California, Davis and Chairman of the Department of Neurobiology, Physiology and Behavior.***



A second set of numbers takes the case for pictures even further. At an average weight of three pounds (1.36 kg), the human brain accounts for only about two percent of an average adult's total body weight. And yet the brain consumes twenty percent of our daily energy burn.

Let's put those two data-points together: your brain consumes more energy than any other organ in your body, and more of that energy is consumed processing vision than anything else.

What does that tell you? As far as your body is concerned, measure-for-measure, vision is the most important thing you do.

## 2 Vision is predictable.

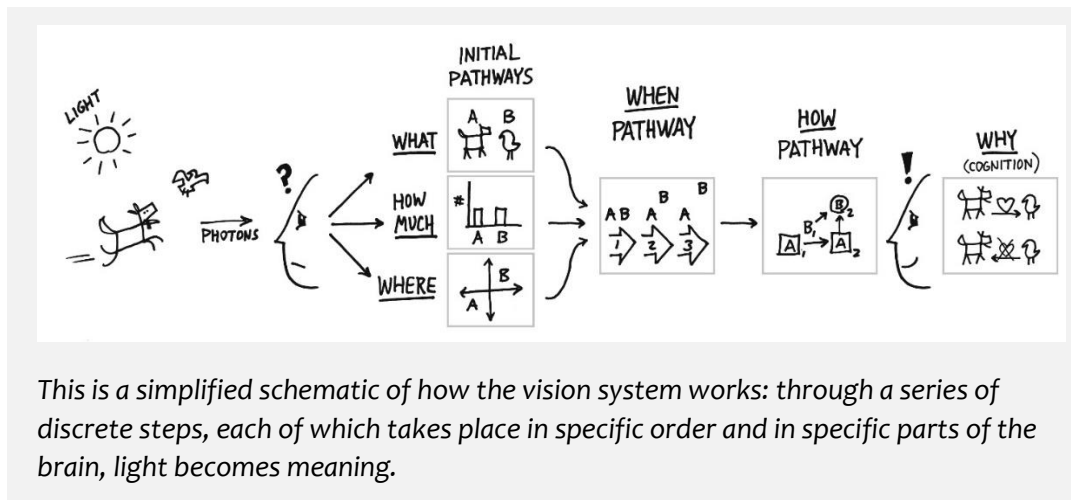
### PEOPLE IMMEDIATELY UNDERSTAND PICTURES THAT ALIGN WITH VISION

It's important to note that the human vision process is a specific **system**. Although vision as a process is extraordinarily complex, vision works because the system follows a series of steps. This is an important insight for communicators because it tells us that, in theory, we ought to be able to create images that work step-by-step within that system, providing immediate comprehension in the minds of our viewers.

Well, guess what; it isn't theoretical any more. We can do exactly that: we can programmatically create visual stories that show (and tell) any audience any idea – and in a way that the audience is going to immediately follow and understand.

To show you how this works, you first need to understand the basic mechanics of vision.

### FIRST, YOU NEED TO SEE HOW VISION WORKS



From a neuro-mechanical and cognitive process perspective, vision at a high-level works like this:

- 1) Light bounces the objects in front of you and enters your eyes as photons. Those electrical signals engage your visual engine (your retinas, optic nerves, visual cortex and about 50 billion neurons) and kick the system into gear so that your brain can make sense of this visual input.
- 2) Right away, those signals are filtered and begin to pass along a series of *pathways*. The **What** Pathway identifies the objects, the **How Much** pathway counts the objects, and the **Where** Pathway determines the position of the objects. These three pathways are more-or-less independent, and operate in parallel throughout physically distinct regions of your brain.

- 3) By detecting changes in the positions of the objects over *multiple scans*, the **When** Pathway then captures the sequence in which the objects are interacting. This gives your mind the impression that things are moving, or to put it more practically, that time is passing.
- 4) The **How** Pathway then pulls everything together – the objects, their numbers and positions, and the sequence in which they occur – and creates a kind of visual cause-and-effect model, through which it tells the rest of your brain what is happening in the visible world around you.
- 5) Last, the **Why** Pathway (which really isn't so much a pathway as it is *visual cognition*) takes that cause-and-effect story and makes rules from it; an ongoing stream of visual 'news you can use.'

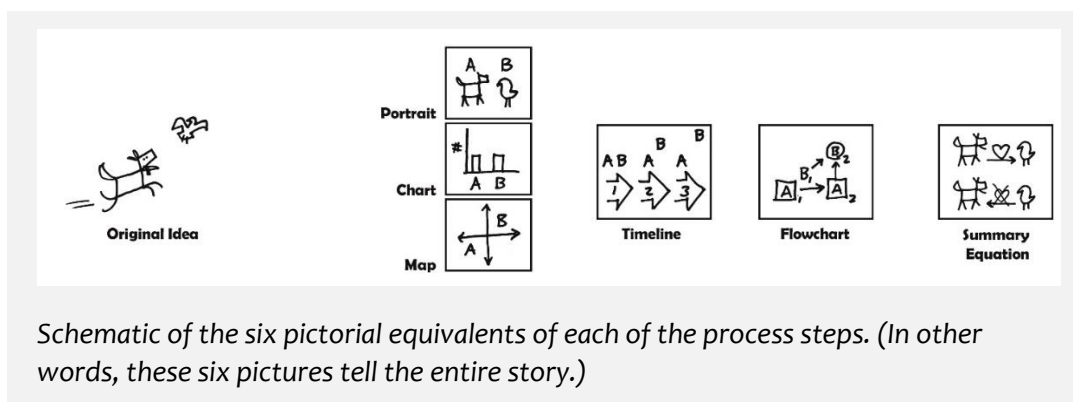
The whole process from photon to insight takes about 1/10<sup>th</sup> of a second, and happens constantly as long as your eyes are open. (It also takes place when you are dreaming, but that's another story.) Along the way, the visual inputs merge with those from your other senses to give you a complete sensory picture of the world around you and your place in it.

### SIX PICTURES ARE ALL YOU NEED

As a management consultant, I for years created different kinds of pictures to suit different kinds of tasks. If I wanted to show where one product segment sat in relation to another, I drew a map. If I wanted to show a financial trend, I drew a stock chart, if I wanted to illustrate a process sequence, I drew a timeline, and so on.

Over time, I developed a series of six basic picture types that covered every type of explanation needed in a presentation, regardless of the specific content of that presentation. (I'll show you the list in a moment.) This little visual toolkit served me well, and gave me the confidence to go to the whiteboard and – regardless of the particular industry or market being discussed – know that I could draw a picture that would clarify the essentials of the underlying concept.

The breakthrough came when I was introduced to the vision-system model described above. All of the sudden, the six pictures I always drew made sense: they are in fact exactly the same six types of visual information the visual system is looking for. Draw them in order and you are giving your viewer's mind exactly the visual information she is looking for – in the order she is looking for it.





This matters because it tells you that if you can draw six simple pictures – **portrait, chart, map, timeline, flowchart, and equation** – you can visually clarify and explain anything.



The six elemental pictures of any complete visual story: A “**portrait**” shows who and what, a “**chart**” shows how many, a “**map**” shows location, a “**timeline**” shows sequence, a “**flowchart**” shows cause-and-effect, and a “**visual equation / multi-variable chart**” illustrates the takeaway lesson.

**SO WHAT DOES THIS MEAN TO YOU?**

The lesson here is simple, powerful, and important. When you break your problem, solution, insight or idea down into its six core visual elements, you can explain it to anyone with six simple pictures. I call this “hijacking the visual brain.”

**3 Hijack the visual brain.**

**“VISION” HAS ALREADY FIGURED OUT WHICH PICTURES WORK**

When it’s time to present your idea, you will use data visualizations. You already know that, and you already know that **SAP Lumira** and other similar applications give you the tools to generate those visuals. What I want to add here is a bit of insight into why certain types of visuals are more successful than others – and how to use that insight as you create your visualizations.

The visual system we've been talking about throughout this paper is your friend; it works incredibly hard to guide you, protect you, and inform you. To serve that end, your visual system has evolved over the ages to do the best job it can in an overwhelmingly complex visual world.

What that means is that "vision" has already figured out what works and what doesn't when it comes to meaningful pictures. When creating charts there is no need to reinvent the wheel; simply recognize what the visual engine *already does* – and do more of that.

### USE PRECOGNITIVE ATTRIBUTES TO CREATE GREAT DATA VISUALIZATIONS

A key reason that vision works at all is that almost all of it takes place before you need to think; in other words, most picture processing is **pre-cognitive**. If you had to stop and think about everything you were seeing, you would have been dead long ago, destroyed by any one of a million hazards long before you ever saw it coming. Thankfully, that didn't happen, and you can thank **pre-cognitive** visual processing for that.

**Effective visuals rely on precognitive attributes.**

The diagram illustrates eight precognitive attributes with visual examples:

- Orientation:** Five vertical lines, with the third one tilted at an angle.
- Length:** Five vertical lines of varying heights.
- Width:** Five vertical lines of varying thicknesses.
- Interaction:** Five vertical lines, with the first one having a horizontal line intersecting it at the top.
- Size:** Five circles of varying diameters.
- Shape:** Five circles, with the third one being a triangle.
- Color:** Five circles of varying shades of gray.
- Position:** Five circles, with the fifth one positioned lower than the others.

*Precognitive attributes are those which are perceived in the viewer's visual mind without any conscious effort. The use of such attributes means that the viewer can "get the picture" immediately without needing to refer to a key or explanation.*

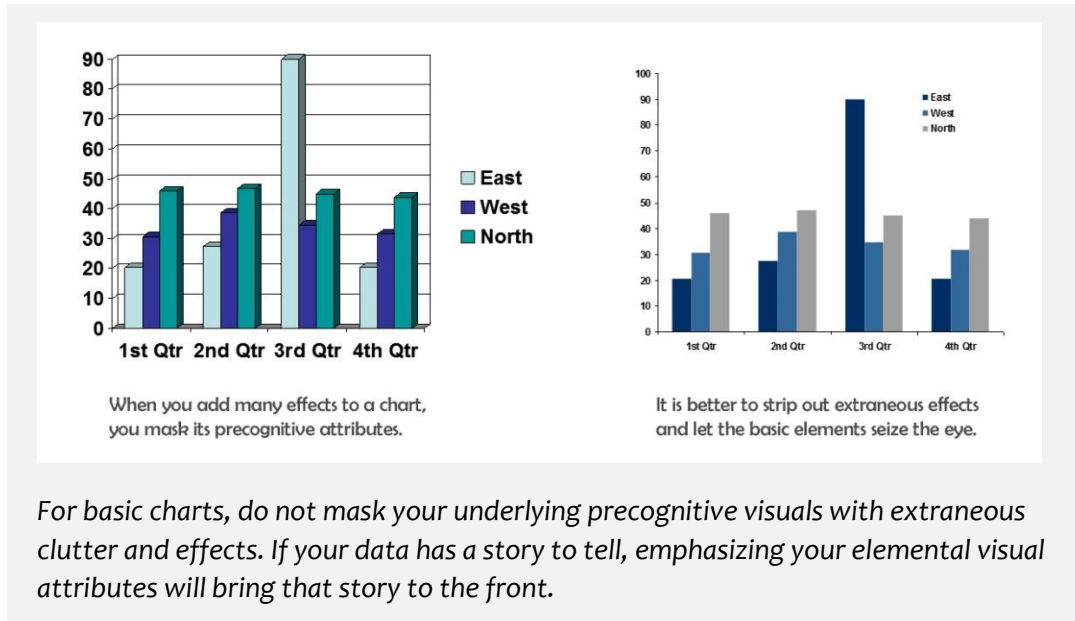
When you create a data visualization, precognitive visual attributes are those parts of your picture that require zero high-level processing to see and understand. The orientation, length, width, or intersections of lines are immediately obvious to your audience's vision system. The same is true of the size, shape, color, and position of shapes and objects.

Your goal in creating visuals of any type should be the same: preload as much important information as you can using these simple visual rules. Audiences will immediately see the consequential data and you can use their higher-thinking skills for insight and discussion.

Almost all basic data visualizations generated by any application are based on these attributes. Bar charts, time series, pie charts, 2x2 quadrants; all work because they package data into clusters that can be illustrated using precognitive visual attributes.

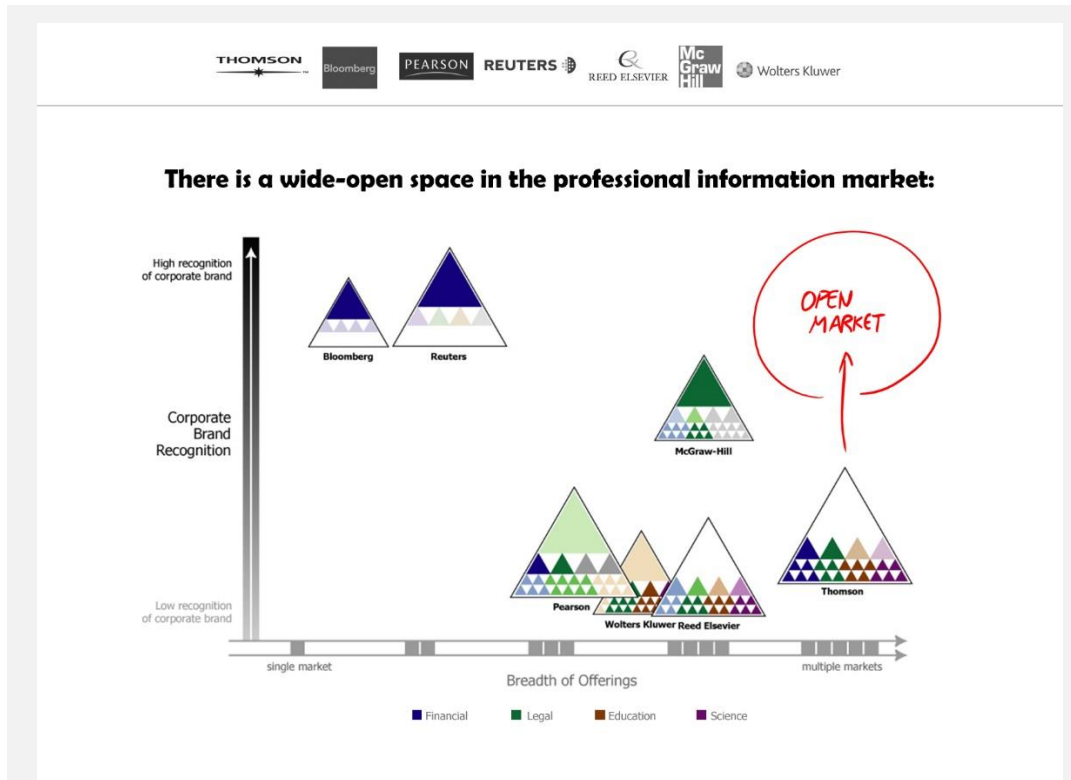


There are two ways you can use this knowledge as you use software to create your visuals.



First, let the essential visual elements speak for themselves. When introducing the essentials of an idea, don't pretty up your visualization with any extraneous distractions. Let a bar chart be nothing more than a bar chart, in which the height of a bar means everything. Let a map be a map, in which the 2-dimensional position of objects reflects just that; their relative positions according to whatever axes and scale you select.

For these basic visuals, let the most elemental precognitive attributes carry the weight of the message.



*In advanced data visualizations, use multiple precognitive attributes to allow different data types to coexist in a single “multi-variable plot.” In this case **color, size, shape, and position** allow seven competitive firms to be compared across six intersecting business dimensions (company, revenue, brand recognition, organizational structure, scope of offerings, and market position.) The result is a compelling visual story that could not be told as effectively any other way.*

Second, use these attributes to explore your own “outside the box” custom visuals, and push beyond the standard charts. You don’t need to create fantastically elaborate visuals or add shiny 3d-effects to attract interest. Instead, combine as many precognitive attributes as needed (and not one more) and let the near-instant insight your viewer experiences be the attraction.

## 4 Show your story in six pictures.

### USE THE SIX-PICTURE MODEL TO VISUALLY TELL YOUR STORY

The last point I’m going to make is the most important, and builds upon everything we’ve just covered: don’t assume that because you’ve created good data visualizations that you have a good visual story. You don’t.

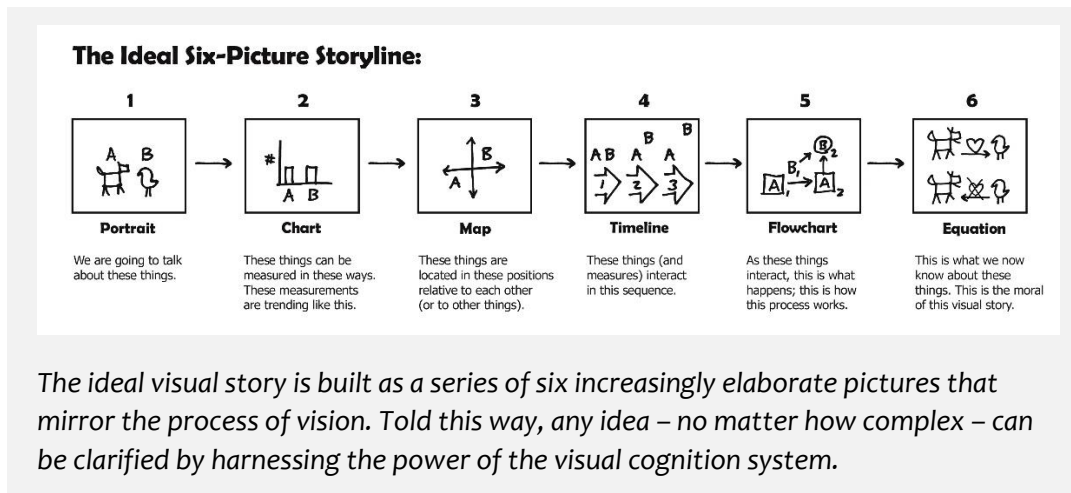
You may have a great collection of individual bits of visual information, and may have great insights, but until they are woven together in a visual narrative with a beginning, middle, and end, they very likely won’t cohere in the mind of your audience – at least not in the way you hope.

A good visual story is one that tells the **whole** story. Starting with *who* or *what* is involved, to the *quantities* in question, to the relative *positions* of those elements, to the *sequence* in which they interact, to the *insight* that surfaces, you want to bring individual information components together to deliver a real A-HA!

So here's my final and most important recommendation: use all the six elemental pictures *in sequence* to build a complete visual narrative. Done right (which is easy if you follow the steps of vision) your visual story will provide the context your audience needs and the full insight they demand.

**The ideal visual story contains these six pictures, presented in this order:**

- 1) **Who and what is involved.** Open every data story with a visual summary of the people and things you are going to be talking about.
- 2) **How many are involved.** Next, provide a quantitative measure (or many measures) of the people or things. Changes in number (trends) are particularly revealing.
- 3) **Where the pieces are located.** Present a map illustrating the relative position of these people or things according to geographical or conceptual coordinates.
- 4) **When things occur.** Next, show a timeline that illustrates the sequence in which these people or things interact, or the steps required to bring them into alignment.
- 5) **How things impact each other.** Provide a flowchart that adds cause-and-effect influences superimposed on any (or all) of your previous pictures; show the change and how you will achieve it.
- 6) **Why this matters.** Complete your visual story with a concluding “visual equation” that summarizes the keep learnings, takeaways, or action items triggered by the previous visual insights.



Not all visual stories will require all six pictures, and sometimes you may find that your story becomes more compelling by switching the order of the more advanced visuals. But remember where these six come from: they are drawn directly from the process of vision.

If you want to create a complete visual story for your audience – one which will take them from limited familiarity with your topic to complete comprehension – this 6-step story should be the rule, not the exception.

### ***IN CONCLUSION: WHEN IN DOUBT, DRAW IT OUT***

Your visual mind is a powerful asset and unshakeable ally for the discovery, exploration, and presentation of ideas. With simple pictures, a little practice, and solid tools, you can turn data into information, information into insight, and insight into action.

If you want to look like a data visualization genius, simply leverage the genius of the visual mind.

### ABOUT THE AUTHOR



Dan Roam is the author of five international bestsellers on the power of visual communication. **The Back of the Napkin: Solving Problems and Selling Ideas with Pictures** was hailed by BusinessWeek, Fast Company, and The Times of London as “the best creativity and innovation book of the year.” **The Back of the Napkin** has been printed in twenty-nine languages and is taught in business seminars around the world.

Dan’s newest book, **Draw to Win: A Crash Course on Visual Leadership, Sales, and Innovation**, will be published by Penguin Portfolio in September 2016.

Dan is the creator of [www.napkinacademy.com](http://www.napkinacademy.com), the world’s first complete online visual thinking training.

Dan has helped leaders at Microsoft, Google, Wal-Mart, Boeing, and the United States Senate solve complex problems through visual thinking. Dan and his whiteboard have been featured on CNN, MSNBC, ABC News, Fox News, NPR, and in the White House. Dan lives in San Francisco.

For more information on Dan’s work, please see:

[www.danroam.com](http://www.danroam.com)

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