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028

CHAPTER

01

★ ESSENTIAL READING CHAPTERS

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fig. 1.1-1.17

IMPORTANCE AND EFFICACY: WHY OUR BRAINS LOVE INFOGRAPHICS

○ VARIED PERSPECTIVES ON INFORMATION DESIGN:

A BRIEF HISTORY

○ OBJECTIVES OF VISUALIZATION

○ APPEAL

○ COMPREHENSION

○ RETENTION

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In *De Architectura*, Roman architect and engineer Vitruvius states that there exist three standards to which all structures should adhere: soundness, utility, and beauty. In their paper, *On the Role of Design in Information Visualization*, authors Andrew Vande Moere and Helen Purchase point out that these standards can and should also be applied to information design and the various applications that serve this purpose. They state that a good visualization should be sound; that is, the design's form should be suitable for the information it depicts. It should be useful, enabling the viewer to derive meaning from it. And of course, as with all design, it should have aesthetic appeal that attracts the viewer's attention and provides a pleasing visual experience.

This framework provides a solid basis that anyone can use to judge the value of visualization. However, we will use a slightly different categorization for the purpose of discussing the positive effects of infographics. We will refer to beauty as *appeal*, and divide utility into the areas of *comprehension* and *retention*—as these are the three basic provisions of all effective verbal or visual communication methods:

1. *Appeal*

Communication should engage a voluntary audience.

2. *Comprehension*

Communication should effectively provide knowledge that enables a clear understanding of the information.

3. *Retention*

Communication should impart memorable knowledge.

We will address the need to have a sound design on a more practical level in Chapter 9 (Information Design Best Practices) when we discuss principles for the practice of information design.

Images and graphics should always look appealing and encourage viewers to engage in the content. It is important that we examine why this is the case and identify the primary elements that lead to this appeal. This is certainly the first and potentially most challenging step in conveying a message: getting the recipient to commit to hearing what you have to say.

People have long accepted the notion that a picture can replace a thousand words, and similarly, that a simple graph can replace a table full of numbers. Basic visualization allows us to immediately comprehend a message by detecting notable patterns, trends, and outliers in the data. This chapter will look at how visualization achieves this feat so easily while other forms of communication fall short.

Further, we'll determine how we can make those visualizations more memorable. The democratization of media, especially online, has given us a great variety of options that we can use to consume our news, videos, and funny pictures—and generally educate ourselves on myriad topics. However, the downside to this exponential increase in stimuli is that we tend to lose much of this knowledge shortly after we gain it. While no one should lament forgetting a mediocre LOLcat, it pays to be memorable—especially in the business world. Fortunately, connections have been made recently between the illustrative elements of graphics and the retention rates of the information displayed—and these connections can help us all figure out how to have people remember our material.

This chapter will also discuss the fact that information design lends itself to achieving these objectives, and will seek to understand exactly how and why it does this, based on the way our brains process information. We will not be getting into too much heavy science; rather, our main goal is to understand which elements of design help us reach our specific communication goals, and to leave behind those that do not. For this we will lean heavily on several key works that have covered the science

of visualization exhaustively, most notably Colin Ware's thoughtfully written *Information Visualization: Perception for Design*.

Finally, we will identify several of the divergent schools of thought. We've concluded that the differences in these approaches are largely rooted in the failure to recognize that varied objectives necessitate varied approaches to the practice. That is, a design whose primary objective is to give the viewer information for analysis cannot be considered, designed, or judged in the same way as one whose primary goal is to be appealing and entertaining while informing. We will discuss these varied approaches to each unique objective and elaborate on the practice in the applications chapters (3, 4, 6, and 7). We will then discuss how we can use these different methods to serve our three basic communication provisions: appeal, comprehension, and retention.

VARIED PERSPECTIVES ON INFORMATION DESIGN: A BRIEF HISTORY

Many a heated debate over the proper approach to information design is raging online nowadays, which seems to raise the question: Why all the conflict in the friendly field of pretty picture creation? The debate surrounds just that: The role of aesthetics and decoration in the design of infographics. To understand the underlying tension, a bit of background is necessary.

Science and publishing have used information design and visualization as a communication tool for centuries. However, study and development in the field has mostly been dominated by academics and scientists, who are concerned primarily with understanding the most effective way to process and present information to aid viewers' analyses. These efforts are driven by loads of research, with highly theoretical consideration; when practical, the focus is on using software to process and visualize data sets. For years, only a select few—an educated, knowledge-

able, and skilled group of individuals—have discussed and practiced visualization in this sense. Then the Internet caught on. Around 2007, interest in infographics (mostly editorial in nature) began to grow on the web, as people shared old infographics like Napoleon's march on Moscow (Figure 1.1) and newer creations such as those published by *GOOD Magazine* (Figure 1.2). Suddenly, a whole new group of "experts" was praising, sharing, and critiquing (mostly critiquing) any infographic they could find.

Since then, an impressive number of new infographics have been created as various industries and areas identified different applications for their use. One of the most common was to use editorial infographics for commercial marketing purposes. This new breed of visual took a bit of a different path, both in format and content. The long, skinny graphic, designed to fit within a blog's width, became ubiquitous and almost instantly synonymous with the term *infographic*. These pieces used illustration and decoration much more than their traditional counterparts. And as with most marketing efforts, their goal was to use their content and design to attract attention, interest, and adoration for the company that produced them—making each brand a "thought leader" in its industry. This was quite a divergence from the traditionally stated purposes of the field, which was purely to use visual representation to aid in the processing and comprehension of data.

As you can imagine, the new field of infographic designers often lacked knowledge of best practices for information design. In other words, people were winging it. As with any field experiencing this kind of growth, overall quality of designs vary drastically—which has attracted criticism (read: utter disdain) from the academic and scientific visualization community. The Internet had usurped infographics.

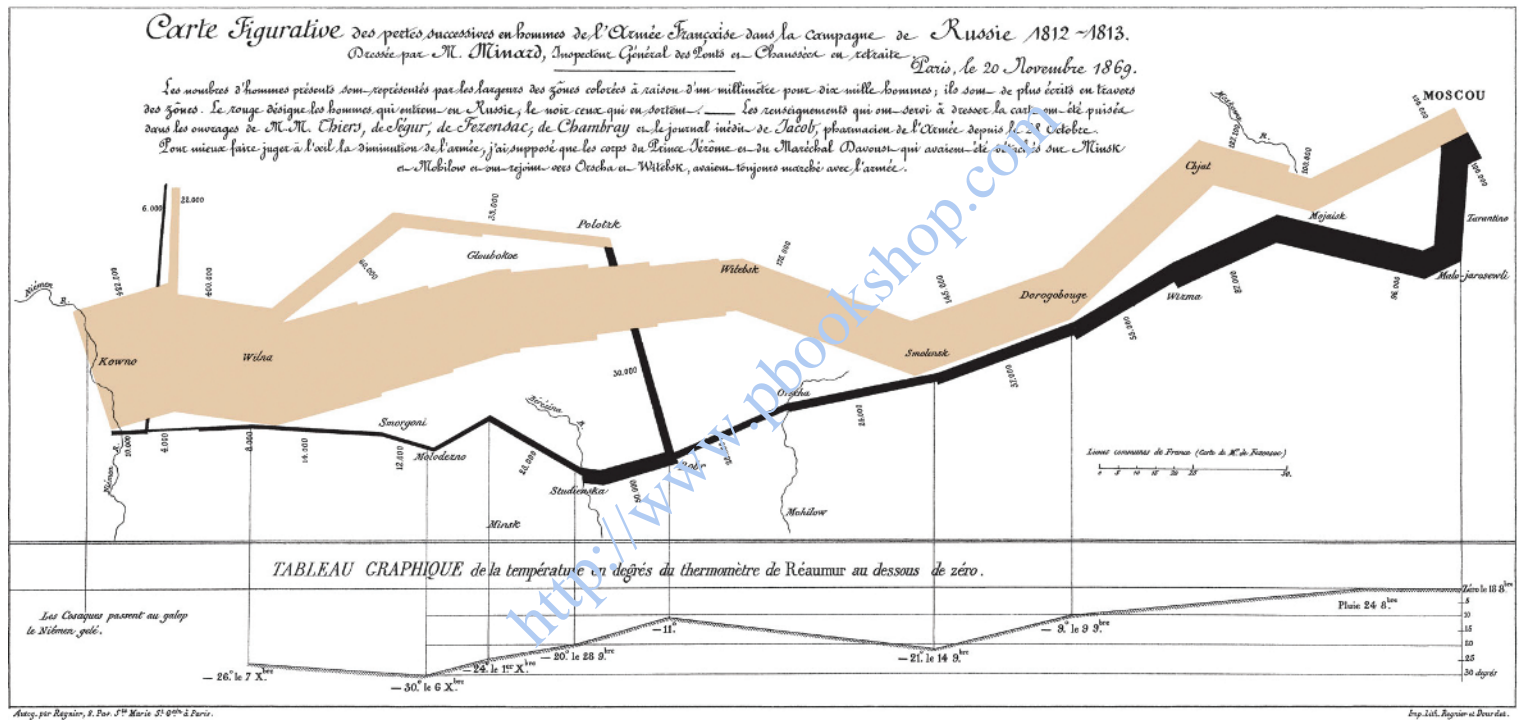


Figure 1.1

Flow map of Napoleon's Russian Campaign of 1812.

Charles Minard.

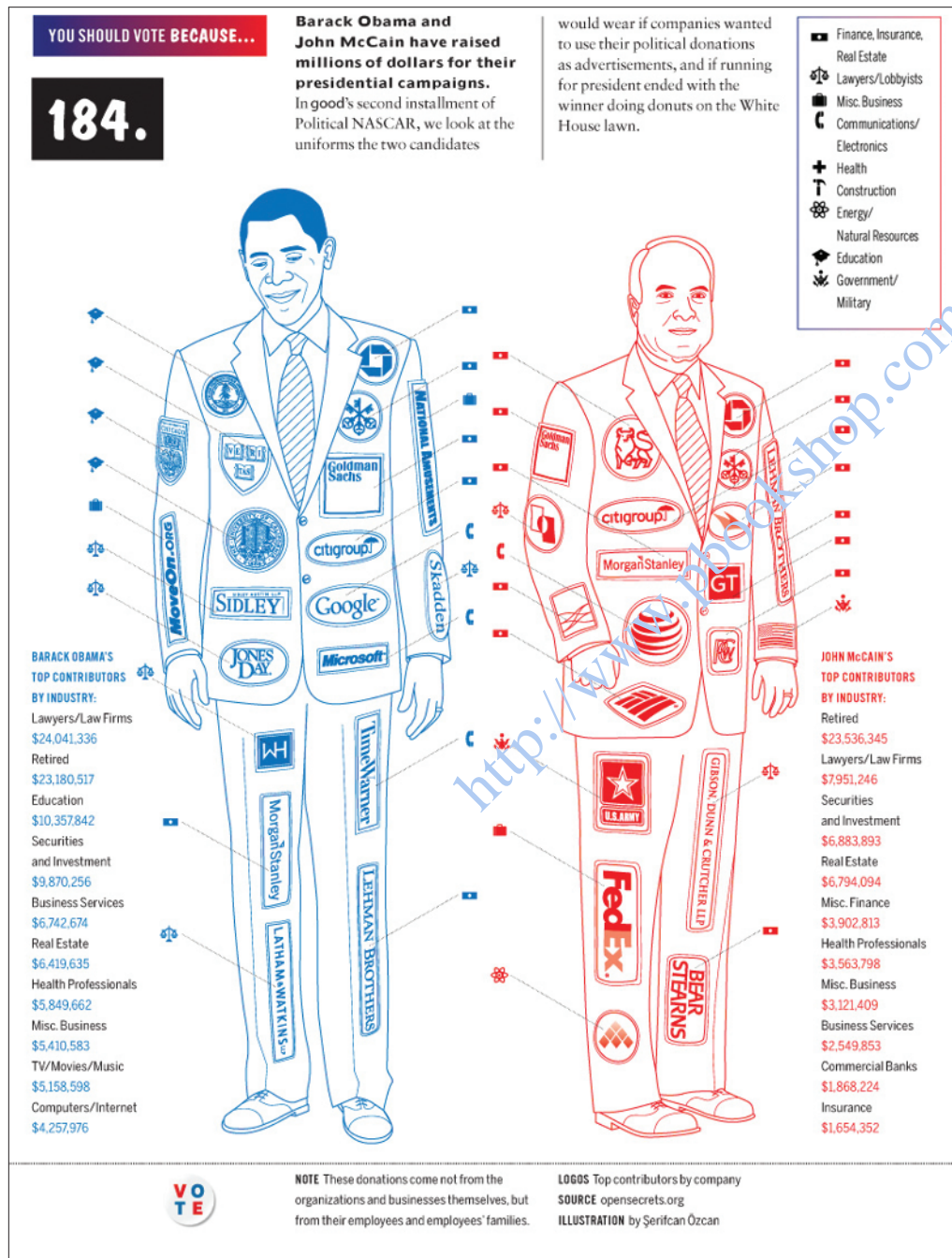


Figure 1.2
 You Should Vote Because.
 Open, NY for GOOD.

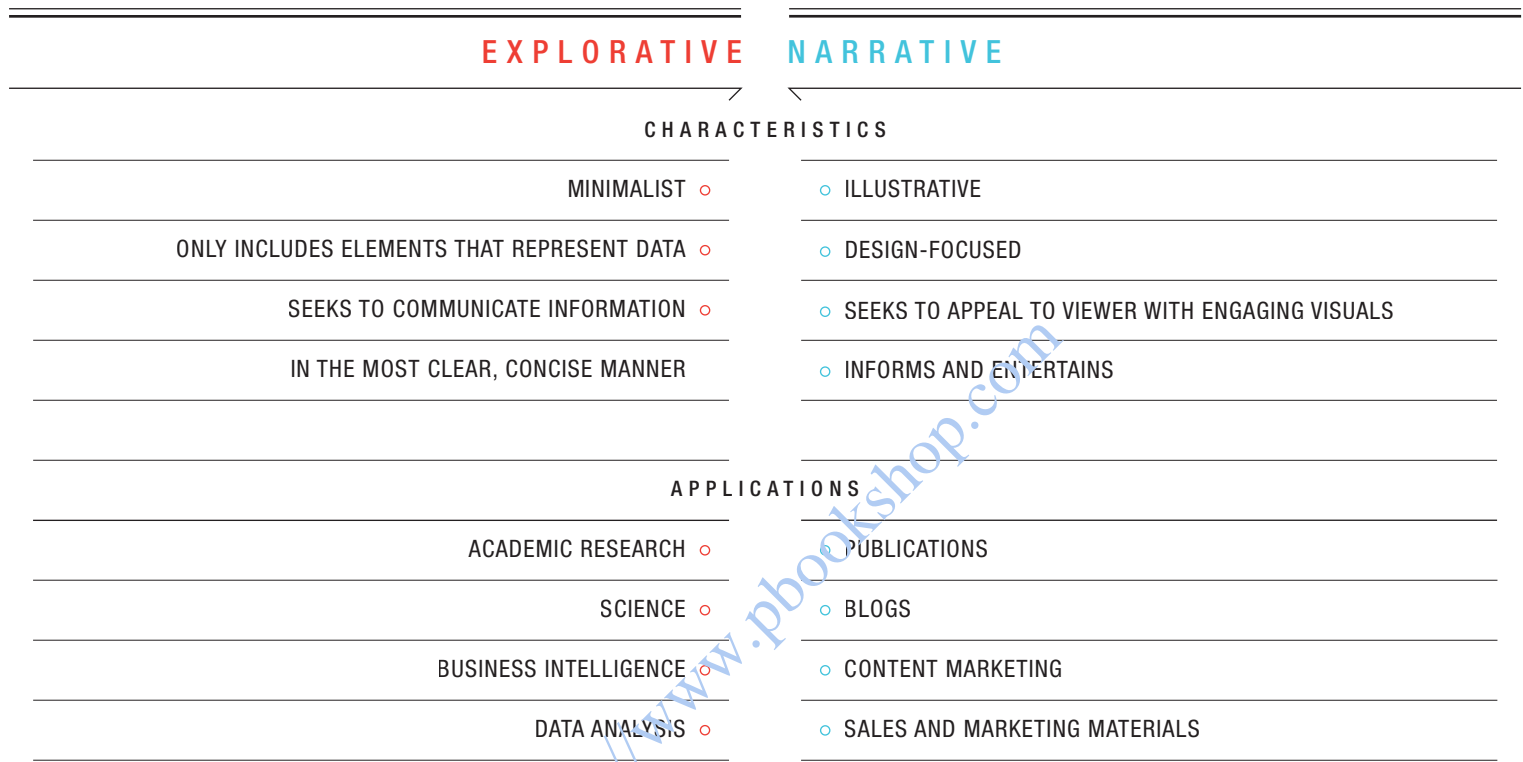


Figure 1.3

Approaches to infographic design.

The debate over what should be considered an infographic continues to this day, as people seek to find concrete definitions in an area that's constantly becoming more nebulous. Among the most known and quoted voices in this area is Yale University statistics professor Edward Tufte, who has written some of the most acclaimed and comprehensive works on the topic of information design. Tufte has contributed much to its popular terminology by coining terms such as *chartjunk* (unnecessary graphic elements that do not communicate information) and developing the data-ink ratio—a measurement of the amount of information communicated in a graphic as it relates to the total number of visual elements in it. Tufte's thoughts on the topic represent a conservative lean on the spectrum of approaches to infographic design (Figure 1.3), which is typical of those who have an academic or scientific background. He argues that any graphic elements of a design that do not communicate specific information are superfluous and should be omitted. He believes that chartjunk such as unnecessary lines, labels, or decorative elements only distract the viewer and distort the data, thus detracting from the graphic's integrity and decreasing its value (Figure 1.4). Although Tufte does concede that decorative elements can help editorialize a topic in some instances, his teachings typically discourage their use.

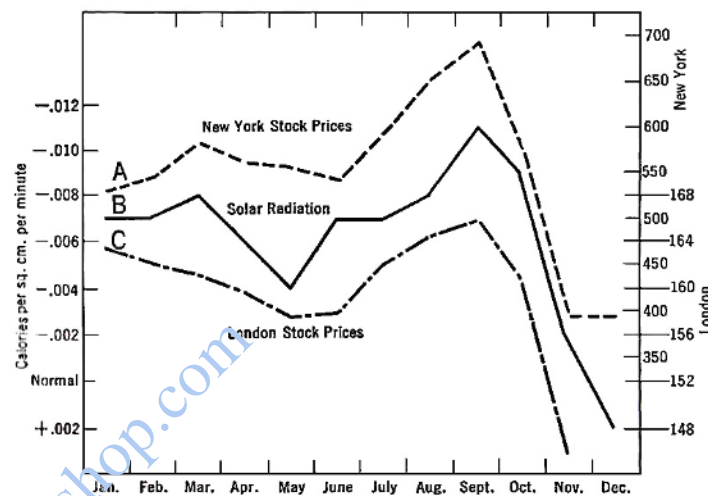


Figure 1.4

Example of explorative graphic approach using minimalist design.

The work and writing of British graphic designer Nigel Holmes characterizes the opposite end of the spectrum, which supports the heavy use of illustration and decoration to embellish information design (Figure 1.5). Holmes is best known for his illustration of editorial “explanation graphics” in *Time* from 1978 to 1994. The perspective that Holmes’ work supports the notion that using illustration and visual metaphor to support and reinforce the topic makes the graphic appealing to viewers. Recent studies show that these decorative elements can also aid in the retention of the information presented, which we will examine later in the chapter.

So which is the correct approach? Both are. What people often overlook in these debates is the most central issue to any design: the objective. While Tufte and Holmes might want to represent the exact same data set, they likely would be doing it for very different reasons. Tufte would aim to show the information in the most neutral way possible, to encourage his audience to analyze it without bias. Conversely, Holmes’s job is to editorialize the message in order to appeal to the viewer while communicating the value judgment he wants readers to take away. Tufte’s communication is *explorative*; that is, it encourages the viewer to explore and extract his or her own insights. Holmes’s, on the other hand, is *narrative*, and prescribes the intended conclusion to the viewer. The difference is inherent in their areas of work, as the objectives of science and research are much different than those of the publishing world. There’s no need to establish a universal approach to govern all objectives; rather, different individuals and industries should develop best practices unique to each application’s specific goal.

ACUMEN

The Topsy Turvy Republic of Alcohol

ALCOHOL has triggered extreme cultural mood swings in American history, with periods of binge consumption alternating with periods of enforced abstinence. Enthusiastic tipping was the norm in the colonies and early republic, but in the 1840s a nation of hearty drinkers

became zealous abstainers. A similar cycle occurred several decades later as a rise in consumption of alcohol at the turn of the century culminated in Prohibition.

DATAGRAPHIC BY NIGEL HOLMES
RESEARCH BY LOURNAE MORFA

1770-2000 HOW MUCH WE DRANK

Americans in the late 1700s and early 1800s were awash in beer, wine and spirits—consuming 30-plus gallons a year per capita. On average, the amount of pure alcohol in those libations was 20 percent, a figure that has remained consistent until the modern day. Per capita consumption dropped by more than half in the mid-1800s and in recent years has hovered above 10 gallons a year.

Gallons of alcohol annually, per person (age 15+)



1787 Two days before completing their work, the 55 members of the Constitutional Convention adjourn to a Philadelphia tavern for a break. They consume:

- 54 bottles of Madeira
- 60 bottles of claret
- 8 bottles of whiskey
- 22 bottles of port
- 8 bottles of hard cider
- 7 bowls of punch so large that people say ducks could swim in them.

1784 U.S. navy ration includes "half-pint of distilled spirits."

1794 Near-tripling of excise tax on whiskey results in the Whiskey Rebellion. (The tax is repealed in 1802.)

1799 George Washington's stills, built at Mount Vernon after his presidency, produce 11,000 gallons of whiskey.

1809 James Madison tries to create a new Cabinet position: Secretary of Beer. He fails.

1849 Bartholomew in Mortimer, Calif., invents the martini.

1770-1830 WHY WE DRANK

In early America, gentry and common folk alike viewed alcohol as a source of energy, a palliative for disease and a necessary substitute for polluted water. Plus, a nip or two made folks a little happier. Rum fueled the slave trade and fueled the colonial economy; 4.8 million gallons were distilled annually by 1770. When the Revolution cut off the rum makers' supply of Caribbean molasses, whiskey became the spirit of choice. Consumption of hard liquor increased as the early republic underwent the strains of an enormous population increase—from 4 million in 1790 to 23 million in 1830—and the beginnings of industrialization.

area 1840 WHY WE STOPPED DRINKING SO MUCH

As consumption rose in the 1820s, so did the boston against it. By 1835 temperance societies claimed 1.5 million converts to the cause of moral living. The temperance movement, which emerged amid a chance for the abolition of slavery and other social reforms, at first condoned drinking in moderation but gradually adopted a zero-tolerance stance.

1920-1933 PROHIBITION: WE KEPT ON DRINKING

The 1920 Volstead Act, which defined how Prohibition was carried out under the 18th Amendment, outlawed the manufacture, sale or transportation of "intoxicating liquor" and paved the way for organized crime to make a killing in the illegal booze trade during the next 13 years.

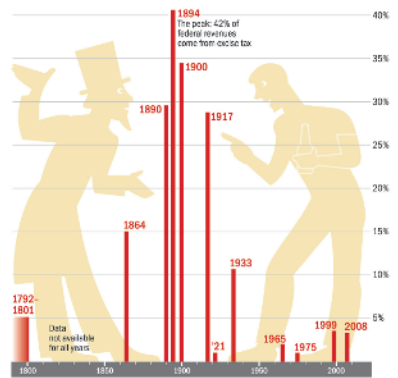
The Volstead Act was riddled with loopholes, including a lack of criminal penalties for possession and consumption of alcohol; an exemption for sacramental wine spiked sharply; and doctors prescribed 1.8 million gallons of medicinal whiskey in 1927 alone. Another exception allowed housewives to produce 200 gallons of home-brewed "ale" or "flat" (like a year then, contained up to 0.5 percent alcohol).

By 1930, 70 percent of the public lined up with corrupt enforcement officials, courts riddled with liquor cases and a prospecting homicide case—wanted to change the Volstead Act. Prohibition hit the federal pocketbook especially hard: The government lost \$1.1 billion in liquor excise taxes.

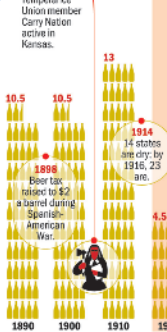
The 21st Amendment repealed Prohibition in December 1933.

1792-2008 EXCISE TAX: WHAT THE GOVERNMENT COLLECTS

Alcohol excise taxes were an on-again-off-again source of federal revenue until Uncle Sam began to depend heavily on them during the Civil War. Personal income taxes became the main source of U.S. revenue after passage of the 16th Amendment in 1913 and now account for 45% of the federal budget while only about 2% comes from alcohol.



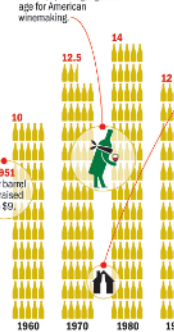
1800-1910 Women's Christian Temperance Union member Carry Nation active in Kansas.



1933 FDR boosts the end of Prohibition with a dry martini.



1976 California wines beat French wines at a blind tasting in Paris, France, sparking a golden age for American winemaking.

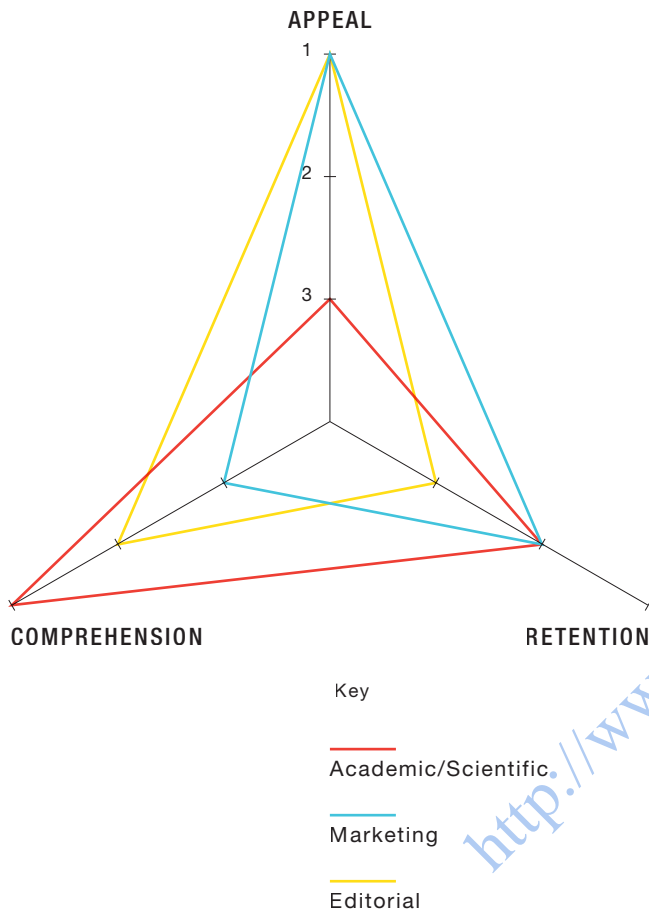


1978 President Carter signs bill legalizing home brewing for the first time since Prohibition.



SOURCES: USDA in *Measures of the Alcohol Industry: An American Handbook* by W.J. Rosecrance; *The Oxford Food and Drink: A Sociological History of the Regulation of Alcohol and Drinking* by Jan. Allan Corbin; OECD 1985; U.S. Office of Management and Budget.

Figure 1.5
The Topsy Turvy Republic of Alcohol.
Nigel Holmes.



OBJECTIVES OF VISUALIZATION

Of course, we must first look at what each infographic is trying to achieve before we can establish the best practices for its application. By definition, all information graphics are aimed at communicating information. What varies is the purpose for doing so—and understanding this purpose is what determines a graphic’s priorities. These priorities account for a necessary difference in approach to each design.

For example, if an infographic is intended to communicate information in the most clear and unbiased manner possible, then the first priority for the designer is *comprehension*, then *retention*, followed by *appeal* (Figure 1.6). This is common in academic, scientific, and business intelligence applications, as these areas typically lack any agenda aside from conveying and having viewers comprehend knowledge. Appeal is less necessary in this setting, as the viewer most typically needs the information and seeks it out as a result. Appeal is only useful when it keeps the viewers’ attention to enable further comprehension. Such a graphic typically would be used as a resource for information—which is why retention is also a secondary priority. If the viewer needs the information and it is a readily accessible resource, then he or she can revisit it as needed to retrieve it again. There’s no need for it to take up any more valuable brain space than necessary.

Figure 1.6
Infographic priorities by application.

However, a graphic created with a commercial interest in mind will have much different priorities. Brands primarily seek to get viewers' attention and eventually (hopefully) convert those users into paying customers. As evidenced by Super Bowl commercials, companies will go to almost any length to get this attention. The order of priorities of a commercial marketing graphic would be *appeal*, *retention*, and then *comprehension*. Brands are looking to catch viewers' attention and make a lasting impression—which usually means that viewers' comprehension of content is frequently the brands' last priority. The exception to this would be infographics that are more focused on the description of a product or service, such as a visual press release, since designers in these cases would want the viewer to clearly understand the material as it relates to the company's value proposition. However, being appealing enough to prospective customers to get them to listen is always goal number one.

Publishers that create editorial infographics have a slightly different mix: *appeal*, *comprehension*, and *retention*. Since the appeal of a magazine's content is what will make it fly off the newsstand, it shares this top priority—improving sales—with companies in other industries. A publisher's survival is based solely upon its ability to spark readers' interest. The quality of content or graphics produced on a consistent basis helps drive this interest by making a strong impression on readers—and this is where *comprehension* comes into play. A publication's quality is based on the content it produces, which is intended to help readers understand a given topic. However, whether or not the reader can *recall* that topic with the same level of understanding one week later is of little importance to a publisher's bottom line. The common denominator between commercial and editorial interests is that they both desire to compel the consumer to take a specific action.

APPEAL

In 2010, Google CEO Eric Schmidt famously stated that we now create more information in two days than we created from the dawn of man up until 2003. This staggering statistic obviously necessitates clarification of what constitutes information and its creation. Regardless, the message is clear and uncontested: humanity is creating and consuming far more information than it ever has before. As a result, it is increasingly difficult to get people's attention, since they're constantly bombarded with various stimuli throughout the day—material that ranges from breaking news to funny photos to Facebook updates. Marketers, salespeople, brand evangelists, and publishers must all figure out how to grab a slice of this attention—a task that is becoming more challenging by the day. How do you get people's attention, and keep it long enough to share your message with them? Due to the sheer volume of “stuff” out there, it's a formidable task to make yours stand out.

How do you appeal to an audience in a world of information overload in which people constantly face new inputs, options, and decisions? Ask the world's biggest company, Apple. With a cash reserve larger than the total valuation of all but fifty companies worldwide (as of early 2012), this organization surely must have some insight into what people like. In the battle for MP3 player dominance, the iPod came in early and overshadowed the competition. What was, and still is, the key differentiator between this and other products? The simple answer is design. While features such as OS compatibility, memory, and screen size certainly factor into the decision, the most outstanding difference between the iPod and its competitors is its impressive design. As Steve Jobs preached, good design not only garners additional appeal for an item, it can also actually incite an emotional reaction. Few can deny the good feeling of pulling a new Apple product out of the box.

So how does this translate to best practices for information design? Our consumer culture is becoming increasingly design focused in areas that extend beyond graphics and consumer electronics, and that play a role in many other industries. Home products company IKEA, for example, has made clever furniture design mainstream. British mega-brand Virgin brought sexiness to the airline industry, with an interior design that looks more like a chic lounge than a mode of mass transit. Regardless of whether they can articulate it—or if they even know it—consumers connect with these brands because of designs that continue to attract new fans and followers. The ever-growing media landscape makes it increasingly important to use great design to differentiate your brand from the crowd.

Even if your goal is to present information for a purely analytical objective—that is, without any desired action from the reader—it is still beneficial to have aesthetic appeal.

DESIGN IS TO DATA AS CHEESE SAUCE IS TO BROCCOLI.

(That analogy is on the SAT, if you don't remember.) In other words, people need an added incentive to eat their vegetables—especially when those vegetables are as cold and dry as research studies and analytics reports. Presenting information by way of engaging visuals immediately attracts readers and entices them to dig deeper into the content.

Possessing this appeal to your audience is not a “nice to have” for businesses; it is a “must have.” You can't sell magazines if no one picks them up, and you can't sell products if you can't get potential customers' attention.

The modern marketer can learn a lot from Horace's quote in the introduction, and the notion that delighting people with your content is a must. It has become a necessity in order to build trust with your audience and capture their attention often. We will discuss how to do this further in Chapter 3 (The Visual Storytelling Spectrum) and Chapter 4 (Editorial Infographics), in the sections pertaining to Editorial Infographics. For now, it is important for us to focus on the first step: How to get their attention in the first place.

Just what appeals to us when we become interested in consuming information? We are drawn to formats that we see as efficient, engaging, and entertaining (Figure 1.7). It's highly unlikely that someone would prefer to read a lengthy article than view a multimedia display presenting the same information. A diversity of media keeps our brains engaged in the material, and the visualization can enable us to digest it more efficiently and facilitate understanding.

The screenshot shows a news website interface. At the top, there's a navigation bar with 'SPECIAL REPORT: COMPETITION', 'TV CLUB THE FIVE APP', and 'BUNK'. The main header reads 'BEACH HOUSE ROOM'. Below this is a news ticker with items like 'Biden Jumping Motorcycle', 'Blazejobs Queen', 'Kennedy Death Liv', and 'Coolest Animals'. The main content area features a large article titled 'Nation Shudders At Latest Block Of Uninterrupted Text' with a sub-headline 'Shove The Onion Down Your Friends' Throats.' and a photo of a man looking stressed at a desk. To the right, there's a sidebar with 'OUR DUMB READERS' and 'AMERICAN VOICES' section. At the bottom right, there's a 'General' beer advertisement with the text 'TRY IT TODAY!' and 'General SORBIC MINT CLASSIC BEER'.

Figure 1.7

Source: Reprinted with permission of THE ONION.
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Further, a recent study from the University of Saskatchewan suggests that viewers prefer a greater use of illustration in visual representations. When presented with both a simple chart and one that contained an illustration by the aforementioned Nigel Holmes (Figure 1.8), participants consistently opted for the Holmes version in a number of different areas (Figure 1.9). While this conclusion—that a more dynamic and stimulating visual is preferable to a plain one—seems somewhat obvious, it's important to consider in design approach. It's not enough to make your content visual; you must also make it visually interesting. You can do this by using representative iconography, illustrative metaphor, or relevant decorative framing mechanisms—all powerful tools for communicating your message. However, you always want to remember your objective. The appropriateness of decorative and illustrative elements will vary based on an infographic's application and use. For example, an editorial graphic in the Sunday newspaper on the topic of corporate profits could find great use in the illustration of a rotund executive sitting atop a throne of gold bullion. Shareholders, on the other hand, might not share the same appreciation for such a work of art if it adorned the pages of an annual report containing similar data.

If used incorrectly, decorative elements have the potential to distract the viewer from the actual information, which detracts from the graphic's total value. Mastering this execution and finding the balance between appeal and clarity can be a nuanced process. We will discuss the proper use of illustration and decorative elements further in Chapter 9 (Information Design Best Practices), where we'll cover the principles and best practices of information design.

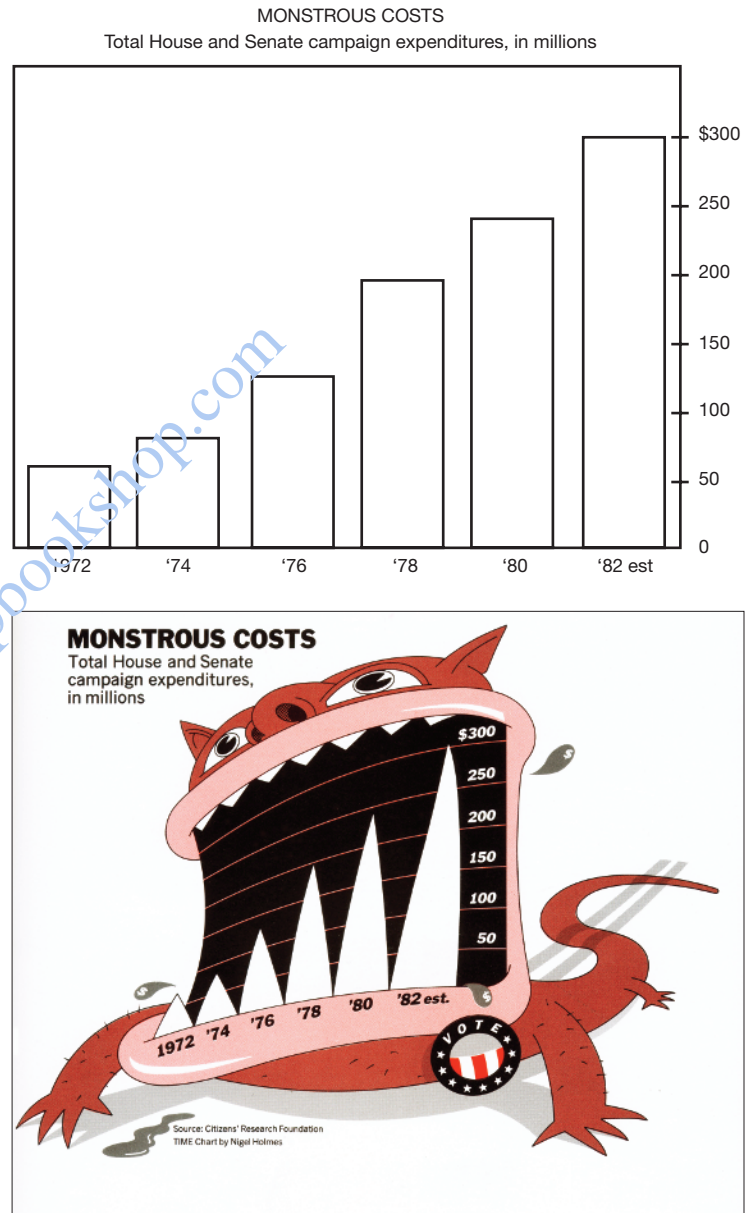


Figure 1.8

Illustrative Nigel Holmes graphic with simplified equivalent.

KEY  HOLMES  PLAIN

COUNT OF RESPONSES

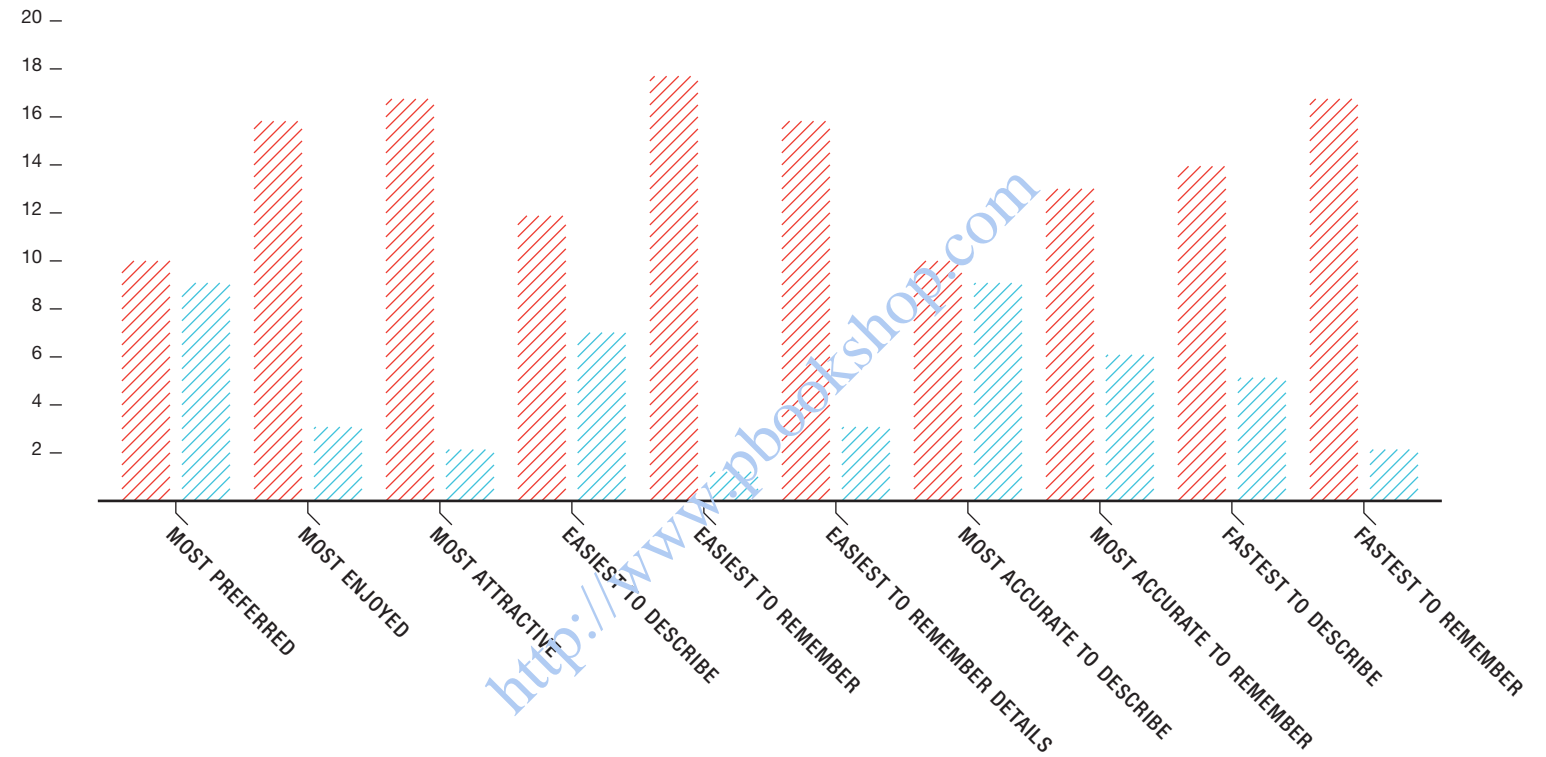
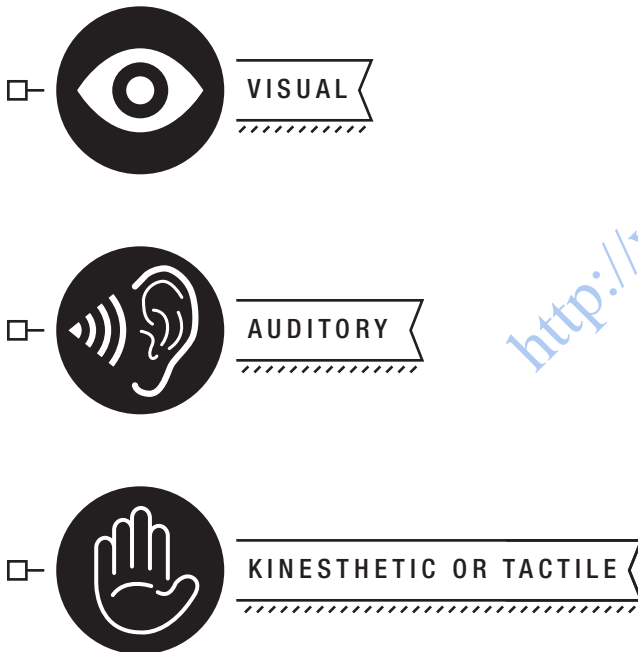


Figure 1.9
University of Saskatchewan study results.

COMPREHENSION

You often hear someone claim to be a “visual learner,” which simply means that they need to see something in order to understand it. Researchers have studied and modeled learning styles in a number of different ways over the past several decades, and the origins of this specific visual style of thinking can be traced to Neil Fleming’s VAK model. One of the most commonly known and quoted models of thinking, it states that when comprehending information, people learn best with one of three types of stimuli:



Visual learners best comprehend information that is presented in pictures, diagrams, charts, and the like; auditory learners do best when hearing this information spoken; and tactile learners need to touch and learn by doing. While this theory is commonly accepted, it has been highly scrutinized in the scientific community, which posits that there is little to no evidence that any one preferred method of learning is actually more beneficial for comprehending and retaining information.

Regardless of this ongoing debate, it is important to consider the media structure and channels through which people obtain information. It is less important to identify how people *prefer* to learn, and instead figure out how they are *actually* learning—and these experiences are occurring increasingly online today, a channel based primarily on visual display. The use of audio-only content on the web is relatively minimal outside of music sites—and until virtual reality is able to provide interactive, tactile experiences, the majority of information on the Internet will be communicated visually.

Given that people are more likely to consume information visually, the value of using visuals in our communication—instead of just words—is truly significant. As Colin Ware states in *Information Visualization: Perception for Design*,

“The human visual system is a pattern seeker of enormous power and subtlety. The eye and the visual cortex of the brain form a massive parallel processor that provides the highest-bandwidth channel into human cognitive centers. At higher levels of processing, perception and cognition are closely interrelated, which is why the words *understanding* and *seeing* are synonymous (p. xxi).”

Ware goes on to state that we are able to acquire more information through our visual system than we do through all our other senses combined (p. 2). This is largely because visualizations contain certain characteristics called preattentive attributes, which our eyes perceive very quickly (within 250 milliseconds) and our brains process with impressive accuracy—without any active attention on our part. Force-feeding for the mind—how convenient! To use a common illustration of this concept, refer to Figure 1.10. Try to count the number of 7s in the number set. How long did that take?

Now, try the same exercise with Figure 1.11. A color change makes recognition almost instant, since color is one of several preattentive attributes, displayed in Figure 1.12. All visualizations contain such attributes, and using them properly to convey information is the key to visual communication. Our brains are able to recognize and process many of these visual cues simultaneously through a course of action called preattentive processing. All this action precedes any cognitive attempts to focus on any specific area; rather, it is purely involuntary and will simply proceed wherever our eyes are pointed.

These natural functions that result from the connection between the eyes and brain can be quite handy when we want to communicate to people who don't have a lot of time—or a long attention span. We know that we can use these visuals to attract people by appealing to them aesthetically, but we can also decrease the amount of time it takes them to comprehend the message by using these same tools.

That said, you can't tell a story through color alone, or craft compelling messaging using only shapes and symbols. So how do words factor into information design? Within the context of a society that speaks the same language, words—as compared to symbols—have a distinct advantage in terms of familiarity. No set of symbols has universal ubiquity; rather, most are isolated to specific social or cultural settings. This necessitates a cost-versus-benefit analysis of using visualization instead of verbal communication. Symbols can take longer to interpret than language when conveying a concept to someone who is unfamiliar with the symbols. In this case, communication should favor text descriptions. To someone who knows the symbols, however, this comprehension process is far easier; in this case, communication should rely more upon visualization methods.

Ware provides a sound breakdown of the general value of each medium by explaining that “images are better for spatial structures, location, and detail, whereas words are better for representing procedural information, logical conditions, and abstract verbal concepts” (p. 304). The practical reality is that we don't need to choose between the two. The strongest visualizations are those that are supported by descriptions as well as narratives, especially in editorial applications. Using words in this way helps to bring both personality and clarity to an infographic.

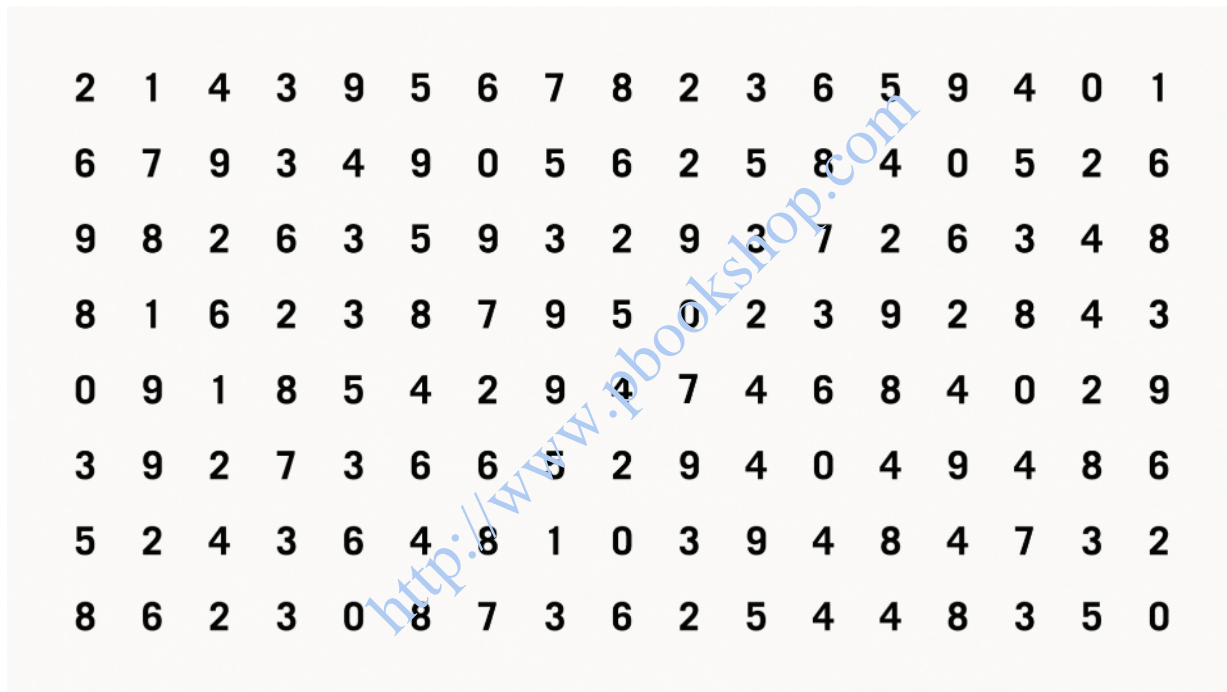


Figure 1.10

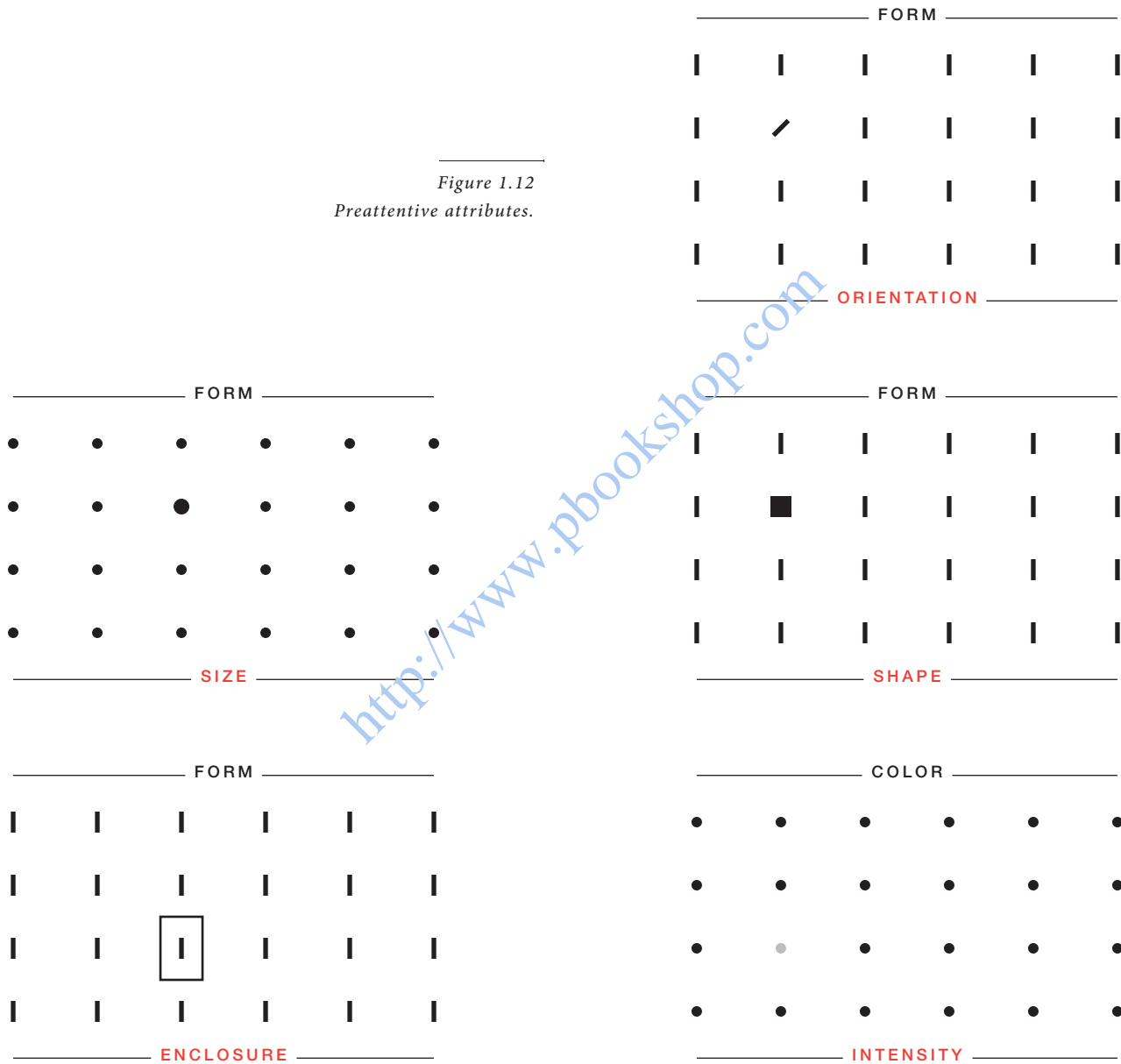
Preattentive Processing Test 1.

2	1	4	3	9	5	6	7	8	2	3	6	5	9	4	0	1
6	7	9	3	4	9	0	5	6	2	5	6	4	0	5	2	6
9	8	2	6	3	5	9	3	2	9	3	7	2	6	3	4	8
8	1	6	2	3	8	7	9	5	0	2	3	9	2	8	4	3
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5	2	4	3	6	4	8	1	0	3	9	4	8	4	7	3	2
8	6	2	3	0	8	7	3	6	2	5	4	4	8	3	5	0

Figure 1.11

Preattentive Processing Test 2.

Figure 1.12
Preattentive attributes.



FORM



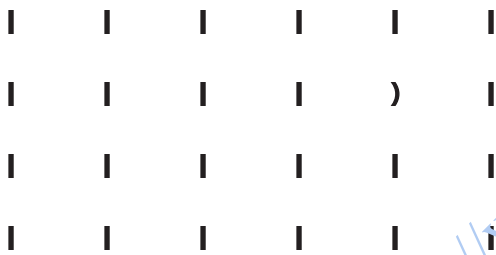
FORM



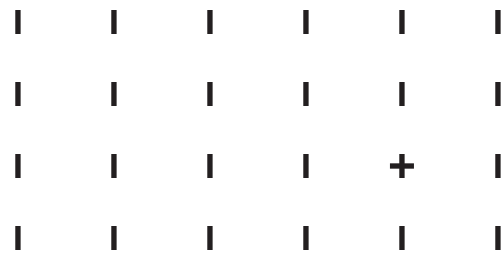
LINE LENGTH

LINE WIDTH

FORM



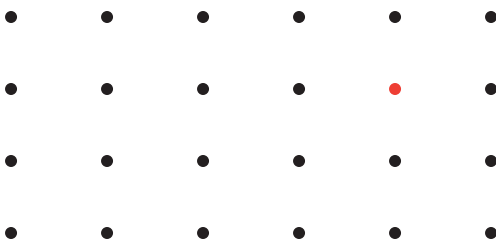
FORM



CURVATURE

ADDED MARKS

COLOR



SPATIAL POSITION



HUE

2-D POSITION

RETENTION

The third main benefit of using infographics in communication is their ability to help people retain information, as the graphics are able to extend the reach of our memory systems. Visualizations do this by instantly and constantly drawing upon nonvisual information that's stored in our long-term memory (Ware, p. 352). The human brain can recall familiar symbols, scenes, and patterns, allowing us to make rapid connections to already stored information and to quickly comprehend what we're seeing. This prompts the question: Which visualization methods best serve recall for various different types of memory?

There are three main types of memory that relate to viewing images. The *iconic memory* is the snapshot of a scene that you retain for a brief instant after looking at something. It is stored for less than a second, unless it is analyzed and connected to something that is already stored in your brain (Sperling via Ware, p. 352). *Long-term memory* stores information from our experiences that we will retain for long periods of time, and from which we draw upon in order to process new information. Long-term memory is further divided into three areas: episodic memory, semantic memory, and procedural memory. *Episodic memory* is the primary device for recalling images and scenes that we've experienced, and the feelings associated with those experiences. *Semantic memory* enables us to recall knowledge that has no specific context or experience associated with it, and could generally be considered the storage of "common knowledge." *Procedural memories* are those that recall processes of doing—such as typing or tying a tie—that we access involuntarily without conscious thought. These memories often build on themselves, which is why you are able to recall that the "M" arm position comes after the "Y" when the Village People are played at a wedding reception.

Visual working memory is what lies in between iconic and long-term memory, and is most essential to processing visual information. When we see an object that requires further attention, we move it from iconic to visual working memory. Visual working memory then calls upon semantic memory (long term, nonvisual) to understand its meaning. All this happens in about 100 milliseconds (Ware, p. 353). With our vision transmitting massive amounts of information into the brain, and the brain accessing its stored knowledge to provide context, we are able to understand much more quickly than with any other combination of sensory perception and processing.

So what visual elements should be used to best ensure that individuals store this understanding for long-term recall? While academics have typically argued against using decorative elements in information design—claiming that they only serve to distract the viewer—this isn't always the case. A very interesting finding from a University of Saskatchewan study conducted by Scott Bateman and his colleagues from the Department of Computer Science uncovered that a more illustrative approach to design actually benefits information recall significantly. All participants were shown a set of alternating graphics, some plain and some in Holmes's illustrative style, such as that depicted in Figure 1.8. The researchers split the participants into two groups: half were part of an immediate recall group, and the other half were in the long-term recall group. After seeing all the graphics, the immediate recall group played a five-minute game to clear their visual and linguistic memory. They were then questioned regarding the information in each graphic. The long-term recall group was scheduled to come back for their recall session two to three weeks following the initial observation.

Each participant had to answer questions about the graphic's subject, the categories displayed within it, and the general trend of the chart. They also had to describe whether there was a value judgment presented in the chart; that is, a perceived

opinion that the graphic’s creator had presented.

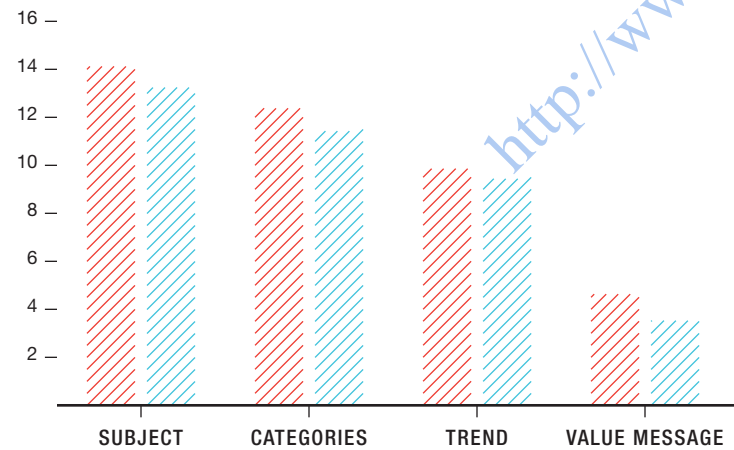
The immediate recall group showed no significant differences between Holmes’s graphics and their plain counterparts in terms of how well they’d retained information about the subject, categories, or trends (Figure 1.13). Yet there was a significant difference in their identification of whether a value judgment had been presented. However, the long-term recall group experienced notable differences in their ability to recall information in all areas (Figure 1.14). The subjects, categories, trends, and value messages within Holmes’s graphics stuck with users more prominently after two to three weeks.

Bateman et al. offer up three possible explanations for the findings in this experiment:

1. Additional imagery enabled people to encode information—more deeply, as there were more visual items to recall and use memory to draw upon.
2. The variety of Holmes’s style gave it a unique advantage in being memorable over the style of the plain graphics, which all had a similar look.
3. The user preference (as described earlier in the Appeal section) provided a hidden factor: The participants’ emotional responses to the graphic, combined with the imagery used, helped to solidify the image in their memories.

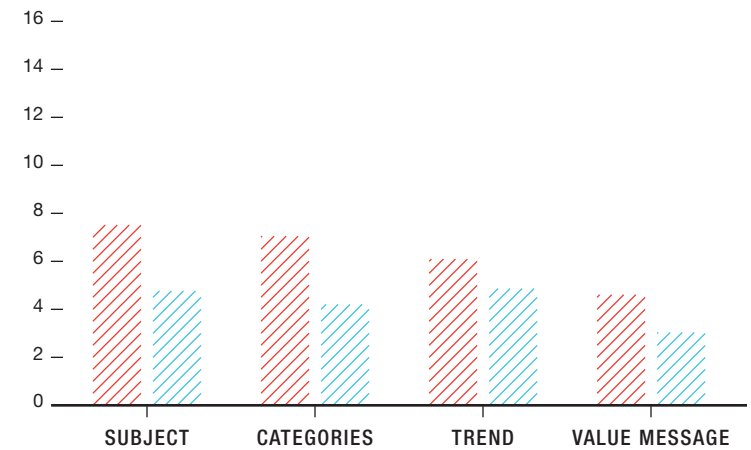
KEY  HOLMES  PLAIN

SUM OF SCORES



IMMEDIATE RECALL

SUM OF SCORES



LONG-TERM RECALL

Figure 1.13: Results of immediate recall group.

Figure 1.14: Results of long-term recall group.

So what does all of this tell us about using infographics, particularly for commercial objectives? Graphics that contain visual embellishment beyond the information being displayed may be superior not only in terms of appeal, but also in their ability to ensure that viewers understand and retain your message—which is likely value-based. Appealing to someone not only aesthetically but also emotionally prompts a deeper connection with the information, which makes them more likely to remember it.

While design style is something that varies greatly and often cannot be categorized neatly, there are certain devices that we can use to facilitate understanding and retention. We refer to these collectively as illustrative design:

1. *Visual Metaphor*

We use this often at Column Five and it works incredibly well when implemented effectively. You can do this by containing information within a framing mechanism that is indicative of your subject matter (Figure 1.15).

2. *Symbols and Iconography*

The success that these achieve depends largely on cultural context. Your audience must universally understand your icons and symbols for them to be effective. When this is the case, they can provide a great communication shortcut by using visual elements in the place of verbal explanation (Figure 1.16).

3. *Decorative Framing*

Using design elements that appeal to your target audience lets them connect with infographics on an emotional level, thereby deepening their interest in and retention of the information (Figure 1.17).

Illustrative design can also have its negative effects, so it is important to determine when it might potentially detract from rather than support your message. The main pitfall here is the designer's accidental or intentional distortion of the display of data. Illustrations should complement visualization elements, but never at the expense of misleading the viewer. Whether intentional or not, you always want to avoid altering accurate information representation.

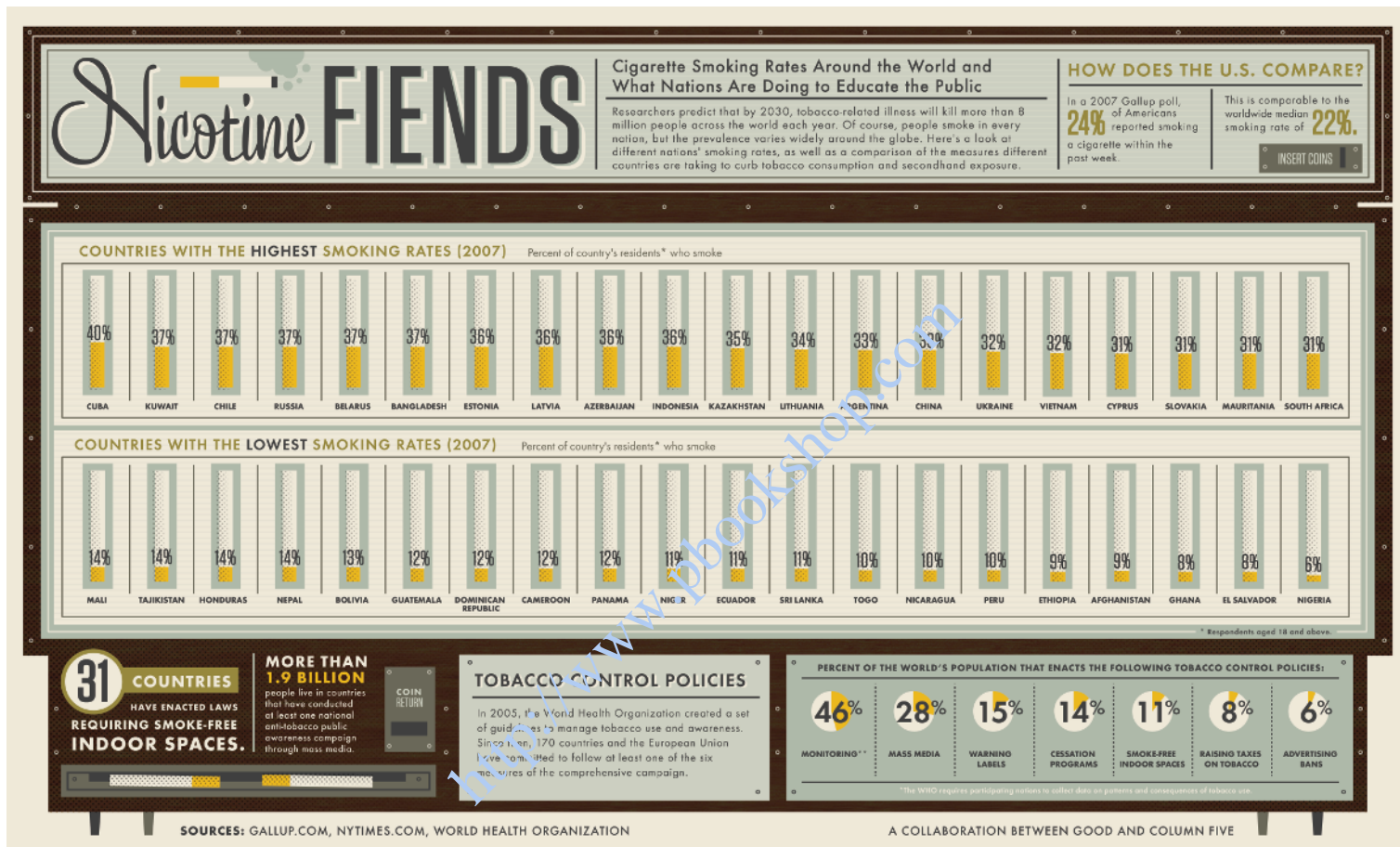


Figure 1.15
 Example of visual metaphor.
 Column Five for GOOD.

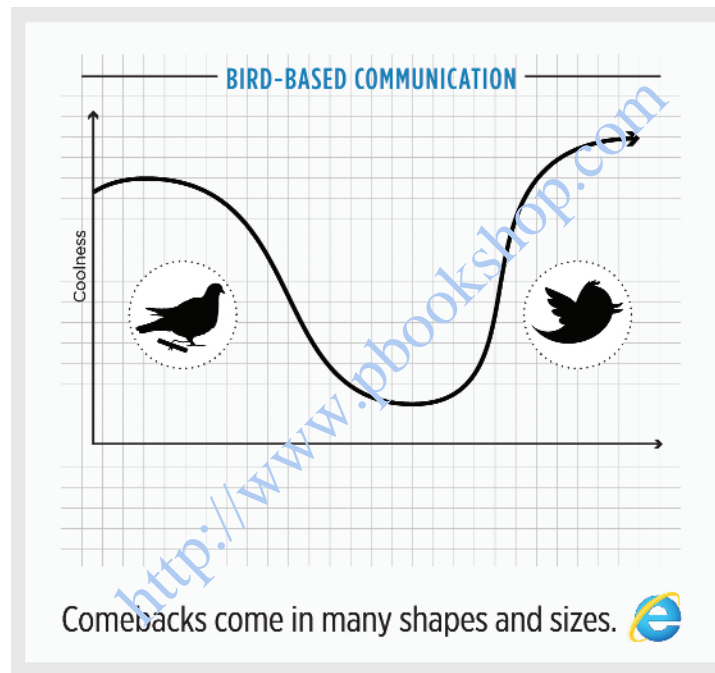


Figure 1.16
Example of use of symbols and iconography. Column Five
for Microsoft.

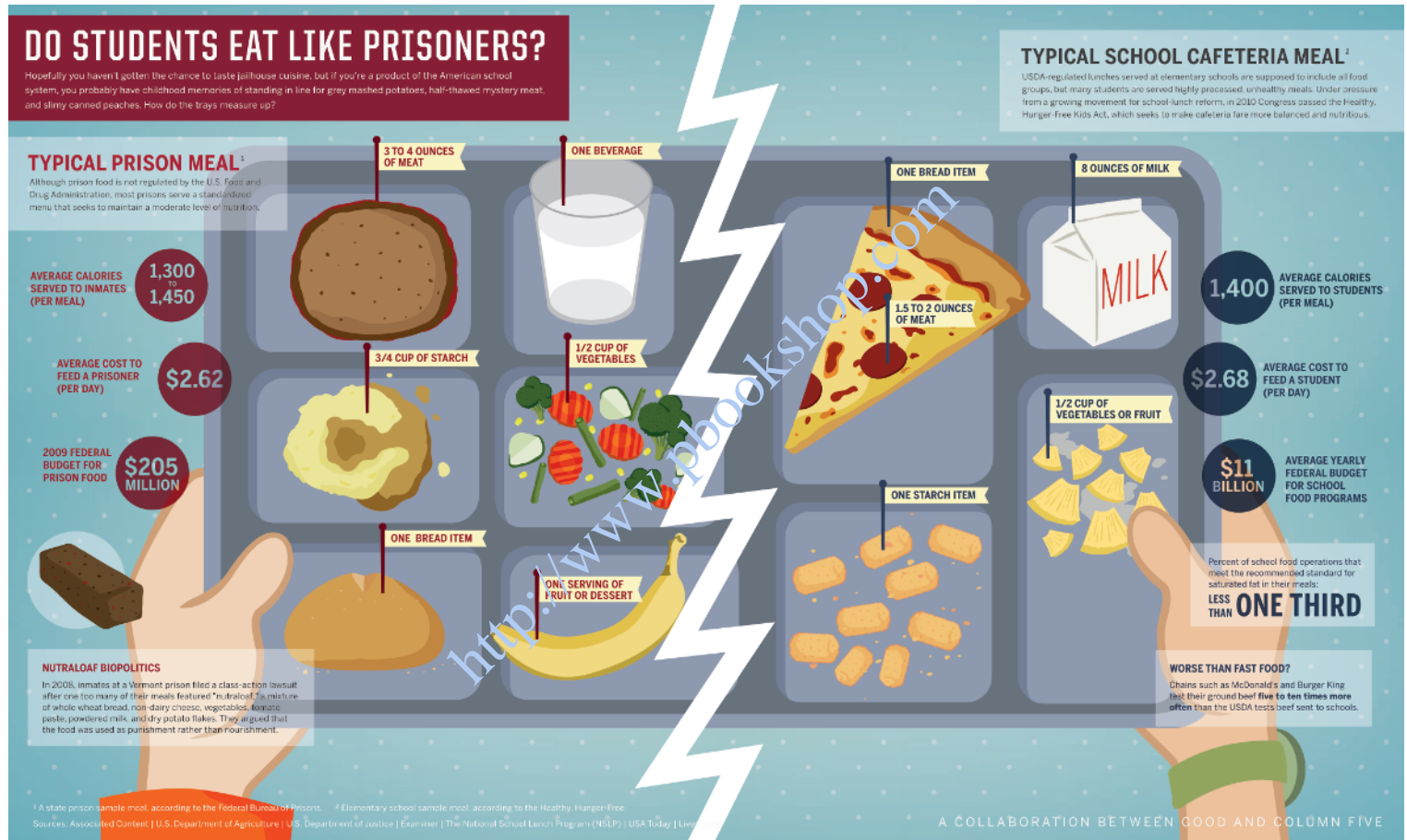


Figure 1.17
Example of decorative framing.
Column Five for GOOD.